Migration Letters

Volume: 20, No: S1 (2023), pp. 1788-1799

ISSN: 1741-8984 (Print) ISSN: 1741-8992 (Online)

www.migrationletters.com

Dental Pain And Associated Factors In Adolescents And Young Adults

Abdulaziz Ibrahim Almazrua[1], Dina Mansour Alassaf[2], Bashayer ghazi alosaimi[2], May Mohammed Alshemaisi[2], Rawan khalid alkhalaf[3], Rawan Mohammed Alsamaani[2], Sahar Binhowaimel[4], Wessam Abdullah Alforaih[4], Arwa Ibrahim Alatiequ[5], Maha khalid Asiri[6], Lamia ayman alrukban[7]

Abstract

Background: *Dental pain is a relevant theme, as it is still considered one of the main problems that lead people to seek dental care, thus becoming an impacting factor in public health.* ***Aim of the study:*** *To identify the factors associated with the prevalence of dental pain in KSA adolescents and young adults.* ***Methods:*** *This is a cross-sectional study was conducted at King Khalid University Dental Clinics, KSA. Data collected from 638 subjects, 16–25 years of age, who were randomly selected from applicants, were analyzed. Questionnaires were administered to collect socio-demographic, economic and behavioral variables. Clinical examinations were carried out to determine the decayed, missing and filled teeth (DMFT) index. The outcome variable was dichotomized 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[1] 18.7± 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.*

Keywords: *Oral health, dental pain, adolescents, young adults.*

Introduction

Dental pain has been considered the most common symptom or consequence of the presence of oral diseases, such as dental caries and gum disease [(1-3)].The International Association for the Study of Pain (IASP) defines pain as an unpleasant sensory and emotional experience caused by tissue damage [(4)]. Among the types of orofacial pain, those of dental origin have been reported as the most frequent, may affect social interaction, daily

[1]Endodontic dentistry senior registrar, North of Riyadh Dental Center, Saudi Arabi.
[2]General Dentist, North of Riyadh Dental Center, Saudi Arabi.
[3]Pediatric dentistry Senior registrar, Alyamamah hospital, Saudi Arabi.
[4]General Dentist, Dental Clinics Complex West of Riyadh, Saudi Arabi.
[5]General Dentist, prince Abdullah bin Musaed specialist dental center in Arar, Saudi Arabi.
[6]General Dentist, Diriyah Hospital, Saudi Arabi.
[7]General Dentist, Primary care west afif, Saudi Arabi.

activities, and may have a negative impact on quality of life [5-8]. It should be noted that the perception of pain may be influenced by knowledge and beliefs of the individuals, as well as by the cultural and social environment in which they live [9, 10]. Different factors have been associated with the presence and perception of dental pain, such as low socioeconomic status, dental caries, food-related difficulties, and sleep disorders [6, 9, and 11]. Moreover, its occurrence has been identified as one of the main reasons for seeking dental care [2, 9]. The prevalence of dental pain varies widely among different studies and age groups. International studies have addressed the prevalence of episodes of dental pain and observed results ranging from 9% in Japan [12] (11–15 years) to 40% in districts of Manchester, England (up to 12 years) [13]. In Brazil, the prevalence is also variable; with rates between 11% and 39% (subjects aged 5–60 years) [1, 5, 11, 14-16].

In KSA, several studies have been conducted to measure the prevalence of dental caries; most of them concluded that there is a high prevalence of caries among children and adults. Some of the studies were systematic reviews; for example, Al Agili et al. (2013) conducted a systematic review to measure the prevalence of dental caries in KSA between 1988 and 2010 [17]. They concluded that 70% of children in primary schools had caries of their permanent dentition, while 80% of them had dental caries cavity in their primary dentition. Another review concluded that the amount of dental caries in permanent dentition is high, with a mean DMFT of 3.34; they also found that mean DMFT in primary dentition is 5.38 [18]. Similarly, Al-Ansari et al. (2014) found that the mean DMFT in primary dentition is 7.34, while the mean DMFT in permanent dentition for adults is 7.35 [19]. Other studies across KSA have reported different amounts of dental caries in different areas [20-26].

