

# Degree of family cohesion and social class are associated with the number of cavitated dental caries in adolescents

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**Abstract:** The aim of this study was to evaluate the association between number of cavitated dental caries in adolescents and family cohesion, drug use, sociodemographic factors and visits to the dentist. A cross-sectional study was conducted with 746 adolescents aged 15 to 19 years from Campina Grande, Brazil. The parents answered a questionnaire addressing sociodemographic data, and the adolescents answered questionnaires on drug use, type of family cohesion and visits to the dentist. Two examiners underwent training and calibration exercises ( $K > 0.80$ ) to diagnose dental caries using the Nyvad criteria. A directed acyclic graph was created to select the variables to be controlled in the statistical model. Associations between the independent variables and the outcome were determined using robust Poisson Regression analysis for complex samples ( $\alpha = 5\%$ ). Rate ratios (RR) and 95% confidence intervals (CI) were calculated. The prevalence of dental caries and cavitated lesions among the adolescents was 92.8% and 41.6%, respectively. The following variables remained associated with the number of cavitated lesions in the multivariate analysis: disengaged (RR: 6.30; 95%CI: 1.24–31.88;  $p = 0.028$ ), separated (RR: 4.80; 95%CI: 1.03–22.35;  $p = 0.046$ ) and connected (RR: 5.23; 95%CI: 1.27–21.59;  $p = 0.024$ ) levels of family cohesion, and high social class (RR: 0.55; 95%CI: 0.39–0.76;  $p = 0.001$ ). In conclusion, this paper posits that adolescents with a lower socioeconomic status, and those whose family cohesion was classified as disengaged, separated or connected, had a larger number of cavitated lesions.

**Keywords:** Adolescent; Dental Caries; Family Relations; Social Class.

## Introduction

Adolescence is a period of transition from childhood to adulthood, involving psychological changes and strong social influences, along with greater exposure to risk factors, making it a phase vulnerable to harmful behavior.<sup>1</sup> According to a systematic review, the prevalence of dental caries among adolescents aged 15 to 19 years, both in Brazil and the rest of the world, ranges from 59 to 90.4%.<sup>2</sup> These high rates underscore the importance of studies addressing factors associated with dental caries in this phase of life. Moreover, the most recent national oral health survey<sup>3</sup> reports that 13.6% of adolescents have never been to a dentist, a neglectfulness



that may contribute to the poorer oral health status of this population. Dental visits are important to prevent dental caries and provide proper treatment, and have been associated with a lower prevalence of untreated dental caries in adolescents.<sup>2</sup>

Adolescents who do not receive socioeconomic support from their families have a greater prevalence of dental caries, probably due to the lack of dental visits and preventive measures.<sup>4</sup> This underscores the importance of evaluating the association between socioeconomic factors and oral health outcomes in this group. Previous studies have also suggested that a mother's schooling and the number of residents in the home are associated with dental caries.<sup>5,6</sup> An investigation into these factors is particularly important in developing countries, since the results may vary depending on regional differences.

Associations have also been found between drug use and problems such as poor oral hygiene habits and dental caries, especially in adults, with little attention to adolescents.<sup>7,8</sup> Therefore, it is important to investigate the influence of drug use on dental caries in adolescents, since substance use is associated with lower adherence to dental treatment in this age group.<sup>9</sup> Moreover, drug abuse is commonly associated with dental caries, mainly due to neglected self-care and the detrimental effects of drugs on the soft and hard tissues of the oral cavity.<sup>8</sup>

The influence of family cohesion on oral health in adolescents has been little explored in the literature. One study reports an association between poor oral health behavior, dental caries and low family cohesion, but the sample was limited to 15-year-olds at public schools.<sup>10</sup> Family cohesion constitutes the emotional ties that family members have with one another. This indicator reflects the level of dependence and independence among the components of a family, and should be studied at different times, since it changes as the adolescent develops.<sup>11,12,13</sup>

Higher levels of family cohesion are believed to contribute to more adequate behavior on the part of adolescents, thereby reducing the likelihood of their developing impulsive and antisocial behavior<sup>14</sup> and having poor oral health habits. The central hypothesis of this study is that family cohesion is associated with dental caries among adolescents.

