





Dental pain and associated factors in Mexican adolescents and young adults: a cross-sectional study

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Objective: To identify the factors associated with the prevalence of dental pain in Mexican adolescents and young adults. **Material and methods:** This is a cross-sectional study in which data from 638 Mexican subjects, 16–25 years of age, who were randomly selected from college applicants, were analysed. Questionnaires were administered to collect sociodemographic, economic and behavioural variables. Clinical examinations were carried out to determine the decayed, missing and filled teeth (DMFT) index. The outcome variable was dichotomised as 0 (no dental pain in the last 12 months) or 1 (dental pain in the last 12 months). Statistical analyses included binary logistic regression. **Results:** Average age was 18.76 ± 1.76 years, and 49.2% of participants were women. Prevalence of dental pain was 34.0%. In the final model, variables significantly ($P < 0.05$) associated with the experience of dental pain were the use of preventive dental services (OR = 0.34), being a former smoker (OR = 2.37), self-report of very poor/poor oral health (OR = 1.94) or fair oral health (OR = 1.94), self-reported dental disease (OR = 2.06) or gingival disease (OR = 2.84). **Conclusions:** The prevalence of dental pain was associated with self-reported oral health status, preventive dental visits and smoking; these results have implications for dental practice. We found that recent experience of dental pain was common in young adults, being reported by one out of three subjects.

Key words: Oral health, dental pain, adolescents, young adults, Mexico

INTRODUCTION

Oral diseases, such as untreated caries and severe periodontitis, present a significant global burden of disease. It is estimated that 3.9 billion people are affected by at least one of the above conditions¹. In Mexico, dental caries in the primary and permanent dentition is a public health problem^{2,3} among children and adolescents. A large proportion of the population presents considerable dental treatment needs⁴. Approximately 75% of young Mexican adults are afflicted by untreated caries⁵.

Untreated oral disease is often associated with pain. The International Association for the Study of Pain⁶ defines pain as a sensorial and emotionally unpleasant experience that promotes behavioural changes in a person, often impeding normal daily activities. Dental pain has been defined as orofacial pain originating in

dental or adjacent structures. This may be a consequence of multiple diseases, such as dental caries, periodontal disease, trauma, occlusal dysfunction and abscess^{7–9}. Dental pain may lead to sleep loss and a poor work or academic performance. It may be associated with truancy or job absenteeism, weight loss and avoidance of certain foods^{10–13}.

Dental pain among children, adolescents and adults has been recognised as an important public health problem^{7,8}. Few epidemiological oral health studies include questions about dental pain, despite its effect on daily activities and quality of life^{10,12}. Because of the biological and psychosocial components of dental pain, its perceptions are moderated by sociodemographic and socio-economic status, individual characteristics (such as knowledge, beliefs and expectations), as well as oral health status¹⁴. Studies have revealed a varying prevalence of dental pain in different

countries and in across age groups: in Mexico, prevalence of dental pain was 50% in children between 6 and 12 years of age¹³; in Uganda, prevalence of dental pain was 66% in 12- to 14 year-old children¹⁴; in India, prevalence of dental pain was 71% in 12-year-old children¹⁵; in Brazil, prevalence of dental pain was 17.5% among 20- to 59-year-old adults¹⁶ and in another study, also from Brazil, prevalence of dental pain was 18.7% in subjects 11–19 years of age¹⁷.

Slade¹⁸ conducted a review and found that most studies asked parents if their children had ever experienced a toothache; the proportion of ‘yes’ responses ranged from 5% to 33%. Prevalence of dental pain throughout life was higher among older children and in children with low socio-economic status, and the authors found an association between presence of caries and dental pain prevalence. Another review, by Pau *et al.*⁷ in adults (≥ 19 years of age), also identified a wide range of prevalence of pain in the mouth, teeth and gums, ranging from 7% to 66%. Younger subjects and those with lower socio-economic status are more likely to report pain. The body of literature is rather sparse for various countries^{7,19}, and most studies have targeted preschoolers, schoolchildren and adults²⁰, omitting adolescents and young adults. With the exception of Brazil^{10,17,19–24}, there is a paucity of such data in Latin America and Mexico¹³.