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 conditions [27]. Dental caries in the primary and permanent dentition is a public health problem [28, 29] among children and adolescents. A large proportion of the population presents considerable dental treatment needs [30]. Approximately 75% of young adults are afflicted by untreated caries [31]. Untreated oral disease is often associated with pain. The International Association for the Study of Pain defines pain as a sensorial and emotionally unpleasant experience that promotes behavioral changes in a person, often impeding normal daily activities [32]. 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 [33-35]. 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 [36-39].

Dental pain among children, adolescents and adults has been recognized as an important public health problem [33, 34]. Few epidemiological oral health studies include questions about dental pain, despite its effect on daily activities and quality of life [36, 38]. Because of the biological and psychosocial components of dental pain, its perceptions are moderated by socio-demographic and socio–economic status, individual characteristics (such as knowledge, beliefs and expectations), as well as oral health status [40]. 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 age [39]; in Uganda, prevalence of dental pain was 66% in 12- to 14 year-old children [40]; in India, prevalence of dental pain was 71% in 12-year- old children [41]; in Brazil, prevalence of dental pain was 17.5% among 20- to 59-year-old adults [42] and in another study, also from Brazil, prevalence of dental pain was 18.7% in subjects 11–19 years of age [43].

Slade, (2001) [44] 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 researchers found an association between presence of caries and dental pain prevalence. Another review, by Pau et al., (2003) [33] 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, and most studies have targeted preschoolers, schoolchildren and adults, omitting adolescents and young adults [33, 39, 45- 50]. Therefore, the present study aimed to identify factors associated with the prevalence of dental pain among adolescents and young adults.

Methods

A cross-sectional study was conducted at King Khalid University Dental Clinics, KSA in adolescents and young adults, 16–25 years of age. The subjects were randomly selected from all applicants. The methodology to collect data on dental caries, treatment needs and use of dental health services has been reported previously [51-53]. The sample size of 653 was calculated taking into consideration the following criteria: proportion to estimate of 75%, confidence of 95%, and precision of 3.5% and a non-response rate of 10%. The final sample comprised 638 subjects. The inclusion criteria were: female or male; 16– 25 years of age. 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 were collected through a self-administered questionnaire completed by applicants. The survey was structured into several sections that allowed collection of socio-demographic 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 standardized (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, dichotomized 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, 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 utilization (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 was used to estimate socioeconomic status and oral health knowledge indicators. The poly-choric correlation allows incorporation of interrelated categorical variables into a single indicator variable [54]. The first group encompassed variables indicating socio-economic 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 [29, 39, 50-52].

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 analyze and minimize multi-collinearity 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 test [(55)]. The statistical package used was SPSS, version 28.

Ethical considerations: The research proposal was approved by the Institutional Review Board at University. The purpose and scope of the study was explained to the participants. Respondents were asked to sign an informed consent form before they were interviewed, and they were informed that their participation in the study was completely voluntary and that they could withdraw at any point of the study. Researchers carried out a pilot test of the modified questionnaires on a sample of 50 randomly selected patients. The results of this pilot study were not used in the analysis of the study results but were used to modify the study questionnaire in order to improve clarity and understandability.

Results

Table (1) shows the overall characteristics of the sample, data from 638 subjects were analyzed, with a response rate above 90%. 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.

Table (3) shows the multivariate logistic regression, 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 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 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).