Depending on the degree of family cohesion, family members exert a stronger or weaker influence on each other, ultimately affecting beliefs, behaviors and habits.<sup>13</sup> Thus, strengthening family cohesion is a valuable strategy for promoting the oral health of adolescents.<sup>10,13,14,15</sup>

The aim of the present study was to investigate associations between dental caries and family cohesion, drug use, sociodemographic factors and visits to the dentist among adolescents aged 15 to 19 years. Investigating these associations can contribute to the establishment of preventive policies that are directed at oral issues and that incorporate factors associated with dental practice.

## Methodology

### Study design and sample size

An analytical cross-sectional study was conducted in Campina Grande, a medium-sized city in Brazil. This city has 407,472 residents, with 13,933 adolescents in the target age group<sup>16</sup>. The data collection period was between October 2016 and July 2017. The sample was composed of adolescents aged 15 to 19 years, enrolled in public and private schools in the city of Campina Grande. The sample size was calculated considering a 5% margin of error, 95% confidence interval and 50% prevalence of the condition, to obtain the largest possible sample. Two-stage probabilistic cluster sampling was performed. First, the schools were chosen randomly, and then the students were selected using a simple random sampling method at each school. The sample was proportional to the six administrative districts in the city, to reproduce the characteristics of the population. The minimum sample was determined as 384 adolescents, and was corrected for the study design by applying a factor of 1.6, resulting in 615 adolescents. Finally, 20% was added to compensate for possible dropouts, yielding a final sample of 769 adolescents.

### Eligibility criteria

This study included literate adolescents between 15 and 19 years old, enrolled in public and private schools in the city of Campina Grande. The exclusion

criteria were adolescents with cognitive impairment that affected learning and reading (according to parents/guardians or teachers), those wearing orthodontic appliances at the time of the study, and those who still had primary teeth.

### Training and calibration exercises

The Nyvad criteria were used to diagnose the dental caries<sup>17</sup>. Training was conducted in two steps (theoretical and practical). In the theoretical step, an expert in the field performed an in-depth analysis of the diagnostic criteria with two dentists. In the practical step, 50 children were examined and reexamined following a seven-day interval to determine the interexaminer ( $\kappa = 0.89$  to  $0.90$ ) and intraexaminer ( $\kappa = 0.88$  to  $0.90$ ) agreement.

### Pilot study

A pilot study was conducted with 50 adolescents (25 from a public school and 25 from a private school). These participants were selected by convenience, and were not included in the main study. The results of the pilot study indicated that there was no need to alter the proposed methods.

### Collection of non-clinical data

The questionnaires were self-administered by the adolescents and their parents/guardians. Meetings were held with the parents/guardians prior to the data collection to clarify the procedures and importance of the study. At this time, the parents answered a questionnaire addressing sociodemographic characteristics (social class, parent's/guardian's age, mother's schooling, adolescent's sex, number of residents in the home and ethnicity). In addition, the adolescents were asked whether they had ever been to a dentist.

The Family Adaptability and Cohesion Evaluation Scales (FACES III) were used to investigate family cohesion,<sup>18,19</sup> and were answered by the adolescents. FACES III has 10 questions on family cohesion and 10 on family adaptability. The questions are related to daily activities and level of emotional dependence among family members. The sum of the family cohesion questions indicates the adolescent's degree of family cohesion. This instrument establishes four

levels of family cohesion: disengaged – lack of an affective union among family members; separated – moderate affective union among family members; connected – considerable affective union among family members; and enmeshed – maximum affective union among family members.<sup>19</sup>

The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) developed by the World Health Organization<sup>20</sup> was employed to evaluate the use of psychoactive substances. The students answered the ASSIST questionnaire in a separate room with no external influences to ensure privacy. The questionnaire addresses licit and illicit drug use, use frequency and risk of psychological disturbance due to drug abuse. It is a self-administered questionnaire with eight items. The item addressing drug use frequency in the previous three months was included in the present study.

