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Electronic Cigarette Use and Dental Service Utilisation Among Schoolchildren in Brazil: A Cross-Sectional Study

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ABSTRACT

Objective: *To analyse the association between electronic cigarette use and the utilisation of dental services among Brazilian schoolchildren, considering sociodemographic characteristics potentially related to both phenomena.*

Methods: *A cross-sectional study was conducted using data from the 2019 National School Health Survey (PeNSE), including 165,838 Brazilian schoolchildren. Sociodemographic variables, electronic cigarette use, and utilisation of dental services in the previous 12 months were analysed. Descriptive and bivariate analyses were performed using the chi-square test. The association between electronic cigarette use and dental service utilisation was estimated using Poisson regression with robust variance, adjusted for sex, age, race/skin colour, and maternal education.*

Results: *The prevalence of electronic cigarette use was 18.0%, being higher among male schoolchildren (20.7%), those aged 16–17 years (24.4%), and those who self-identified as Black (19.6%). Utilisation of dental services in the previous 12 months was 71.0%, with higher frequencies among girls, younger schoolchildren, those who self-identified as White, and those whose mothers had higher educational attainment. In the bivariate analysis, an association was observed between electronic cigarette use and dental service utilisation. After adjustment for sex, age, race/skin colour, and maternal education, the association remained statistically significant, although of small magnitude (PR=1.03; 95%CI: 1.02–1.04; p<0.001). Sociodemographic characteristics also remained associated with dental service utilisation, indicating inequalities in access to dental care.*

Conclusion: *Electronic cigarette use was associated with greater utilisation of dental services among Brazilian schoolchildren, even after controlling for sociodemographic characteristics. The results also reveal sociodemographic inequalities in dental service utilisation and reinforce the importance of integrated strategies for oral health promotion and prevention of electronic cigarette use among adolescents.*

Keywords

Electronic Nicotine Delivery Systems, Cross-Sectional Studies, Adolescent, Oral Health, Dental Health Services.

Introduction

The use of electronic smoking devices, commonly known as electronic cigarettes or *vapes*, has increased among adolescents and has become an increasingly important issue in public health discussions. Although these devices are often perceived as less harmful alternatives to conventional cigarettes, they are not risk-free. Adolescence is a developmental stage characterized by exploration, social influences, and the formation of habits, making

experimentation with these products particularly concerning, especially because it may involve early exposure to nicotine and other chemical substances [1-3].

In recent years, several studies have indicated that electronic cigarettes should not be considered harmless. Their use has been associated with an increased risk of initiating conventional cigarette smoking and has been regarded as a potential gateway to the use of other tobacco products [4]. In Brazil, this concern is particularly relevant given data from the 2019 National Survey of School Health, which indicates that experimentation with electronic cigarettes is already part of the reality of many Brazilian adolescents, particularly among male students and those in older age groups [5].

The implications of electronic cigarette use also extend to oral health. Evidence suggests that the use of these devices may cause changes in periodontal tissues and the oral microbiota, as well as promote inflammatory processes and other forms of damage to the oral cavity [6]. Among adolescents, associations have also been identified between electronic cigarette use and self-reported oral symptoms, such as tongue pain, oral mucosal discomfort, and the presence of cracked or fractured teeth [7].

In this context, the utilization of dental services plays an important role, not only in the treatment of existing oral conditions but also in disease prevention and health promotion. Dental visits represent a strategic opportunity for care, health education, and the early detection of oral conditions, particularly during adolescence, when educational interventions may have lasting positive effects [4,8].

Access to and continued utilisation of dental services, however, are uneven and are influenced by social, economic, and behavioural factors. Adolescents in more favourable socioeconomic circumstances tend to use dental services preventively. In contrast, those experiencing greater vulnerability are more likely to seek care only when an oral problem or treatment need has already arisen [9,10].

Investigating the potential association between electronic cigarette use and dental care utilisation is relevant, given that the use of these devices may be associated with a broader range of risk behaviours and health-related factors among adolescents. Understanding this association may provide a broader perspective on oral health during adolescence and inform more effective strategies for oral health promotion and disease prevention.

This study aimed to investigate the association between electronic cigarette use and dental care utilisation among Brazilian adolescents, using data from the 2019 National Survey of School Health.