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)

Variable	Result
Number of missing teeth	0.31± 0.92 (0–5)
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	
Lowest	217 (34.0)
Middle	219 (34.3)
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)

Variable	Result
Broad	206 (32.3)

Values are given as mean SD (limit) and n (%).
DHSU, dental health services utilization; DMFT index, decayed, missing and filled teeth index

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*	**<0.001**
Yes	17.8	0.34 (0.21–0.54)	
Works in addition to studying			
No	32.2	1*	0.154
Yes	37.9	1.29 (0.91–1.82)	
Financial dependence on parents			
No	36.5	1*	0.660
Yes	33.7	0.88 (0.51–1.52)	
Mother's education			
High school and more	33.7	1*	0.885
Lower than high school	34.2	1.02 (0.73–1.43)	
Father's education			
High school and more	30.8	1*	0.054
Lower than high school	38.1	1.38 (0.99–1.92)	
Vehicle in the household			
Yes	32.7	1*	0.173
No	39.2	1.32 (0.88–1.98)	
Socio–economic status			
Lowest	35.5	1*	
Middle	33.8	0.93 (0.62–1.38)	0.710
Highest	32.7	0.88 (0.59–1.32)	0.544
Health insurance			

Variable	Prevalence	OR (95% CI)	P value
With insurance	36.1	1*	0.136
Without insurance	30.3	0.79 (0.54–1.09)	
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*	**<0.001**
Yes	49.1	2.84 (2.02–4.00)	
Gum disease self-report			
No/Do not know	29.7	1*	**<0.001**
Yes	60.0	3.54 (2.24–5.61)	
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

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*	<0.001
Yes	0.41 (0.25–0.67)	
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 $v^2(8) = 12.19$; $P = 0.1429$. DHSU, dental health services utilization. *Reference category.

Discussion

The present study aimed to identify key factors associated with the prevalence of dental pain among adolescents and young adults. It was observed that slightly more than one-third (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 life [42]. A review by Slade (2001) [44] indicates that dental pain prevalence ranges from 5% to 33% in children and adolescents, and a review by Pau et al., (2003) [33] reports a prevalence of dental pain of 7% to 66% among adults. These wide ranges 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 [36, 40, 45, 49], 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 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., (2013) [49] 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 needs [50]. 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 [56, 57]. Tobacco use has been related to oral diseases32–34, 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 [45, 46]. 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., (2005) [45] found that people who smoked had 70% more dental pain than non-smokers. Freire et al., (2012) [43] and Kuhnen et al., (2009) [46] 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 [40, 46]. 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., (2016) [42], 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 [58, 59] 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 visit [42]. Building on such assumptions, health policies and program 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 availability [60]. 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 [36, 42, 43, 47, 48, and 61]. Likewise, it has been noted that sex and age variables are influencing factors of dental pain [43, 46, and 61].

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 previously sparsely studied age group within the 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-third of subjects presented dental pain experience in this sample of adolescents and young adults. The prevalence of dental pain was associated with self-reported oral health status, preventive dental health services utilization and smoking. No socio-economic inequalities were observed despite multiple uses of indicators examining socio-economic categories. We found no sex differences in self-reported dental pain.