### Collection of clinical data

The adolescents brushed their teeth under supervision and received topical fluoride prior to the clinical examinations. They were examined individually in a reserved room, sitting in a school chair in front of the examiner, who was equipped with a head lamp (Petzl Zoom, Petzl America, Clearfield, UT, USA), sterilized mouth mirror (PRISMA, São Paulo, SP, Brazil), sterilized Williams probe (WHO-621, Trindade, Campo Mourão, PR, Brazil) and individual protective equipment. The Nyvad criteria<sup>17</sup> were used to classify the dental caries, based on the severity of the lesions. These criteria have been validated for use in clinical practice and research in the field of dentistry. The following classification is used, in ascending order: a) active carious lesion on an intact surface; b) active carious lesion on a discontinuous surface; c) active carious lesion with cavitation; d) inactive carious lesion on an intact surface; e) inactive carious lesion on a discontinuous surface; f) inactive carious lesion with cavitation; g) restoration in good state; h) restoration with active carious lesion. After the examinations, the adolescents received verbal recommendations regarding oral hygiene, and were instructed to seek dental care at a public service center in their neighborhood, when needed.

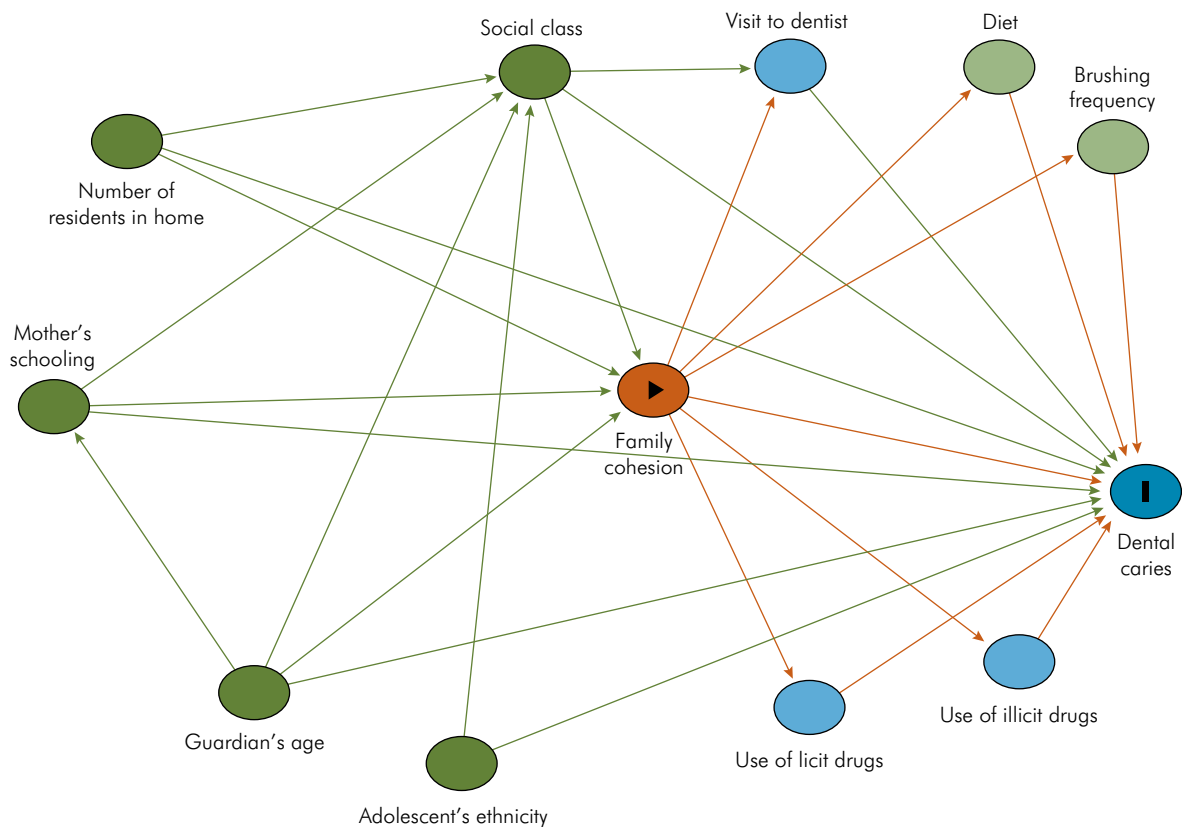
## Directed acyclic graph

A directed acyclic graph (DAG) was created to select covariables for the statistical adjustment, and support the causal interpretation of the effect of exposure on the outcome. DAG is an important tool for reducing bias in epidemiologic studies, since it enables estimating the effect of different independent variables on the outcome, and suggests a minimally sufficient adjustment. Moreover, DAG presents causal directions and facilitates the visualization of the relationships among variables.<sup>21</sup> Both investigated and uninvestigated variables were incorporated into the model. This step led to the identification of confounding variables that could be controlled in the final model (social class, mother's schooling, number of residents in the home and parent's/guardian's age) (Figure).

## Statistical analysis

Organization of the data and statistical analysis were performed using STATA version 15 (STATA