Methodology

This was an epidemiological, observational, cross-sectional study conducted in Brazil, considering its five major geographic regions: North, Northeast, Central-West, Southeast, and South. The data analysed were obtained from the 2019 National Survey of School Health (Pesquisa Nacional de Saúde do Escolar – PeNSE), conducted by the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística – IBGE) in partnership with the Ministry of Health. PeNSE is a population-based survey that investigates health-related conditions and risk behaviours among Brazilian adolescents [11].

The 2019 PeNSE employed a two-stage cluster probability sampling design, with schools as the primary sampling units and classes as the secondary sampling units. All students enrolled in the selected classes were eligible for inclusion. The sampling frame was based on the 2017 School Census, conducted by the National Institute for Educational Studies and Research Anísio Teixeira (Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira – INEP). The sample was stratified according to the geographic location and administrative status of schools, resulting in 106 sampling strata. This design allowed estimates for Brazil as a whole, the major geographic regions, Federative Units, state capitals, and the Federal District.

Classes were selected using simple random sampling according to the sampling stratum and school size. Schools with fewer than 20 enrolled students were excluded. Among the selected schools, 119 were excluded from the analytical sample due to school closures, the absence of eligible classes, or missing information. In addition, classes with an insufficient number of valid questionnaires relative to the number of students attending were excluded following quality control procedures. No schools refused to participate at the end of the data collection process [12].

In the 2019 edition, PeNSE included students aged 13 to 17 years enrolled in grades 7 through 9 of elementary school and grades 1 through 3 of high school in public and private schools located in urban and rural areas across all regions of Brazil. The target population of the present study comprised all students who participated in the 2019 PeNSE, totalling 165,838 participants. The analytical sample consisted of participants with complete information on the variables included in each analysis. Participants with missing data were excluded from the respective analyses, and a complete-case approach was adopted.

The sociodemographic variables examined were age, sex, race/skin colour, school type (public or private), school grade/class, and maternal educational attainment. The exposure variable was electronic cigarette use, and the outcome was dental care utilisation in the previous 12 months.

Electronic cigarette use was assessed using the question: “Have you ever tried an electronic cigarette (e-cigarette)?” with response options of “yes” or “no”. Dental care utilisation was assessed using the question: “In the past 12 months, how many times have you been to the dentist?” with the following response options: “none in the past 12 months”, “once”, “twice”, and “three or more times”.

Dental care utilisation was analysed in two ways: as a polytomous variable, with four categories of dental visit frequency, and as a dichotomous variable, categorised as "no" (no dental visits in the previous 12 months) and "yes" (one, two, or three or more visits during the period).

Data cleaning was initially performed, including recoding nonresponse categories as missing values (.), assessing the distribution and consistency of the study variables, and identifying observations with incomplete data. The study variables were classified as follows: the exposure variable was lifetime electronic cigarette use, categorized as yes or no; the outcome variable was dental care utilization in the previous 12 months, assessed according to the number of dental visits and analyzed both as a polytomous variable (none, one, two, and three or more visits) and as a dichotomous variable (no visit versus at least one visit). Sociodemographic covariates included age, sex, race/skin colour, school grade/class, and maternal educational attainment.

Descriptive analyses were performed by calculating absolute and relative frequencies for the categorical variables. Bivariate analyses were conducted using the chi-square test to assess associations between electronic cigarette use and the study variables, with statistical significance assessed at the 5% level.

For the multivariable analysis, Poisson regression with robust variance was used to estimate adjusted prevalence ratios (PRs) and corresponding 95% confidence intervals (95% CIs). The dichotomous outcome of having had at least one dental visit in the previous 12 months was modelled as a function of lifetime electronic cigarette use, adjusting a priori for age, sex, race/skin colour, and maternal educational attainment. Statistical significance was set at 5% ($p < 0.05$). All analyses were performed using Stata, version 17.

Secondary data from the 2019 National Survey of School Health (Pesquisa Nacional de Saúde do Escolar – PeNSE), publicly available and provided without individual participant identification, were used in this study. Given the public nature of the dataset and the absence of identifiable participant information, the study was exempt from review by the Brazilian Research Ethics Committee system (CEP/CONEP), in accordance with Resolutions No. 510/2016 [13] and No. 674/2022 [14] of the Brazilian National Health Council. The use of these data was consistent with the ethical principles governing research involving human participants in Brazil, as established by Resolution No. 466/2012 of the Brazilian National Health Council [15].

Results

The sociodemographic characteristics of the study population are presented in Table 1. The sample comprised 50.9% female and 49.1% male participants. Regarding age, 51.9% were aged 13–15 years and 26.8% were aged 16–17 years. With respect to race/skin colour, 44.0% of participants were classified as mixed race and 38.7% as White. Students enrolled in elementary school accounted for 55.5% of the sample, whereas 42.9% were enrolled in high school. Most participants attended public schools (51.2%), and 51.4% lived in state capitals.