The present study aimed to identify factors associated with the prevalence of dental pain among Mexican adolescents and young adults.

MATERIAL AND METHODS

Design, population and study sample

A cross-sectional study was undertaken in adolescents and young adults, 16–25 years of age. The subjects were randomly selected from all college applicants to the Autonomous University of San Luis Potosí (UASLP), the public university of the state of San Luis Potosí (a northern state of Mexico). UASLP is the institution in which the largest number of students in this state are enrolled.

The present report is part of a project in which multiple oral health indicators were measured. The methodology to collect data on dental caries, treatment needs and use of dental health services has been reported previously^{25–27}. The sample size of 653 was calculated taking into consideration the following criteria: proportion to estimate of 75%, confidence of 95%, precision of 3.5% and a non-response rate of 10%. The final sample comprised 638 subjects. The inclusion criteria were: either female or male; 16–25 years of age; and a college applicant to the UASLP. The exclusion criteria were: failure to attend

the appointment for the clinical oral examination and/or having a fixed orthodontic appliance. Selection of participants for the study was performed using random numbers. Subjects were not compensated for their time but they received a summary of the oral examination findings.

Data collection and variables conformation

Data were collected through a self-administered questionnaire completed by applicants. The survey was structured into several sections that allowed collection of sociodemographic and economic information, smoking status, oral health practices, satisfaction with oral appearance and use of oral health services. The decayed, missing and filled teeth (DMFT) index was used to measure the prevalence of dental caries. Clinical examinations were carried out in a dental chair under artificial light using a dental mirror and a World Health Organization (WHO)-type probe, by two trained and standardised ($\kappa > 0.80$) dentists.

The dependent variable was self-reported oral pain, assessed through the question: In the last 12 months, have you had any pain or discomfort in your mouth, teeth or gums? It was created with the following answer, dichotomised as 0 = no pain in the previous 12 months or 1 = any report of pain in the last 12 months.

Independent variables were sex, age, number of individuals who share the same household expenses, individuals who study and have a remunerated job at the same time, financial dependence on parents, level of mother’s and father’s education, parents’ socio-economic status (in tertiles), having a vehicle in the household, having health-care insurance, use of dental hygiene aids (number of items used: toothbrush, toothpaste, floss and mouthwash), preventive dental health services utilisation (DHSU) in the 12 months prior to the study, number of decayed teeth, smoking, self-perception of oral health status, dental disease self-report, gum disease self-report and oral health knowledge.

Principal components analysis (polychoric correlation) was used to estimate socioeconomic status and oral health knowledge indicators. The polychoric correlation allows incorporation of interrelated categorical variables into a single indicator variable²⁸. The first group encompassed variables indicating socioeconomic position, referring to household appliances (e.g., refrigerator, stove, television, telephone, computer, internet, etc.). Regarding knowledge about oral health, we used a set of questions that we validated (Cronbach’s $\alpha > 0.70$) in previous research and have used in various earlier publications^{3,13,25–27}. Tertiles were calculated for each generated variable, in which the first tertile corresponded to the group with

the worst condition and the third tertile to the group with the best condition.

Statistical analysis

Univariate analyses were performed; results are presented as central tendency and dispersion measures for continuous variables and as frequencies and percentages for categorical variables.

We used binary logistic regression models in the bivariate and multivariate analyses. The strength of association between the dependent variable and independent variables is presented as odds ratio (OR) with 95% CI. The variance inflation factor (VIF) test was performed to analyse and minimise multicollinearity between independent variables. Variables with a value of $P < 0.25$ in the bivariate analysis were included in the model construction. Global model adjustment was performed with the Hosmer–Lemeshow goodness-of-fit test²⁹. The statistical package used was STATA 11.0 (StataCorp., College Station, TX, USA).

Ethical considerations

The present study was conducted following the scientific principles of Helsinki and the Mexican law in general health and research. The protocol was approved by the Autonomous University of San Luis Potosí IRB (MC016). All participants signed a letter of informed consent, and data were treated as confidential.