Corp., College Station, USA). The number of cavitated lesions (Nyvad index) was the dependent variable, and was treated as a discrete numeric variable. Codes 3 and 6 of the Nyvad criteria were used in the present study, since these codes represent the worst possible outcome for dental caries, thereby exerting a greater impact on adolescents. The independent variables were the sociodemographic characteristics, family cohesion, drug use and visits to the dentist. Social class was classified into two categories (low [C, D and E] and high [classes A and B]), based on the Brazilian Economic Classification Criteria. These criteria depend on the number of household appliances, and the householder's education and access to public utility services. They allow a social class to be classified according to five strata (A, B, C, D, and E), based on the estimated average household income<sup>22</sup>. The cutoff for the guardian's age was the median (42 years old). Elementary school (eight years of study) is commonly considered a cutoff point for mother's schooling in Brazil, since it discriminates



**Figure.** Directed acyclic graph of factors associated with number of cavitated lesions in adolescents aged 15 to 19 years.

between low to medium and high levels of education.<sup>23</sup> Drug use, family cohesion and dental visits were categorized according to the recommendations of the validated questionnaires.<sup>3,19,20</sup> The association between these variables and the outcome were tested using robust Poisson regression analysis for complex samples. Variables with a p-value < 0.20 in the bivariate model were incorporated into the multivariate model, and those with a p-value < 0.05 in the final model were considered as significantly associated with the outcome.

### Ethical clearance

This study received approval from the Human Research Ethics Committee of The State University of Paraiba (certificate number: 55953516.2.1001.5187) and was conducted in accordance with the guidelines established by the Declaration of Helsinki. The parents/guardians and adolescents agreed to participate by signing a statement of informed consent.

### Results

The final sample was composed of 746 adolescents (response rate: 97%). A total of 497 (66.6%) adolescents attended public schools and 249 (33.4%) attended private schools. Dropouts were counted as three consecutive failures of adolescents (n = 23) to appear on the days scheduled for the examinations. Table 1 shows the characterization of the sample. Most adolescents self-declared themselves as having non-white skin color (71.7%); 42.1% were the eldest child; the female sex accounted for 59.5% of the sample; the majority lived with up to five people in the home (83.2%), had been to a dentist at least once in their lifetime (93.8%) and had mothers who had more than eight years of schooling (59.4%). Most adolescents reported needing dental treatment (88.6%) and 41.6% had cavitated lesions. A large portion of the adolescents reported disengaged family cohesion (46.1%).