Table 1: Sociodemographic characteristics of Brazilian schoolchildren participating in the 2019 National School Health Survey (PeNSE), Brazil.

Variable	Absolute Frequency (N)	Relative Frequency (%)
Gender*		
Male	78011	49.1
Female	80788	50.9
Age*		
< 13 years old	25642	16.1
13 - 15 years old	82389	51.9
16 - 17 years old	42509	26.8
≥18 years old	8276	5.2
Race/skin colour*		
White	60297	38.7
Black	16737	10.7
Asian	5515	3.5
Brown	68497	44.0
Indigenous	4760	3.1
Type of school*		
Public	81496	51.2
Private	77749	48.8
Educational level*		
Elementary and middle school	88437	55.5
High school	68378	42.9
Technical education	2396	1.5
Teacher training	34	0.0
Type of municipality of residence*		
Capital	81906	51.4
Not capital	77339	48.6
Mother's educational level*		
None	4541	2.9
Did not complete elementary and middle school	18589	11.7
Complete elementary and middle school	7230	4.5
Did not complete high school	9484	6.0
Complete high school	29175	18.4
Did not complete College	11425	7.2
Complete college	50810	32.0
Don´t Know	27656	17.4

Source: PeNSE 2019 * Missing data.

Regarding maternal educational attainment, completed higher education was the most frequently reported category (32.0%), followed by completed secondary education (18.4%). Maternal education below completion of elementary school was reported for 11.7% of participants, while 2.9% reported that their mothers had no formal education.

Table 2 presents the bivariate analysis of electronic cigarette use according to sociodemographic characteristics and dental care

utilisation. The overall prevalence of lifetime electronic cigarette use was 18.0%. Across the categories of the variables analysed, non-use was more frequent than use.

Table 2: E-cigarette use by sex, age, and race/skin colour, and dental service utilisation among Brazilian schoolchildren participating in the 2019 National School Health Survey (PeNSE), Brazil.

	E-cigarette use				p-value
	Yes		No		
	N	%	N	%	
Gender*					
Male	13652	20.7	52335	79.3	<0.001*
Female	10306	15.4	56553	84.6	
Age*					
< 13 years old	11730	14.3	70465	85.7	<0.001*
13 - 15 years old	10344	24.4	32081	75.6	
≥16 years old	1876	22.7	6373	77.3	
Race/skin colour*					
White	9528	19.2	40153	80.8	<0.001*
Black	2922	19.6	11976	80.4	
Asian	821	17.5	3871	82.5	
Brown	9654	16.9	47627	83.1	
Indigenous	584	15.3	3238	84.7	
Use of dental services in the past 12 months					
None	6413	16.5	32472	83.5	<0.001*
Once	3616	16.9	17742	83.1	
Twice	4015	18.4	17779	81.6	
Three times or more	9824	19.5	40622	80.5	

Source: PeNSE 2019 *Chi-square test (χ^2 test).

The prevalence of electronic cigarette use was 20.7% among male participants and lower among female participants. By age group, prevalence was highest among participants aged 16–17 years (24.4%). The prevalence estimates across age groups ranged from 14.3% to 24.4%, representing an absolute difference of 10.1 percentage points between the lowest and highest estimates.

Regarding race/skin colour, the highest prevalence of lifetime electronic cigarette use was observed among participants who identified as Black (19.6%), followed by those who identified as White (19.2%). The prevalence estimates differed only modestly across the race/skin colour categories. About dental care utilisation, the prevalence of lifetime electronic cigarette use was 18.6% among participants who reported at least one dental visit in the previous 12 months. This prevalence should be interpreted in conjunction with the other sociodemographic characteristics examined.

Regarding sex, three or more dental visits in the previous 12 months were the most frequent category among both female and male participants, accounting for 40.4% and 35.5%, respectively. No dental visits was the second most frequent category in both groups and was more common among males (30.7%) than females.

Regarding age, three or more dental visits were the most frequent category in most age groups, with the highest proportion observed among participants aged 13–15 years (39.5%). Among participants aged 18 years or older, however, none of the dental visit frequency categories exceeded 35.5%. Regarding race/skin colour, three or more dental visits were the most frequent category across most groups, with the highest proportion among White participants (41.1%). Among Black participants, no dental visits was the most frequent category, accounting for 35.9% of the group.

