

PREVALENCE AND CO-OCCURRENCE OF HEALTH RISK BEHAVIORS AMONG ADOLESCENTS IN THE BACKLANDS OF PARAÍBA, BRAZIL: A SCHOOL-BASED DESCRIPTIVE STUDY

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Abstract: The aim of the study was to analyze the prevalence and co-occurrence of health risk behaviors among school adolescents in the backlands of Paraíba. A descriptive study was conducted with 242 participants (aged 16.6 ± 1.3 years) of a federal public school in the city of Sousa, Paraíba. The following health risk behaviors were assessed using the Global School-based Student Health Survey questionnaire: a) physical inactivity (<60 min/day of moderate-to-vigorous physical activity); b) inadequate sleep (<8 h/day for <18 years of age and <7 h/day for 18+ years of age); c) high smartphone screen time (5+ h/day); d) occasional consumption of fruits and vegetables (<1 time per day); e) alcohol consumption (in the last 30 days); f) nicotine product consumption (in the last 30 days). Observed frequencies (%) and 95% percentile bootstrap confidence intervals (CI) were calculated. High prevalence of physical inactivity (71.5%, 95% CI 65.7, 76.9), inadequate sleep (78.1%, 95% CI 72.3, 83.5), high smartphone screen time (88.0%, 95% CI 83.9, 91.7), occasional consumption of fruits/vegetables (93.4%, 95% CI 90.1, 96.3), alcohol consumption (46.3%, 95% CI 39.7, 52.1), and consumption (12.4%; 95% CI 8.3; 16.9) were observed. Regarding co-occurrence, 6.6% (95% CI 3.7, 9.9) presented two behaviors, 24.4% (95% CI 19.4, 30.2) three behaviors, 39.3% (95% CI 33.1, 45.0) four behaviors, 22.3% (95% CI 17.4, 28.1) five behaviors, and 5.4% (95% CI 2.9, 8.3) six health risk behaviors. In conclusion, the results highlight high prevalence and co-occurrence of health risk behaviors among school adolescents in the highlands of Paraíba.

Keywords: Lifestyle. Risk factors. Student Health. Adolescence.

PREVALÊNCIA E SIMULTANEIDADE DE COMPORTAMENTOS DE RISCO À SAÚDE ENTRE ADOLESCENTES DO ALTO SERTÃO DA PARAÍBA, BRASIL: UM ESTUDO DESCRITIVO DE BASE ESCOLAR

Resumo: O objetivo do estudo foi analisar a prevalência e a simultaneidade de comportamentos de risco à saúde entre adolescentes escolares no Alto Sertão da Paraíba. Para tanto, foi conduzido um estudo descritivo com 242 participantes (idade: $16,6 \pm 1,3$ anos) de uma escola pública federal da cidade de Sousa, Paraíba. Os comportamentos de risco à saúde foram avaliados pelo questionário da Pesquisa Global de Saúde Escolar: a) inatividade física (<60 min/dia de atividade física moderada-vigorosa); b) sono inadequado (<8 h/dia para <18 anos de idade e <7 h/dia para $18+$ anos de idade); c) alto tempo de tela de smartphone ($5+$ h/dia); d) consumo ocasional de frutas e verduras (<1 vez por dia); e) consumo de bebidas alcoólicas (nos últimos 30 dias); f) consumo de produtos com nicotina (nos últimos 30 dias). As frequências observadas (%) e intervalos de confiança (IC) bootstrap percentil de 95% foram calculados. Observou-se altas prevalências de inatividade física (71,5%; IC 95% 65,7; 76,9), sono inadequado (78,1%; IC 95% 72,3; 83,5), alto tempo de tela (88,0%; IC 95% 83,9; 91,7), consumo ocasional de frutas/verduras (93,4%; IC 95% 90,1; 96,3), consumo de bebidas alcoólicas (46,3%; IC 95% 39,7; 52,1) e consumo de produtos com nicotina (12,4%; IC 95% 8,3; 16,9). Quanto à simultaneidade, 6,6% (IC 95% 3,7; 9,9) apresentaram dois comportamentos, 24,4% (IC 95% 19,4; 30,2) três comportamentos, 39,3% (IC 95% 33,1; 45,0) quatro comportamentos, 22,3% (IC 95% 17,4; 28,1) cinco comportamentos e 5,4% (IC 95% 2,9; 8,3) seis comportamentos de risco à saúde. Em conclusão, os resultados destacam elevadas prevalências e simultaneidade de comportamentos de risco à saúde entre adolescentes escolares no Alto Sertão da Paraíba.