In the multivariate analysis (Table 2), the variables that remained in the final model were disengaged (RR: 6.30; 95%CI: 1.24–31.88; p = 0.028), separated (RR: 4.80; 95%CI: 1.03–22.35; p = 0,046) and connected (RR: 5.23; 95%CI: 1.27–21.59; p = 0.024) levels of family cohesion; and high social class (RR: 0.55; 95%CI: 0.39–0.76; p = 0.001).

**Table 1.** Characterization of sample.

Variable	n	%
Sex		
Female	444	59.5
Male	302	40.5
Ethnicity		
White	211	28.3
Non-white	535	71.7
Birth order		
Youngest child	248	33.2
Middle child	184	24.7
Eldest child	314	42.1
Visit to dentist		
Yes	694	93.8
No	46	6.2
Mother's schooling		
< 8 years of study	299	40.1
≥ 8 years of stud	443	59.4
Social class		
Low (C-D-E)	428	57.4
High (A-B)	318	42.6
Guardian's age		
≤ 42 years	384	51.6
> 42 years	360	48.4
Treatment need		
Yes	597	88.6
No	77	11.4
Number of residents in home		
1 to 5	619	83.2
6 or more	125	16.8
Dental caries		
Yes	692	92.8
No	54	7.2
Cavitated lesions		
Yes	310	41.6
No	436	58.4
Use of licit drugs		
Yes	301	40.3
No	445	59.7
Use of illicit drugs		
Yes	54	7.2
No	692	92.8
Family cohesion		
Disengaged	344	46.1
Separated	266	35.7
Connected	121	16.2
Enmeshed	15	2.0

**Table 2.** Poisson regression for number of cavitated lesions in adolescents, and associated factors.

Variable	Number of teeth with cavitated lesions		Bivariate		Multivariate	
	Mean	Standard deviation	p-value	Unadjusted RR* (95% CI)	p-value	Adjusted RR** (95% CI)
<b>Social class</b>						
Low (C-D-E)	1.13	1.62	-	1.00	-	1.00
High (A-B)	0.53	1.09	< 0.001	0.47 (0.33–0.67)	0.001	0.55 (0.39-0.76)
<b>Mother's schooling</b>						
< 8 years of study	1.07	1.67		1.00	-	-
≥ 8 years of study	0.73	1.26	0.012	0.65 (0.47–0.90)	-	-
<b>Guardian's age</b>						
≤ 42 years	0.86	1.44	0.491	0.85 (0.54–1.34)	-	-
> 42 years	0.88	1.46		1.00	-	-
<b>Ethnicity</b>						
White	0.74	1.44	0.254	0.78 (0.51–1.20)	-	-
Non-white	0.92	1.45		1.00	-	-
<b>Number of residents in home</b>						
1 to 5	0.80	1.39		1.00	-	-
≥ 6	1.16	1.67	0.266	1.26 (0.82–1.94)	-	-
<b>Use of licit drugs</b>						
Yes	0.82	1.42	0.470	0.87 (0.59–1.27)	-	-
No	0.90	1.47		1.00	-	-
<b>Use of illicit drugs</b>						
Yes	0.96	1.65		1.00	-	-
No	0.86	1.43	0.329	0.81 (0.54–1.23)	-	-
<b>Family cohesion</b>						
Disengaged	0.98	1.55	0.017	6.70 (1.45–30.92)	0.028	6.30 (1.24–31.88)
Separated	0.73	1.25	0.049	4.87 (1.00–23.61)	0.046	4.80 (1.03–22.35)
Connected	0.93	1.57	0.037	4.71 (1.10–20.10)	0.024	5.23 (1.27–21.59)
Enmeshed	0.27	0.45		1.00	-	1.00
<b>Visit to dentist</b>						
No	1.00	1.85		1.00	-	-
Yes	0.86	1.42	0.557	0.87 (0.55–1.38)	-	-