Table 4 presents the association between lifetime electronic cigarette use and dental care utilisation, adjusted for sex, age, race/skin colour, and maternal educational attainment. Electronic

Table 3: Frequency of dental service utilisation in the past 12 months by sex, age, and race/skin colour among Brazilian schoolchildren participating in the 2019 National School Health Survey (PeNSE), Brazil.

Use of dental services in the past 12 months									p-value
	None		Once		Twice		Three times or more		
	N	%	N	%	N	%	N	%	
Gender									
Male	23723	30.7	12840	16.6	13262	17.2	27461	35.5	<0.001*
Female	21888	27.2	12694	15.8	13395	16.6	32496	40.4	
Age									
< 13 years old	6805	26.7	4196	16.5	4903	19.2	9600	37.6	
13 - 15 years old	23247	28.4	12785	15.6	13488	16.5	32311	39.5	
									<0.001*
16 - 17 years old	12661	29.9	7197	17.0	6925	16.4	15492	36.6	
≥18 years old	2897	35.5	1361	16.7	1339	16.4	2570	31.5	
Race/skin colour*									
White	14483	24.1	10193	17.0	10697	17.8	24642	41.1	
Black	5948	35.9	2420	14.6	2524	15.2	5679	34.3	<0.001*
Asian	1738	31.8	836	15.3	881	16.1	2008	36.8	
Brown	21083	31.0	10842	15.9	11274	16.6	24865	36.5	
Indígenous	1490	31.6	798	16.9	775	16.5	1648	35.0	

Source: PeNSE 2019 *Chi-square test (χ^2 test).

cigarette use was positively associated with dental care utilisation. Participants who reported lifetime electronic cigarette use had a 3% higher prevalence of having had at least one dental visit in the previous 12 months than those who reported no lifetime use (adjusted PR = 1.03; 95% CI: 1.02–1.04).

In the multivariable model, the outcome was dental care utilisation in the previous 12 months, defined as at least one dental visit versus no visits. Female participants were more likely to have used dental care than males (adjusted PR = 1.05; 95% CI: 1.04–1.05; p < 0.001), with males as the reference category.

Table 4: Association between e-cigarette use and dental service utilisation, adjusted for age, sex, race/skin colour, and maternal education, among Brazilian schoolchildren participating in the 2019 National School Health Survey (PeNSE), Brazil.

Variável	PR adjusted	CI95%	p-value
Uso do Cigarro eletrônico	1.03	1.02 - 1.04	<0.001*
Gender			
Male	-		
Female	1.05	1.04 – 1.05	<0.001*
Age			
< 13 years old	-		
13 - 15 years old	0.98	0.97 – 0.99	<0.001*
16 - 17 years old	0.96	0.94 – 0.98	
Race/skin colour*			
White	-		
Black	0.89	0.88 – 0.90	
Asian	0.92	0.90 – 0.94	<0.001*
Brown	0.94	0.93 – 0.95	
Indigenous	0.94	0.92 – 0.96	
Mother's educational level*			
None	-		
Did not complete elementary and middle school	1.05	1.02 – 1.08	
Complete elementary and middle school	1.11	1.08 – 1.15	
Did not complete high school	1.14	1.10 – 1.17	<0.001*
Complete high school	1.18	1.15 – 1.21	
Did not complete College	1.22	1.19 – 1.26	
Complete college	1.35	1.31 – 1.38	
Don´t Know	1.06	1.03 – 1.09	

Source: PeNSE, 2019. * Poisson regression with robust variance.

Compared with participants aged 13–15 years (reference category), those aged 16–17 years (adjusted PR = 0.98; 95% CI: 0.97–0.99) and those aged 18 years or older (adjusted PR = 0.96; 95% CI: 0.94–0.98) were less likely to have used dental care.

Compared with White participants (reference category), those who identified as Black, Asian, mixed race, or Indigenous had lower dental care utilisation. Black participants had the lowest estimate among the race/skin colour groups (adjusted PR = 0.89; 95% CI: 0.88–0.90; p < 0.001).

Compared with participants whose mothers had no formal education (reference category), dental care utilisation was higher among those whose mothers had greater educational attainment. The highest estimate was observed among participants whose mothers had completed higher education (adjusted PR = 1.35; 95% CI: 1.31–1.38; p < 0.001).