Palavras-chave: Estilo de vida. Fatores de risco. Saúde do Estudante. Adolescência.

Introduction

In recent years, a substantial increase in the prevalence and co-occurrence of health risk behaviors among adolescents are described as those that have the potential to harm physical or mental health¹, as well as their association with the emergence of non-communicable diseases². Adolescence, the period from 10 to 19 years, is a phase marked by significant changes in several aspects, including biological, physical, cognitive, and social interactions³.

The region of the backlands of Paraíba, is formed by geographical, cultural, and socioeconomic peculiarities, offers a context for studying health risk behaviors among school adolescents⁴. It is located in the semi-arid area of the Northeast, facing various adversities, including high rates of socioeconomic vulnerability and significant illiteracy rates, which contribute to the slow development of the Human Development Index (HDI) across the whole region^{4,5}. Among the most prevalent behaviors in this population are physical inactivity, high sedentary behavior, inadequate sleep, occasional consumption of fruits and vegetables, alcohol consumption, and smoking^{2,6-9}. Understanding these behaviors in this specific context might usefully contribute to understanding on the current situation and challenges that may affect the health of this population. Thus, investigating health risk behaviors among school adolescents in the backlands of Paraíba is important not only for this community but also as a valuable contribution to the broader field of public health, which has seen a worsening of these behaviors in recent years⁶.

Previous studies have reported a high prevalence and co-occurrence of health risk behaviors among school adolescents in northeastern Brazil^{6,9,10}. For instance, Farias Júnior et al.¹⁰ found that among 782 school adolescents from the capital of Paraíba, physical inactivity (59.5%) and inadequate dietary habits (49.5%) were the most prevalent risk behaviors, with 51.4% of participants presenting two or more co-occurring behaviors. Similarly, Brito et al.⁹, in their study involving 4,207 school adolescents aged 14 to 19 years from the state of Pernambuco, observed that 58.5% of participants exhibited two or more health risk behaviors. Despite these findings, there remains a significant knowledge gap regarding adolescents in the backlands of Paraíba, as few specific studies have been conducted in this region.

To address this gap, the current study focuses on the health risk factors associated with school adolescents, particularly examining their physical activity levels, smartphone usage, and sleep duration. Additionally, it aims to understand the frequency of regular and occasional consumption of fruits and vegetables, as well as the consumption of alcoholic beverages and nicotine-containing products. Investigating these health risk behaviors in this adolescent

population is essential for the formulation of effective public health policies aimed at monitoring and improving their health. Therefore, this study aimed to investigate the prevalence and co-occurrence of health risk behaviors among school adolescents in the backlands of Paraíba.

Materials and Methods

Study design

This is an observational study with a descriptive design. Data collection was conducted between June and October 2023 at the Federal Institute of Education, Science and Technology of Paraíba (IFPB) in the city of Sousa, state of Paraíba, Brazil. This city is located in the interior of the state of Paraíba, with approximately 70,000 inhabitants, situated in the semi-arid region of the northeastern backlands. The study followed the STROBE guidelines for observational studies¹¹. The study was conducted in accordance with the Declaration of Helsinki and Resolution No. 466/2012 of the National Health Council of Brazil, following approval by the Research Ethics Committee (CAAE No. 49857421.0.0000.5184).

