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# Prevalence of cardiovascular risk and associated factors in adolescents

Prevalencia de riesgo cardiovascular y factores asociados en adolescentes

Prevalência de risco cardiovascular e fatores associados em adolescentes

## ABSTRACT

Cardiovascular risk factors and associated factors may together add to the development of cardiovascular diseases. Objective: The frequency of cardiovascular risk factors and associated factors in adolescents was analyzed. Method: Cross-sectional study with high school students from the city of Teresina (PI), with a sample of 251 adolescents with a mean age of  $16.2 \pm 0.76$  years. Lifestyle information, anthropometric and clinical data were obtained. Results: Adolescents presented prevalence of excessive daytime sleepiness (88%), physically inactive (38.2%), prehypertensive (14.7%) SBP and (27.1%) DBP. Regarding body mass index, females presented higher indices, but for waist and neck circumference, males presented higher indices ( $p < 0.05$ ). Conclusion: The presence and positive associations between risk factors that may contribute to the development of cardiovascular diseases serve as indicators for preventive measures to be taken.

**DESCRIPTORS:** Risk factors, Lifestyle, Adolescents.

## RESUMEN

Los factores de riesgo cardiovascular y los factores asociados pueden sumarse al desarrollo de enfermedades cardiovasculares. Objetivo: Analizar la frecuencia de factores de riesgo cardiovascular y factores asociados en adolescentes. Método: Estudio transversal realizado con 251 estudiantes de secundaria de la ciudad de Teresina (PI), entre 14 y 17 años. Se obtuvo información sobre estilo de vida, datos antropométricos y clínicos. Resultados: La edad promedio de los adolescentes fue de  $16,2 \pm 0,76$  años. Hubo una prevalencia de somnolencia diurna excesiva (88%), inactividad física (38,2%), PAS prehipertensos (14,7%) y EAP (27,1%). En cuanto al índice de masa corporal, las mujeres tuvieron tasas más altas, sin embargo, para la circunferencia de cintura y cuello, los hombres tuvieron tasas más altas ( $p < 0.05$ ). Conclusión: La presencia y asociaciones positivas entre factores de riesgo que pueden contribuir al desarrollo de enfermedades cardiovasculares sirven como señales para la toma de medidas preventivas.

**DESCRIPTORES:** Factores de Riesgo; Estilo de Vida; Adolescentes.

## RESUMO

Os fatores de riscos cardiovasculares e fatores associados podem em conjunto somar-se para o desenvolvimento de Doenças Cardiovasculares. Objetivo: Analisar a frequência de fatores de risco cardiovascular e fatores associados em adolescentes. Método: Estudo transversal realizado com 251 estudantes do ensino médio da cidade de Teresina (PI), entre 14 a 17 anos de idade. Foram obtidas informações sobre o estilo de vida, dados antropométricos e clínicos. Resultados: A média de idade dos adolescentes de  $16,2 \pm 0,76$  anos. Observou-se prevalência de sonolência diurna excessiva (88%), fisicamente inativos (38,2%), pré-hipertensos (14,7%) PAS e (27,1%) PAD. Sobre o índice de massa corporal o sexo feminino apresentou maiores índices, porém para circunferência da cintura e pescoço o sexo masculino apresentou maiores índices ( $p < 0,05$ ). Conclusão: A presença e associações positivas entre os fatores de riscos que podem contribuir para o desenvolvimento de doenças cardiovasculares servem como sinalizadores para que medidas preventivas sejam tomadas.

**DESCRITORES:** Fatores de Risco; Estilo de Vida; Adolescentes.

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## INTRODUCTION

**A**mong Chronic Non-Communicable Diseases (NCDs), Cardiovascular Diseases (CVD) are at the top with 31,3%, hypertension, which is a Cardiovascular Risk Factor (CVRF), affects 2% to 13% of children and adolescents.<sup>1</sup> The prevalence of CVD is a growing concern, considered one of the major causes of morbidity and mortality.<sup>2</sup> In this context, it is important to develop preventive strategies, as multicenter studies show regional differences in CVRF.<sup>3</sup>

The World Health Organization (WHO)<sup>4</sup> (2006) considers that the practice of physical activity prevents or reduces high blood pressure, depression, heart disease, overweight and other illnesses, in addition to promoting well-being in its practitioners. And this in a planned way provides several morphological and physiological adaptations in the cardiovascular system, improvements in the functioning of the cardiorespiratory system, body composition indices, post-exercise and post-training hypotension.<sup>4,5</sup>