\*Unadjusted Poisson regression for independent variables and number of cavitated lesions among adolescents aged 15-19 years, rate ratio (RR) and confidence interval (95%CI); \*\*Variables incorporated into multivariate model ( $p < 0.20$ ): mother's schooling, number of residents in home, family cohesion, social class, guardian's age and ethnicity; (-): variables not selected for final adjusted model ( $p$ -value  $> 0.05$ ); \*\*Variables incorporated into multivariate model (adjustment factors - directed acyclic graph): social class, mother's schooling, number of residents in home and guardian's age.

## Discussion

In the present study, the prevalence of dental caries in adolescents was high, and the number of cavitated lesions was associated with family cohesion and social class. This is the first study to associate family cohesion and dental caries in a school-based representative sample of adolescents aged 15 to 19 years. The high prevalence of dental caries (92.8%) may be related to

the diagnostic criteria, which also consider carious lesions in the initial stage (white spots).<sup>17</sup> This aspect has been observed in previous studies using the same index.<sup>24,25,26</sup> The Nyvad index is proposed for use in clinical practice and research in dentistry, and can differentiate the various stages of caries, thus making it useful for epidemiological studies.

In the present investigation, a higher social class was associated with fewer cavitated lesions. Previous



studies report similar findings.<sup>4,24,27</sup> An individual's cognizance of belonging to a higher social class could exert a positive influence on his access to oral health information and dental services, thereby reducing the dental caries experience.<sup>28</sup> Moreover, a higher social class may contribute to social cohesion. It has been claimed that social cohesion enhances self-confidence and reduces psychosocial stress, thus leading to better general and oral health behaviors.<sup>29,30</sup>

Drug use was not associated with the number of cavitated lesions among the adolescents, unlike the results reported in previous studies.<sup>31,32</sup> This likely occurred because drug use may have been considered at some time in life, but may not represent frequency of use. It is important to conduct longitudinal studies considering the frequency of drug use. Another possible explanation for the non-association between drug use and cavitated lesions is the underestimation of drug use. Adolescents may be reluctant to report the truth.<sup>33</sup> However, for the purposes of the present study, the adolescents answered the ASSIST questionnaire in a separate room with no external influences to ensure privacy.

Regarding family cohesion, the results show that adolescents with low to moderate levels of family union had more cavitated lesions. A previous study found an association between family cohesion and a cariogenic diet in female adolescents<sup>15</sup>. Another study found an association between low levels of family cohesion and dental caries in 15-year-old adolescents enrolled in public schools.<sup>10</sup> The present investigation included private schools together with public schools, and older adolescents, thus showing that the influence of family cohesion on the number of dental caries continues to be important not only in early but also in late adolescence, and regardless of the type of school. Noteworthy, the present study enabled better representation, compared with the previously cited study.

It is likely that the association between dental caries and family cohesion is mediated by the influence of preventive habits related to dental caries.<sup>10,34</sup> Thus, a higher degree of family cohesion exerts a positive influence on the prevention of dental caries. The present findings underscore the importance of oral health promotion actions in the school setting,<sup>35</sup> which take into account socioeconomic and familial factors regarding the prevention of dental caries in adolescents.

The major limitation of the present study was its cross-sectional design, which did not enable a cause-and-effect relationships to be established among the variables analyzed. The strengths of this study were its representative school-based sample, use of validated instruments and calibration of the examiners. Moreover, this study followed the recommendations of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) initiative,<sup>36</sup> and demonstrated the importance of evaluating the influence of family relations on dental caries.

## Conclusions

In conclusion, this paper posited that adolescents with a lower socioeconomic status and those whose family cohesion is classified as disengaged, separated or connected had a larger number of cavitated lesions.

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