Participants

Participant recruitment took place through social media and in classrooms at IFPB. This institution is a federal public school that offers integrated high school with technical courses, including agroindustry, agriculture and livestock farming, environment, and informatics, all in full-time (morning and afternoon) periods. The sample for this study consisted of adolescents enrolled in the integrated high school courses offered by this institution. The following inclusion criteria were adopted for participant selection: adolescents of both sexes, aged 14 to 19 years. For exclusion criteria, voluntary withdrawal by the participant or failure to complete any of the proposed questionnaires were considered. During the data collection period, there were approximately 300 adolescents enrolled in the institution who met the inclusion criteria. A total of 265 participants agreed to take part in the study and were included, but only 242 participants (81.5% of the target population) were included in the final analysis of the study (Figure 1). All adolescents involved in this study, as well as their respective guardians, provided written informed consent before participating in the research.

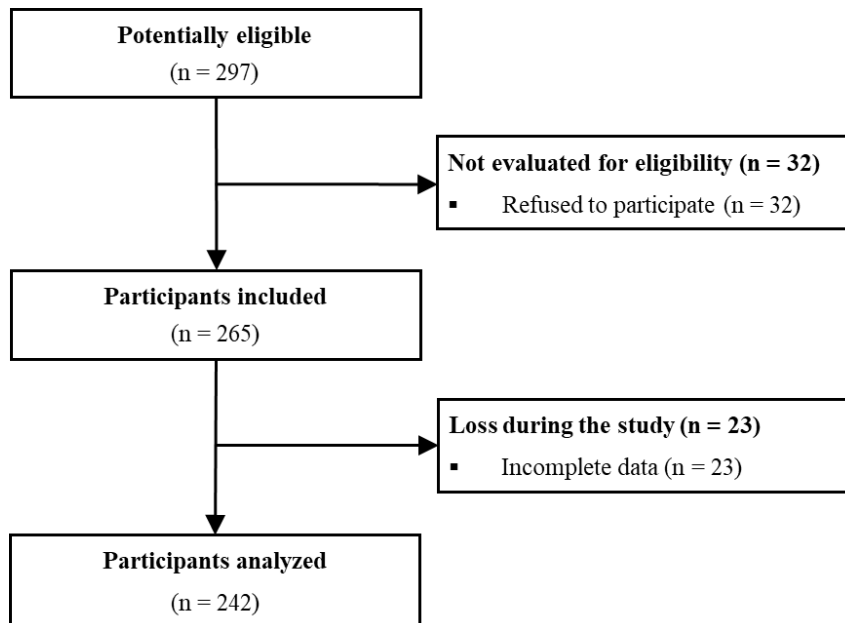


Figure 1 - Study sample flowchart.

Procedures

The data collection took place in air-conditioned rooms at the Department of Physical Education of the IFPB. After obtaining consent from both the volunteer and their legal guardian, data collection began. The questionnaire was administered in person by trained researchers in an environment of individual interaction, with one examiner for each participant (face-to-face). During the assessment, the examiner filled out the printed questionnaire based on the participant's verbal responses. Subsequently, physical evaluation was performed using anthropometric measurements.

Health Risk Behaviors

The Global School-based Student Health Survey (GSHS)¹² was used to assess health risk behaviors. We utilized modules addressing demographic data, sleep duration and quality, physical activity, dietary behaviors, alcohol consumption, and nicotine product consumption. Additionally, screen time was measured using the participant's smartphone. For data analysis, the following dichotomous variables were considered as health risk behaviors:

- Physical inactivity: less than 60 minutes per day of moderate to vigorous physical activity during a typical week, as recommended¹³. All domains of physical activity were considered, including leisure, transportation, domestic, and work-related activities.
- Inadequate sleep: sleep duration of less than 8 or more than 10 hours per day for those under 18 years old, and less than 7 or more than 9 hours per day for adolescents aged

18 years or older, as recommended^{14,15}. The sleep assessment was based on the duration of sleep on a typical weekday and a typical weekend day, followed by a weighted average calculation: $(5 * \text{weekday sleep}) + (2 * \text{weekend day sleep}) / 7$.