In puberty, the adoption of health risk behavior is evidenced, which tends to be maintained during adulthood, which can interfere with quality of life. 6 Elicker et al.<sup>7,8</sup> report drug use as a

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global concern, and both alcohol and tobacco have higher mortality rates in the world. The early use of alcohol in adolescence is associated with health problems in adulthood, contributing to the risk of excessive consumption throughout life.<sup>16,17</sup>

The sleep habit is considered a beneficial behavior for the body and essential for the 24-hour cycle.<sup>8</sup> Legnani<sup>9</sup> describes that good sleep levels are associated with higher frequencies of health-promoting behaviors, and lack of sleep or even insufficient sleep levels are associated with tobacco and alcohol use. In this scenario, the Excessive Daytime Sleepiness (EDS) reported by Felden et al.<sup>10</sup> as an increased feeling of need for sleep, and decreased alertness. In adolescence there is a delay in the sleep phase characterized by later stages of waking up, which may be associated with hypertension, studies show an association between poor sleep quality with both less and excessive sleep time and high blood pressure.<sup>11,12,13,14</sup>

Studies of this nature contribute to the development of interventions aimed at promoting a healthy lifestyle among adolescents, and will help health professionals with reliable parameters. In this sense, the study aimed to analyze the frequency of cardiovascular risk factors in adolescents.

## METHOD

Cross-sectional study conducted with 251 public school students regularly enrolled between the 1st and 3rd years of high school in a public school in Teresina (Piauí, Brazil).

Students were selected by simple random probability sampling through a draw performed by the BioEstat program, version 5.3 and stratified by year of high school (1st, 2nd and 3rd years), and the sample was calculated based on the finite population and normality test.

The study was approved by the Research Ethics Committee of the Federal University of Piauí/UFPI-CCS under CAA 90250618.3.0000.8057, and the measurement of anthropometric data, blood pressure and the application of questionnaires with the students were performed only upon return of the Free Informed Consent Form by the parents/guardians of the selected students and

an Assent Term signed by the students, according to resolution 510/16.

Data collection was carried out from September to November 2018, during the school hours of study by evaluators duly trained to occupy a room divided into stations (1st station: Questionnaires; 2nd: blood pressure measurement; 3rd: anthropometric measurements).

The statistical software Statistical Package for Social Sciences (IBM SPSS®) for Windows®, version 23.0, was used for statistical analysis. The normality of the variables was verified by the Kolmogorov-Smirnov test, ( $p > 0,05$ ), the variables BMI, SBP, DBP presented normal distribution. Student's t-test was used for dichotomous categorical variables, and ANOVA for variables with 3 or more categories. The variables CC and CP presented non-normal data ( $p < 0,05$ ); for these variables, the Mann-Whitney test was used, for a dichotomous categorical variable, and the

Kruskall-Wallis, for a variable with 3 or more categories. Descriptive analysis included the calculation of mean, medians, standard deviation, interquartile range, minimum and maximum for quantitative variables; and frequencies for the qualitative ones and their respective 95% confidence intervals (95%CI).

## RESULTS

As for lifestyle, 94% did not participate in the study, 251 adolescents with a mean age of 16,2 years ( $\pm 0,76$ ) and 60,1% females showed sedentary behavior during the week. Regarding the level of physical activity, 38,2% were classified as inactive. Regarding alcohol consumption, 8,4% were in a moderate risk zone, 6,0% students used tobacco, 20,0% had consumed alcohol in the last 30 days, 53,0% tried it for the first time at 14 or 15 years old and 20,0% usually smoke at friends' houses (Table 1)

Table 1. Distribution of the sample of adolescents, in absolute and proportional values, according to Lifestyle, perception of sleep quality and daytime sleepiness, Teresina – Piauí, 2019.

VARIABLES	FREQUENCY, N	%
Sedentary behavior in the week (SB)		
Yes	15	6,0
No	236	94,0
Sedentary behavior on the weekend		
Yes	32	12,7
No	219	87,3
Physical activity level		
Very active	91	36,3
Moderately Active	62	25,5
Inactive	96	38,2
Alcohol consumption		
Low risk	225	89,6
Medium risk	21	8,4
High risk or harmful use	03	1,2
Alcohol Dependence Syndrome	02	0,8
Tobacco Use		
Yes	15	6,0
No	236	94,0
In the last 7 days, how many days has someone smoked in your presence?		