Discussion

The prevalence of electronic cigarette use among adolescents has increased in many countries over the years, constituting an important public health concern [2,3]. In the present study, the overall prevalence of lifetime electronic cigarette use was 18%, with a higher prevalence among males than females. Higher estimates were also observed among adolescents aged 16–17 years and among those who identified as Black.

These findings are consistent with national and international studies reporting higher levels of experimentation and current use of electronic smoking devices among older adolescents and males. The higher prevalence observed among older adolescents may be related to greater autonomy, social exposure, curiosity, and peer influence, which are factors commonly associated with late adolescence [2,5].

Electronic cigarette use has been associated with oral health conditions, including xerostomia, mucosal irritation, gingival changes, and alterations in the oral microbiota [6,16]. These conditions may be relevant to dental care utilisation, although the available evidence does not establish that electronic cigarette use directly leads to greater use of dental services. In the present study, lifetime electronic cigarette use was associated with a slightly higher prevalence of dental care utilisation in the previous 12 months. However, the magnitude of this association was small, and given the cross-sectional design, the findings should not be interpreted as evidence of a temporal or causal relationship. The observed association may also reflect differences in other characteristics related to both electronic cigarette experimentation and dental care utilisation.

A study conducted among dental students from 11 countries found that electronic cigarette users had a higher prevalence of conditions such as dry mouth, darkened tongue, and heart palpitations, despite reporting good oral hygiene practices [17]. These findings indicate that electronic cigarette experimentation or use may be associated with self-reported health effects, including oral manifestations. However, because the cited study was conducted among university students rather than school-aged adolescents and investigated health conditions rather than dental care utilisation, its findings cannot be directly compared with the association observed in the present study.

Dental care utilisation among adolescents in Brazil has been extensively described and is influenced by multiple socioeconomic and access-related factors [9,18,19]. In the present study, three or more dental visits per year were more frequently reported among

female participants, those younger than 18 years, and those who identified as White. In contrast, no dental visits were more frequently reported among males, participants aged 18 years or older, and those who identified as Black. These findings are consistent with inequalities in dental care utilisation described in previous studies. Research among Brazilian adolescents has shown that dental care utilisation is associated with sociodemographic characteristics, with higher utilisation among girls, students with more favourable socioeconomic conditions, and individuals with greater family support. In contrast, non-utilisation is more frequent among socially vulnerable groups [9,10].

Regarding the association between lifetime electronic cigarette use and dental care utilisation, the present study found a positive association after adjustment for sex, age, race/skin colour, and maternal educational attainment (adjusted PR = 1.03; 95% CI: 1.02–1.04). Although statistically significant, the magnitude of this association was small. Therefore, the finding should not be interpreted as evidence that experimentation with electronic cigarettes increases dental care utilisation. Rather, participants who reported lifetime electronic cigarette use had a slightly higher prevalence of at least one dental visit in the previous 12 months.

Given the cross-sectional design, the temporal relationship between lifetime electronic cigarette experimentation and dental care utilisation cannot be established, and reverse causality cannot be ruled out. In addition, unmeasured factors may be associated with both electronic cigarette experimentation and dental care utilisation, including oral health conditions, health-related behaviours, access to care, and patterns of health care-seeking. Thus, the observed association may reflect the combined influence of these factors rather than a direct relationship between electronic cigarette use and dental care utilisation.

In the present study, the outcome was dental care utilisation in the previous 12 months, defined as at least one dental visit versus no dental visits. Female participants were more likely to report at least one dental visit than male participants, consistent with national evidence indicating sex differences in dental care [20].

Differences were also observed according to race/skin colour. Black participants were less likely to report a dental visit than White participants. This finding is consistent with evidence indicating inequalities in dental care across population groups and may reflect the influence of social, economic, and structural factors. Similarly, a study based on data from the Brazilian population found that Black individuals were more likely to have irregular dental follow-up or to have never visited a dentist, further indicating persistent racial inequalities in dental care in Brazil [21].

Differences in maternal educational attainment were also observed. A positive gradient was identified, with a higher frequency of dental visits among participants whose mothers had higher levels of education. These findings are consistent with previous evidence showing that adolescents whose mothers have higher educational attainment are more likely to visit a dentist [22]. Maternal education may be related to dental care through differences in health-related knowledge, health-care practices, and the ability to navigate health services; however, these mechanisms were not directly assessed in the present study.

These findings can also be considered within the framework of the social determinants of health proposed by Dahlgren and Whitehead [23], which recognises that socioeconomic and educational conditions are related to health and access to health services. From this perspective, the racial and educational differences observed in the present study may reflect broader social inequalities associated with patterns of dental care.