RESULTS

Data from 638 subjects were analysed, with a response rate above 90%. *Table 1* shows the overall characteristics of the sample. Average age was 18.76 ± 1.76 years, and 49.2% of participants were women. Almost one-third (31.8%) of the sample had planned to be enrolled in college and to hold some level of employment at the same time, but most (90.1%) also indicated that they were financially dependent on their parents. The prevalence of dental pain in the 12 months prior to the study was 34.0% ($n = 217$, 95% CI = 30.3%–37.7%).

Table 2 shows the results of the bivariate logistic regression analysis. The variables that demonstrated statistical significance (i.e., had a value of $P < 0.05$) were: number of decayed teeth; sex; preventive DHSU in the previous 12 months; oral health self-perception; dental disease self-report; and gum disease self-report.

In the multivariate logistic regression (*Table 3*), subjects who had a dental visit for preventive reasons in the last year had a lower likelihood of having experienced dental pain (OR = 0.41; 95% CI: 0.25–0.67) than those who did not have a dental visit for preventive reasons. Those who reported being former

Table 1 Descriptive analysis of the variables included in the study

Variable	Result
Age (years)	18.76 ± 1.76 (16–25)
Number of household members	4.01 ± 1.78 (1–11)
Number of dental hygiene devices used	2.89 ± 0.91 (1–4)
Number of decayed teeth	1.69 ± 2.49 (0–14)
Number of missing teeth	0.31 ± 0.92 (0–5)
Number of filled teeth	2.24 ± 3.40 (0–16)
DMFT index	4.24 ± 3.85 (0–17)
Sex	
Male	324 (50.8)
Female	314 (49.2)
Preventive DHSU in the previous 12 months	
No	492 (77.1)
Yes	146 (22.9)
Works in addition to studying	
No	435 (68.2)
Yes	203 (31.8)
Financial dependence on parents	
No	63 (9.9)
Yes	575 (90.1)
Mother's education	
High school and more	273 (42.8)
Lower than high school	365 (57.2)
Father's education	
High school and more	360 (56.4)
Lower than high school	278 (43.6)
Vehicle in the household	
Yes	513 (80.4)
No	125 (19.6)
Socio-economic status	
First tertile (Lowest)	217 (34.0)
Second tertile	219 (34.3)
Third tertile (Highest)	202 (31.6)
Health insurance	
With insurance	410 (64.3)
Without insurance	228 (35.7)
Smoking	
Never	469 (73.5)
Former smoker	36 (5.6)
Current smoker	133 (20.9)
Oral health self-perception	
Very poor/Poor	84 (13.2)
Fair	324 (50.8)
Good/Very good	230 (36.0)
Dental disease self-report	
No/Do not know	406 (63.6)
Yes	232 (36.4)
Gum disease self-report	
No/Do not know	548 (85.9)
Yes	90 (14.1)
Oral health knowledge	
Poor	248 (38.9)
Basic	184 (28.8)
Broad	206 (32.3)

Values are given as mean ± SD (limit) and n (%).

DHSU, dental health services utilisation; DMFT index, decayed, missing and filled teeth index.

smokers were 2.37 (95% CI: 1.12–5.01) times more likely to have experienced dental pain than those who had never smoked. Those who perceived their health as very poor/poor (OR = 1.94; 95% CI: 1.05–3.57) or fair (OR = 1.94, 95% CI: 1.27–2.97) had higher odds of having had dental pain. The likelihood of experiencing dental pain was higher among those who

Table 2 Bivariate analysis of binary logistic regression for dental pain and independent variables