0 days	124	49,3
1 or 2 days	74	29,5
3 or 4 days	23	9,2
5 or 6 days	04	1,6
All the 7 days	26	10,4
Tobacco consumption by parents		
None of them	198	78,8
Father	30	12,0
Mother	12	4,8
Both	01	0,4
Doesn't know	10	4,0
Tobacco consumption by friends		
No	157	62,5
Most of them	14	5,6
A few	80	31,9
How often do you think you sleep well?		
Never	05	2,0
Rarely	44	17,5
A few times	93	37,1
Most of the times	80	31,9
Always	29	11,6
How do you rate the quality of your sleep?		
Bad	33	13,1
Regular	96	38,2
Good	74	29,5
Very Good	31	21,4
Excellent	17	6,8
How many hours of sleep on weekdays?		
Less than 6 hours	60	23,9
6 hours	87	34,7
7 hours	54	21,5
8 hours	36	14,3
9 hours	09	3,6
10 or more hours	05	2,0
How many hours of sleep on weekend days?		
Less than 6 hours	19	7,6
6 hours	25	10,0
7 hours	26	10,4
8 hours	63	25,1
9 hours	56	22,3
10 or more hours	62	24,7
Daytime sleepiness?		

Excessive daytime sleepiness	221	88,0
No	30	12,0

Source: research data.

The mean systolic blood pressure (SBP) and the mean diastolic blood pressure (DBP) for males had higher mean values than for females (110,8 and 63,9), respectively; Contrary to these data, the Heart Rate (HR) of females was higher than males in both ( $p < 0,05$ ). Regarding physical activity levels, the mean SBP of

very active adolescents had higher means (108,6) compared to the other categories, and those considered inactive had higher mean HR (77,5), both results ( $p < 0,05$ ). In the high risk or harmful use of alcohol category, adolescents had high mean values of the mean SBP ( $p < 0,05$ ). And despite the high prevalence of daytime sleepiness,

adolescents with little daytime sleepiness had higher mean DBP levels (67) when compared to those with excessive daytime sleepiness ( $p < 0,05$ ). (Table 2).

## DISCUSSION

Health promotion at school is a glo-

Table 2. Comparison of means of anthropometric variables with socioeconomic and lifestyle-related data of students, Teresina – Piauí, 2019.

VARIABLES	BMI		CC		CP	
	X±SD*	P-VALUE	X±SD*	P-VALUE	X±SD*	P-VALUE
Sex		0,020 <sup>t</sup>		0,010 <sup>m</sup>		0,000 <sup>m</sup>
Male	20,0±3,0		70,3±6,8		34,8±4,0	
Female	21,0±3,2		68,3±7,5		30,4±1,9	
Year of study		0,426 <sup>a</sup>		0,512 <sup>k</sup>		0,856 <sup>k</sup>
1st year	20,4±2,9		68,7±6,3		32,2±4,3	
2nd year	21,0±3,5		70,2±9,0		32,1±3,1	
3rd year	20,5±3,0		68,3±6,4		31,9±2,9	
Economic class		0,880 <sup>a</sup>		0,162 <sup>k</sup>		0,002 <sup>k</sup>
A	19,8±2,7		66,4±5,8		30,0±5,0	
B1 – B2	20,7±3,5		70,2±7,8		33,3±4,7	
C1 – C2	20,6±3,1		68,8±7,3		31,6±2,7	
D-E	20,3±2,6		66,7±5,3		30,7±2,0	
Physical activity level		0,390 <sup>t</sup>		0,096 <sup>k</sup>		0,000 <sup>k</sup>
Very active	20,8±3,3		70,2±8,0		33,4±2,9	
Moderately active	20,1±2,7		67,8±6,0		31,8±5,2	
Inactive	20,7±3,3		68,9±7,4		31,0±2,2	
Alcohol consumption		0,028 <sup>a</sup>		0,008 <sup>k</sup>		0,065 <sup>k</sup>
Low risk	20,4±3,1		68,7±7,2		31,9±2,9	
Medium risk	22,6±4,0		73,0±7,4		33,9±7,8	
High risk or harmful use	21,1±2,5		74,0±4,1		35,7±1,1	
Addiction syndrome	20,1±1,2		62,7±1,7		29,8±0,8	
Tobacco use		0,141 <sup>t</sup>		0,601 <sup>m</sup>		0,367 <sup>m</sup>
Yes	21,8±2,7		71,0±7,6		31,5±3,0	
No	20,5±3,2		68,9±7,3		32,1±3,6	
Daytime sleepiness		0,286 <sup>t</sup>		0,899 <sup>m</sup>		0,412 <sup>m</sup>