- c) High screen time on smartphones: 5 or more hours per day of electronic device use regardless of content consumed^{16,17}. Smartphone screen time was measured using the participant's device digital well-being feature, considering the average over the last week, from Monday to Sunday (7 consecutive days).
- d) Occasional consumption of fruits and vegetables: not consuming fruits and vegetables at least once a day during the week¹⁸.
- e) Alcohol consumption: consumption of alcoholic beverages in the past 30 days¹⁹.
- f) Nicotine product consumption: use of any type of nicotine-containing product in the past 30 days (e.g., tobacco cigarettes, electronic cigarettes)²⁰.

Other variables

Participant characteristics were assessed using questionnaires^{12,21} and standardized methods, including: age, sex, ethnicity, area of residence, socioeconomic level, and body mass index (BMI). To determine the socioeconomic level, the Economic Classification Criteria Brazil was utilized²¹, which categorizes participants based on possession of items, housing conditions, and the head of the family's education. The strata were grouped into three categories: Low (0 to 22 points), Medium (23 to 37 points), and High (38 to 100 points). In addition, to measurements of body mass and height were taken using a digital scale (model W200, Welmy, Brazil) and a portable stadiometer (model ES2060, Sanny, Brazil), respectively. BMI was calculated by dividing body mass by height squared (kg/m^2). The BMI z-score of each participant were classified according to age and sex, following the World Health Organization reference table²².

Statistical Analysis

Descriptive statistics of participant characteristics were performed using mean $\pm$ standard deviation for continuous variables, and absolute frequencies (n) and relative frequencies (%) for categorical variables. The prevalence of health risk behaviors was determined using observed frequencies (%) along with 95% percentile bootstrap confidence intervals (CI) derived from 1,000 samples. All analyses were conducted using SPSS software, version 27 (IBM Corp., Armonk, NY).

Results

Table 1 presents the results of participant characteristics. Most were female (66.9%) and aged 15 to 16 years (54.1%). Half of the participants were brown/black (50.4%), while the other were white/yellow (49.6%). The majority resided in urban areas (66.7%) and in neighboring states, including Rio Grande do Norte and Ceará (61.2%). Economically, most were from the middle class (43.8%) and upper class (29.3%). Only 31.7% of participants were excess of weight (overweight + obesity).

Table 1 – Characteristics of study participants (n = 242).

	n	(%)
Age range		
15-16 years	131	(54.1 %)
17-19 years	111	(45.9 %)
Sex		
Female	162	(66.9 %)
Male	80	(33.1 %)
Ethnicity		
Black	21	(8.7 %)
Brown	101	(41.7 %)
White/Yellow	120	(49.6 %)
Socioeconomic class		
Low	65	(26.9 %)
Medium	106	(43.8 %)
High	71	(29.3 %)
Area of residence		
Rural	80	(32.2 %)
Urban	161	(66.8 %)
State of residence		
Paraíba	94	(38.8 %)
Others states	148	(61.2 %)
Body mass index		
Normal	164	(63.8 %)
Overweight	58	(24.2 %)
Obesity	18	(7.5 %)

Data are presented in absolute (n) and relative (%) frequencies.

Figure 2 shows the prevalence of health risk behaviors among the participants. High prevalence of physical inactivity (71.5%, 95% CI 65.7, 76.9), inadequate sleep (78.1%, 95% CI 72.3, 83.5), high smartphone screen time (88.0%, 95% CI 83.9, 91.7), occasional consumption of fruits/vegetables (93.4%, 95% CI 90.1, 96.3), alcohol use (46.3%, 95% CI 39.7, 52.1), and nicotine product use (12.4%, 95% CI 8.3, 16.9) were observed.