Variable	Prevalence	OR (95% CI)	P value
Age	34.1	0.99 (0.90–1.09)	0.863
Members in the household	34.1	1.01 (0.92–1.11)	0.768
Dental hygiene devices	34.1	0.97 (0.81–1.17)	0.791
Number of decayed teeth	34.1	1.09 (1.02–1.16)	0.010
Number of missing teeth	34.1	1.02 (0.86–1.22)	0.809
Number of filled teeth	34.1	1.01 (0.97–1.06)	0.561
DMFT index	34.1	1.05 (1.01–1.09)	0.026
Sex			
Male	30.2	1*	
Female	37.9	1.41 (1.01–1.95)	0.042
Preventive DHSU in the previous 12 months			
No	38.8	1*	
Yes	17.8	0.34 (0.21–0.54)	<0.001
Works in addition to studying			
No	32.2	1*	
Yes	37.9	1.29 (0.91–1.82)	0.154
Financial dependence on parents			
No	36.5	1*	
Yes	33.7	0.88 (0.51–1.52)	0.660
Mother's education			
High school and more	33.7	1*	
Lower than high school	34.2	1.02 (0.73–1.43)	0.885
Father's education			
High school and more	30.8	1*	
Lower than high school	38.1	1.38 (0.99–1.92)	0.054
Vehicle in the household			
Yes	32.7	1*	
No	39.2	1.32 (0.88–1.98)	0.173
Socio-economic status			
First tertile (lowest)	35.5	1*	
Second tertile	33.8	0.93 (0.62–1.38)	0.710
Third tertile (highest)	32.7	0.88 (0.59–1.32)	0.544
Health insurance			
With insurance	36.1	1*	
Without insurance	30.3	0.79 (0.54–1.09)	0.136
Smoking			
Never	31.6	1*	
Former smoker	47.2	1.94 (0.98–3.84)	0.057
Current smoker	39.1	1.39 (0.93–2.07)	0.104
Oral health self-perception			
Very poor/Poor	47.6	3.64 (2.13–6.22)	<0.001
Fair	40.4	2.71 (1.83–4.02)	<0.001
Good/Very good	20.0	1*	
Dental disease self-report			
No/Do not know	25.4	1*	
Yes	49.1	2.84 (2.02–4.00)	<0.001
Gum disease self-report			
No/Do not know	29.7	1*	
Yes	60.0	3.54 (2.24–5.61)	<0.001
Oral health knowledge			
Poor	37.9	1*	
Basic	30.4	0.71 (0.47–1.07)	0.107
Broad	32.5	0.78 (0.53–1.16)	0.233

Significance ($P < 0.05$) is indicated in bold.

DMFT index, decayed, missing and filled teeth index.

*Reference category.

self-reported having dental disease (OR = 2.06; 95% CI: 1.41–3.02) or gum disease (OR = 2.84; 95% CI: 1.73–4.65).

DISCUSSION

The present study aimed to identify key factors associated with the prevalence of dental pain among Mexican adolescents and young adults entering college. It

was observed that slightly more than one in three (34.0%) subjects had experienced dental pain in the previous 12 months. Dental pain is a public health problem because of its relatively high prevalence and its negative impact on quality of life¹⁶. A review by Slade¹⁸ indicates that dental pain prevalence ranges from 5% to 33% in children and adolescents, and a review by Pau *et al.*⁷ reports a prevalence of dental pain of 7% to 66% among adults. These wide ranges

Table 3 Multivariate model of binary logistic regression for dental pain

Variable	OR (95% CI)	P value
Preventive DHSU in the previous 12 months		
No	1*	
Yes	0.41 (0.25–0.67)	<0.001
Smoking		
Never	1*	
Former smoker	2.37 (1.12–5.01)	0.023
Current smoker	1.25 (0.79–1.97)	0.342
Oral health self-perception		
Very poor/Poor	1.94 (1.05–3.57)	0.034
Fair	1.94 (1.27–2.97)	0.002
Good/Very good	1*	
Dental disease self-report		
No/Do not know	1*	
Yes	2.06 (1.41–3.02)	<0.001
Gum disease self-report		
No/Do not know	1*	
Yes	2.84 (1.73–4.65)	<0.001

Estimates were adjusted according to age and sex.

Hosmer–Lemeshow $\chi^2(8) = 12.19$; $P = 0.1429$.

DHSU, dental health services utilisation.

*Reference category.

may be explained by multiple factors, including the study's geographical location, population groups within the country, age groups included in the study, the methodology employed in data collection, time interval to define prevalence and even case definition. Therefore, direct comparisons of our results with other studies may only allow tentative conclusions to be reached.