Excessive sleepiness	20,7±3,2	69,1±7,5	32,1±3,7
Little sleepiness	20,0±2,9	68,6±6,0	32,2±2,4

\* X±SD: mean ± standard deviation; \* Student t-test / ° ANOVA / ° Mann-Whitney / ° Kruskal-Wallis; significant values (p ≤ 0,05) are highlighted in bold. Source: research data.

bal concern because it is during adolescence that life habits are incorporated that can persist into adulthood, <sup>45,46,47</sup> contributing to the triggering of cardiovascular risk factors that have been associated with an increased risk of morbidity and mortality. <sup>4,8</sup>

The study evaluated cardiovascular risk factors (CRF) such as the lifestyle of adolescents, considering physical inactivity, alcohol and tobacco consumption, and sleep. For obesity, body mass index (BMI), waist circumference (WC) and neck circumference (NC) data were established, and clinicians verified hypertension through SBP and DBP.

236 (94%) adolescents were identified who did not have SB during the week. This result can be explained by the Integral Education system, in which students are inserted because they spend eight hours at school and are restricted to using cell phones, computers, TV and video games. However, at the end of the week these showed a small increase in SB, a result that corroborates others <sup>15</sup> which denote the importance of maintaining physical activity in the school environment. <sup>16</sup>

About the quality of sleep 38,2% considered it regular. Studies show the association between short sleep duration and poor sleep quality among adolescents. <sup>16,17,18,19</sup> The National Sleep Foundation <sup>21</sup> denotes a cutoff point for sleep time in adolescents, a period that can vary from 8h to 10h. Thus, it is clear that part of the adolescents in this study is below this cutoff point.

Adolescents had a prevalence of normal weight for the classification of BMI, corroborating other studies that showed higher percentages of

**The study evaluated cardiovascular risk factors (CRF) such as the lifestyle of adolescents, considering physical inactivity, alcohol and tobacco consumption, and sleep. For obesity, body mass index (BMI), waist circumference (WC) and neck circumference (NC) data were established, and clinicians verified hypertension through SBP and DBP.**

normal weight among adolescents 62,8%, 66,2% respectively. <sup>4,5</sup> However, a study by Brito et al. <sup>14</sup> showed that both females and males had higher levels of overweight and obesity. But the BMI between the sexes showed statistical difference, where females had a higher BMI than males. The study of PeNSE 17 states that higher levels tend to be more prevalent among females.

Abdominal obesity was determined in 4,8% of the sample. Similar values were found in other studies with adolescents, 5,8 when comparing the variable between the sexes, the WC of the male sex was significantly higher than that of the female sex. Other studies have found similar differences between the sexes. <sup>22,23,24</sup> Also, NC in males was significantly higher than in females. Other studies found similar values, <sup>19,24</sup> and when making comparisons between NC and classes B1-B2, these presented high values.

Thus, they assume that lower levels of alcohol consumption were associated with lower anthropometric indices, which can be considered a protective factor.

The most active adolescents had a mean SBP higher than the other categories, a study found similar values, however without significant differences. <sup>66</sup> Despite this difference, high levels of physical activity are related to low prevalence of SAH. <sup>18,22</sup> The effects of physical exercise in decreasing BP and the actions and mechanisms of this response do not seem to be a statement accepted in a majority way, especially among teenagers. <sup>66</sup>

The study was limited due to recall bias, which was corrected by using validated questionnaires.

## CONCLUSION

The work allows us to understand

how the frequency of cardiovascular risk factors manifests itself in different contexts of adolescent life, supporting future interventions, or

even providing a basis for monitoring trends, thus promoting a healthy lifestyle in this audience. ■

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