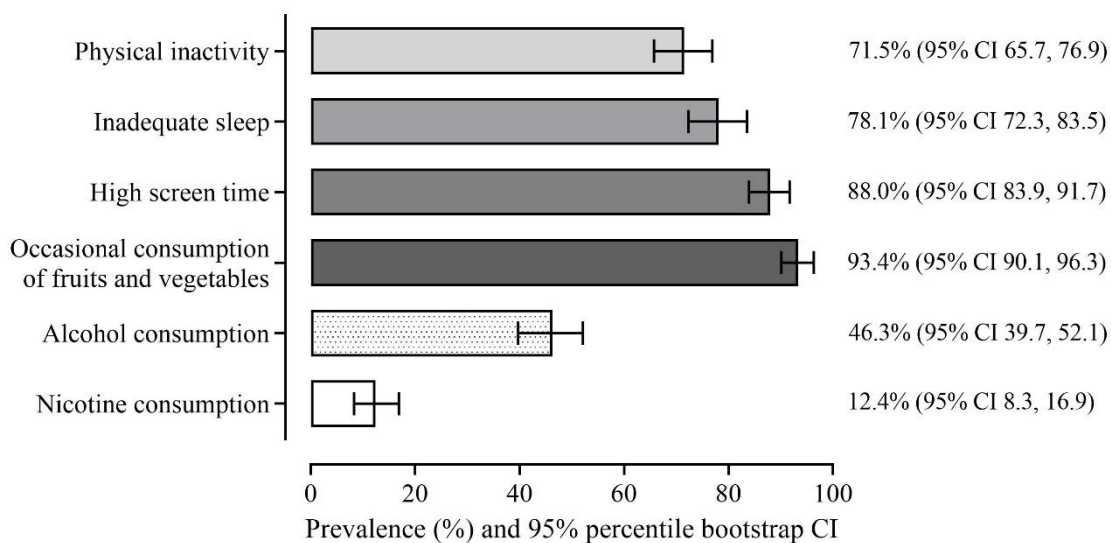


Figure 2 – Prevalence of health risk behaviors among school adolescents in backlands of Paraíba, Brazil (n = 242).

Data are presented as observed frequency (%) and 95% percentile bootstrap confidence intervals (CI).

Figure 3 shows the prevalence of co-occurrence of health risk behaviors among the participants. It was noted that 2.1% (95% CI 0.4, 4.1) exhibited one behavior, 6.6% (95% CI 3.7, 9.9) exhibited two behaviors, 24.4% (95% CI 19.4, 29.8) exhibited three behaviors, 39.3% (95% CI 33.1, 45.0) exhibited four behaviors, 22.3% (95% CI 17.4, 28.1) exhibited five behaviors, and 5.4% (95% CI 2.9, 8.3) exhibited six health risk behaviors.

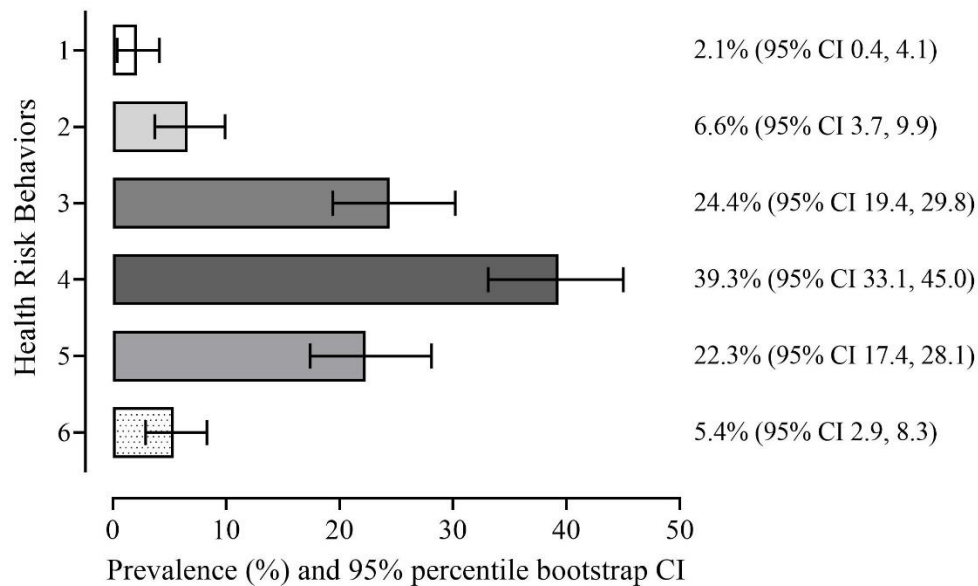


Figure 3 – Prevalence of co-occurrence of health risk behaviors among school adolescents in backlands of Paraíba, Brazil (n = 242).