When considering the association between lifetime electronic cigarette use and dental care utilisation, it is important to recognise that this relationship may vary according to social and demographic characteristics, including sex, age, race/skin colour, and maternal educational attainment. Adolescents from more advantaged social contexts may have greater opportunities both to experiment with products such as electronic cigarettes and to access regular dental care. Conversely, adolescents experiencing greater social vulnerability may face both greater exposure to risk behaviours and more barriers to preventive care [21-24]. However, these potential pathways were not directly examined in the present study.

Dental visits should also be viewed not only as an indicator of health-care utilisation but as potential opportunities for health promotion. Dental care during adolescence may offer opportunities to identify risk behaviours, provide information on the potential health effects of electronic cigarette use, and encourage healthier practices. From this perspective, dental professionals should be prepared to recognise the oral and systemic health effects associated with these devices and to provide appropriate health education and counselling [8,16].

In addition to its potential for nicotine dependence, electronic cigarette use may be associated with subsequent initiation of conventional cigarette smoking and other patterns of nicotine use, potentially contributing to health risks over the life course [1,4]. Nevertheless, electronic cigarettes are often perceived by adolescents as less harmful than conventional cigarettes, which may contribute to their social acceptability and continued use among this population. Dental visits may therefore represent an opportunity to address risk behaviours and provide health education to adolescents.

The findings of this study should be interpreted in light of the limitations inherent to the use of secondary data and the operationalisation of the study variables. Although a statistically significant association was observed between lifetime electronic cigarette use and dental care utilisation, its magnitude was small (adjusted PR = 1.03; 95% CI: 1.02–1.04). Therefore, the statistical significance of the association should not be interpreted as evidence of a strong relationship.

The cross-sectional design is an important limitation because the temporal sequence between lifetime electronic cigarette use and dental care utilisation over the previous 12 months could not be established. In particular, the exposure measure captured whether participants had ever experimented with electronic cigarettes, without information on the timing, frequency, or intensity of use. Consequently, it was not possible to determine whether experimentation preceded dental care utilisation, and reverse causality cannot be ruled out. The outcome was based on the number of dental visits reported over the previous 12 months and did not distinguish between the reason for the visit and the type of care received.

Both the exposure and outcome were self-reported and may therefore be subject to recall or social desirability bias, particularly because electronic cigarette use is a potentially sensitive behaviour among adolescents. Although the multivariable analysis adjusted for age, sex, race/skin colour, and maternal educational attainment, other factors potentially associated with both electronic cigarette experimentation and dental care utilisation were not included in the analytical model. Thus, residual confounding cannot be excluded.

Regarding sampling, PeNSE 2019 was designed to represent students enrolled in the grades and schools covered by the survey. Therefore, the findings should be interpreted as applicable to Brazilian school-attending adolescents in the survey's target population and should not necessarily be generalised to adolescents who were not attending school or were outside the sampling frame. In addition, because the study used a secondary dataset, the analysis was necessarily restricted to the information and sampling structure available in PeNSE.

Despite these limitations, the study used data from a large national survey that covered adolescents across different geographic regions and social contexts in Brazil. The analysis provides population-level evidence on the relationship between lifetime electronic cigarette use and dental care utilisation. It contributes to the limited Brazilian literature addressing these two phenomena jointly among adolescents.

Conclusions

The findings indicate a small positive association between lifetime electronic cigarette use and dental care utilisation among Brazilian school-attending adolescents. This association should not be interpreted as evidence of a causal relationship, given the cross-sectional design and the inability to establish the temporal sequence between electronic cigarette experimentation and dental visits. The study also identified important sociodemographic differences in dental care utilisation, particularly according to sex, race/skin colour, and maternal educational attainment.

By examining electronic cigarette use and dental care utilisation within the same national sample, this study adds evidence on an understudied relationship among Brazilian adolescents. The findings support the incorporation of electronic cigarette use into adolescent oral health promotion and prevention strategies, particularly through educational and intersectoral actions. Dental professionals may contribute by identifying risk behaviours, providing evidence-based health education, and supporting preventive care. Longitudinal studies are needed to clarify the temporal relationships among electronic cigarette use, oral health conditions, and dental care utilisation.

Data Availability

The data analysed in this study are publicly available from the 2019 National Survey of School Health (PeNSE), conducted by the Brazilian Institute of Geography and Statistics (IBGE). The dataset can be accessed on the IBGE website and contains anonymised information with no individual participant identification.

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