Although several studies have observed that caries experience or untreated dental caries experience were risk factors for dental pain^{10,14,19,23}, in the present study these factors were only associated at the bivariate analysis level. In the final model, self-perception of dental or gingival health status was more important. It is necessary to highlight that unlike other studies in which large percentages of untreated dental caries were observed, this population in Mexico had considerable experience of dental services (a care index of 52.8%). This, in turn, may explain why oral health perception variables were more important than clinical variables. Santiago *et al.*²³ also found that in subjects ≥ 15 years of age, perception of oral health status was associated with dental pain. Health perception is a subjective measure generally based on existing dental knowledge and personal experience, which correlates moderately with clinical indicators. This association is related to perceived health needs; for example, oral rehabilitation needs²⁴. Needs assessment based entirely on a normative point of view does not consider the functional, social and psychological consequences of diseases of the teeth and oral cavity; this situation further supports the importance of subjective or perceived health in this context^{30,31}.

Tobacco use has been related to oral diseases^{32–34}, such as in the association between smoking and dental caries. Root caries is associated with smoking through breakdown of periodontal attachment; root exposure may not only facilitate root caries but may also lead to dental pain^{19,20}. In the present study, being a former smoker increased the likelihood of experiencing dental pain compared with those who had never smoked, but such a relationship was not observed in current smokers. Bastos *et al.*¹⁹ found that people who smoked had 70% more dental pain than non-smokers. Freire *et al.*¹⁷ and Kuhnen *et al.*²⁰ also found an association between tobacco consumption (current and former) and the presence of dental pain.

The association between caries and dental pain is stronger in population groups with reduced access to dental care. On one hand, less frequent dental-care patterns have been associated with a low prevalence of dental pain in other countries^{14,20}. However, this trend can be expected to vary depending on the actual reasons for the dental visit. In the present study, just as in the research conducted by Constante *et al.*¹⁶, we observed that the reason for the last dental visit was related to dental pain experience; subjects who visited the dentist for preventive or for check-up reasons presented a lower prevalence of dental pain. People who regularly use health services, including dental health services for preventive reasons, may have particular characteristics. The use of dental services for preventive purposes reduces the risk of having oral diseases^{35,36} or at least allows the early detection of these diseases. It would then be reasonable to assume that dental pain would also be affected by the pattern of use of dental services and the motive driving the last dental visit¹⁶. Building on such assumptions, health policies and programmes aimed at reducing dental diseases could also reduce the financial and social impact caused by dental pain in terms of suffering, quality of life, dental care financing and services availability³⁷.

Several studies have reported differences in dental pain across different socio-economic groups: those with a lower socio-economic status show higher prevalence of dental pain^{10,16,17,21,22,38}. Likewise, it has been noted that sex and age variables are influencing factors of dental pain^{17,20,38}. In this study, socio-economic inequalities were not observed despite the inclusion of several socio-economic indicators. Similarly, no difference was found according to age and sex.

Findings from the present study shed new light on a hitherto sparsely studied age group within the Mexican population. Although our results add to the state of epidemiological knowledge for this location, there are some limitations in our research, primarily that cross-sectional studies cannot establish causal

relationships between dependent and independent variables because of temporal ambiguity. In addition, the present study collected the information by questionnaire, and the inherent recall bias might have affected these results.

CONCLUSIONS

One out of three subjects presented dental pain experience in this sample of Mexican adolescents and young adults. The prevalence of dental pain was associated with self-reported oral health status, preventive dental-health services utilisation and smoking. No socio-economic inequalities were observed despite multiple use of indicators examining socio-economic categories. We found no sex differences in self-reported dental pain.

Conflict of interest

The authors declare that they have no conflict of interest.

Authors' contributions

JOGC, JJNH, CEMS and GM were involved in the design and development of the study as well as in data analysis and in the writing of the first draft of the manuscript. JMC, RMR, RIZ and RRS were involved in the conception of the study, as well as in the analysis and interpretation of the results. All the authors were involved in the critical review of the manuscript, made intellectual contributions and accepted the final version.

FUNDING

No external grant funding supported the present research.

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