Data are presented as observed frequency (%) and 95% percentile bootstrap confidence intervals (CI).

Discussion

This study investigated the prevalence and co-occurrence of health risk behaviors among school adolescents in the backlands of Paraíba. The main results revealed high prevalence of physical inactivity, inadequate sleep, high smartphone screen time, occasional consumption of fruits and vegetables, alcohol use, and nicotine products use amongst adolescents. Additionally, high rates of co-occurrence of these risk behaviors were observed. These data provide important insights that may guide the development of specific public policies for the region, aiming to promote health and prevent non-communicable chronic diseases among school adolescents in the backlands of Paraíba.

The present study revealed that 72% of adolescents are classified as physically inactive for not meeting the recommended levels of physical activity. These findings are consistent with the study by Hallal et al.²³, which analyzed physical inactivity worldwide and observed a high prevalence, especially among adolescents aged 13 to 15 years (80.3% physical inactivity). Similarly, a national survey (PeNSE) conducted with Brazilian students aged 13 to 17 from both public and private schools reported an 82% prevalence of physical inactivity²⁴. The high prevalence of physical inactivity observed in the backlands of Paraíba may be attributed to the lack of opportunities for physical activities both in the school and home environments. Additionally, factors such as laziness, lack of companionship, preference for other activities,

and excessive screen time for recreational activities have been barriers to adopting a more physically active lifestyle²⁵⁻²⁷. These findings highlight the urgency of implementing measures to promote regular physical activity among adolescents, aiming to prevent potential health problems associated with inactivity.

We objectively measured smartphone screen time and observed a high prevalence of 88% for excessive screen time (≥ 5 hours per day). Our prevalence is significantly higher compared to studies that utilize self-reported questionnaires to measure screen time.¹⁶ This behavior correlates with a sedentary lifestyle, heightening the risk of obesity, poor academic performance, and mental health problems amongst adolescents^{28,29}. A critical factor contributing to this outcome in our study was the effects of the challenging period during the Covid-19 pandemic, showing a widespread increase in screen time for entertainment³⁰. These habits persist in the adolescent population, emphasizing the importance of encouraging healthy habits from early age to mitigate the risks faced, as emphasized in our study.

The observed high prevalence of inadequate sleep (78.1%) surpasses that found in the study by Felden et al.³¹ (53.6%), conducted in the southern region of Brazil. Potential explanation for this trend in our study population is the rigorous daily routine experienced by adolescents. Over half of our study participants reside in the neighboring state of Rio Grande do Norte and commute daily to the campus to meet their academic obligations. Typically, these students rise early to attend school, as classes commence at seven-fifteen in the morning and conclude around five in the afternoon. Furthermore, many dedicate additional time to studying at home, completing assignments, and preparing for exams. This lifestyle pattern significantly contributes to the reduced quality of sleep among this demographic. Adequate sleep is essential for the restoration of physical and mental functions, and its deficiency leads to detrimental health behaviors³², associated with poor academic performance and increased school dropout rates³³. Hence, the implementation of strategies to address and mitigate this health concern is imperative.

The high prevalence of occasional consumption of fruits and vegetables observed in our study (93%) was significantly higher than those reported in studies conducted with adolescents from Pernambuco and Minas Gerais^{9,34,35}, as well as in samples representative of Brazilian capitals³⁶. This health-risk behavior is associated with various comorbidities, including obesity, diabetes mellitus, and hypertension^{37,38}. The significant increase in this prevalence reinforces the concerning trend of this health-risk behavior, which may have significant negative impacts on adolescents' health in the short and long term. One influencing factor of this behavior may

be the frequent consumption of soft drinks, snacks, canned foods, and processed foods, which tend to be preferred by this population due to their availability in school settings, as well as their appealing taste^{36,39}. Therefore, it is crucial to develop nutritional strategies in the school environment to modify this behavior and promote healthier eating habits among adolescents.

A prevalence of 46% for alcohol consumption among school adolescents was observed, indicating a high adoption of this harmful behavior. This high prevalence is supported by other studies^{40,41}. One significant reason for the presence of this risk behavior in our study is the influence of the social groups to which adolescents are connected. During the adolescence, those try to find to assert their independence and experiment with new experiences, for example, alcohol consumption. It is important to note that alcohol consumption is frequently associated with other health risk behaviors, such as involvement in accidents, sexual violence, and delays in mental, emotional, and brain development, which impair memory, learning, and impulse control⁴². Adolescent alcohol consumers are more susceptible to serious health issues, such as injuries, death, and brain development problems¹⁹. Therefore, promoting awareness campaigns about alcohol use in schools and institutions is crucial, aiming to provide information that can alter or guide alcohol consumption practices among adolescents.

Regarding nicotine product consumption, a prevalence of 12% was observed, which is consistent with previous studies that report similar rates^{6,9,40}. The increased incidence of this behavior is largely due to the use of electronic smoking devices, particularly e-cigarettes. These devices are popular among both adults and adolescents because they are perceived as a modern alternative to traditional tobacco use. They are favored for not causing bad breath or body odor, containing flavored essences, emitting aromatic smoke, and being mistakenly considered less harmful to health than conventional cigarettes⁴³. However, their use remains controversial as they can lead to symptoms of cancerous diseases, such as cancers of the mouth, tongue, and pharynx, gastrointestinal intoxications, and cardiovascular alterations⁴⁴. The rising use of these devices among young people is concerning, as highlighted in the study by Malta et al.⁴⁵, which shows that Brazilian students, particularly males and those aged 16 to 17, are increasingly adopting this behavior. The use of tobacco products is unsafe for young people of any age, including adolescents²⁰. Most adult smokers started smoking during their teenage years²⁰. Therefore, it is crucial to raise awareness about the dangers of this habit among the youth, primarily through national campaigns and strategic interventions.

Regarding the co-occurrence of risk behaviors, we observed that 98% of the adolescents investigated exhibit two or more behaviors. Similar studies have also found high rates of co-

occurrence^{6,9,10}, highlighting the complexity of the health problem and the urgency of implementing public policies to address it. The co-occurrence of health risk behaviors can potentiate the onset of severe pathologies. For instance, the combination of smoking and alcohol consumption, as identified by the World Health Organization, can result in throat cancer⁴⁶. A study conducted by Sousa Neto et al.⁴⁷ revealed that adolescents from Paraíba with low levels of physical activity, excessive screen time, and high body weight face reduced sleep problems, harming their health. These findings underscore the need for multifaceted interventions to promote healthier lifestyles among young people.

This study has several limitations that should be acknowledged. First, the sample was limited to students from the IFPB in Sousa, excluding other public and private schools in the region. This restricts the generalizability of the findings to all adolescents in the backlands of Paraíba. Additionally, the cross-sectional design of the study prevents the establishment of causal relationships between health risk behaviors and their potential outcomes. Self-reported data might also introduce bias, as participants may underreport or overreport their behaviors. Future research should aim to include a more diverse sample, incorporating various educational institutions and examining a broader range of health risk behaviors to provide a more comprehensive understanding.

Conclusion

In conclusion, our results revealed high prevalence and co-occurrence of health risk behaviors among school adolescents in the backlands of Paraíba. These findings suggest the need for integrated approaches between public health authorities to encouraging development and implementation of public policies to improving health and preventing non-communicable diseases in this population. Health promotion strategies should consider the local reality, addressing issues ranging from physical inactivity to alcohol and nicotine consumption.

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