References

1. Peres, M.A., Iser, B.P., Peres, K.G., Malta, D.C., Antunes, J.L. Contextual and individual inequalities in the prevalence of dental pain in adults and elderly people in Brazil. Public Health Cad, 28 (2012), pp. S114-S123
2. Lacerda, J.T., Simionato, E.M., Peres, K.G., Peres, M.A., Traebert, J., Marcenes, W. Pain of dental origin as a reason for dental consultation in an adult population. Rev Saude Publica, 38 (2004), pp. 453-458 http://dx.doi.org//S0034-89102004000300017 | Medline
3. Nomura, L.H., Bastos, J.L. Peres, M.A. Prevalence of toothache and association with caries and socioeconomic conditions in schoolchildren, southern Brazil, 2002. Braz Oral Res, 18 (2004), pp. 134-140 http://dx.doi.org//S1517-74912004000200008 | Medline
4. Task Force on Taxonomy of the International Association for the Study of Pain. Part III: Pain terms, a current list with definitions and notes on usage. IASP Press, (1994),
5. Borges, C.M., Cascaes, A.M., Fischer, T.K., Boing, A.F., Peres, M.A., Peres, K.G. Tooth and gum pain and associated factors in Brazilian adolescents: analysis of the SB-Brazil national oral health survey 2002–2003. Cad Saude Publica, 24 (2008), pp. 1825-1834
6. Locker, D., Grushka, M. The impact of dental and facial pain. J Dent Res, 66 (1987), pp. 1414-1417
7. Wandera, M.N., Engebretsen, I.M., Rwenyonyi, C.M., Tumwine, J., Astrøm, A.N. Periodontal status, tooth loss and self-reported periodontal problems effects on oral impacts on daily performances, OIDP, in pregnant women in Uganda: a cross-sectional study. Health Qual Life Outcomes, 7 (2009), pp. 89 http://dx.doi.org/10.1186/1477-7525-7-89 | Medline
8. Clementino, M.A., Gomes, M.C., Pinto-Sarmento, T.C., Martins, C.C., Granville-Garcia, A.F., Paiva, S.M. Perceived impact of dental pain on the quality of life of preschool children and their families.
9. Bastos, J.L., Nomura, L.H., Peres, M.A. Dental pain, socioeconomic status, and dental caries in young male adults from southern Brazil. Cad Saude Publica, 21 (2005), pp. 1416-1423 http://dx.doi.org//S0102-311X2005000500014 | Medline
10. Dworkin, S.F., Chen, A.C., Schubert, M.M., Clark, D.W. Cognitive modification of pain: information in combination with N2O. Pain, 19 (1984), pp. 339-351
11. De Lacerda, J.T., de Bem Pereira, M., Traebert, J. Dental pain in Brazilian schoolchildren: a cross-sectional study. Int J Paediatr Dent, 23 (2013), pp. 131-137 http://dx.doi.org/10.1111/j.1365-263X.2012.01235.x | Medline
12. Karibe, H., Shimazu, K., Okamoto, A., Kawakami, T., Kato, Y., Warita-Naoi, S. Prevalence and association of self-reported anxiety, pain, and oral para functional habits with temporo mandibular disorders in Japanese children and adolescents: a cross-sectional survey. BMC Oral Health, 15 (2015), pp. 8 http://dx.doi.org/10.1186/1472-6831-15-8 | Medline
13. Milsom, K.M., Tickle, M., Blinkhorn, A.S. Dental pain and dental treatment of young children

attending the general dental service. Br Dent J, 192 (2002), pp. 280-284
14. Bastos, J.L., Peres, M.A., Peres, K.G., Araujo, C.L., Menezes, A.M. Toothache prevalence and associated factors: a life course study from birth to age 12 yr. Eur J Oral Sci, 116 (2008), pp. 458-466 http://dx.doi.org/10.1111/j.1600-0722.2008.00566.x | Medline
15. Moure-Leite, F.R., Ramos-Jorge, J., Ramos-Jorge, M.L., Paiva, S.M., Vale, M.P., Pordeus, I.A. Impact of dental pain on daily living of five-year-old Brazilian preschool children: prevalence and associated factors. Eur Arch Paediatr Dent, 12 (2011), pp. 293-297
16. Schuch, H.S., Correa, M.B., Torriani, D.D., Demarco, F.F., Goettems, M.L. Perceived dental pain: determinants and impact on Brazilian schoolchildren. J Oral Facial Pain Headache, 29 (2015), pp. 168-176
17. Al Agili D.E. A systematic review of population-based dental caries studies among children in Saudi Arabia. Saudi Dent J. 2013 doi: 10.1016/j.sdentj.2012.10.002.
18. Khan S.Q., Khan N.B., ArRejaie A.S. Dental caries. A meta-analysis on a Saudi population. Saudi Med J. 2013:744–749.
19. Al-Ansari A. Prevalence, severity, and secular trends of dental caries among various saudi populations: a literature review. Saudi J Med Med Sci. 2014 doi: 10.4103/1658-631x.142496.
20. Al-Malik M., Holt R.D. The prevalence of caries and of tooth tissue loss in a group of children living in a social welfare institute in Jeddah, Saudi Arabia. Int Dent J. 2000 doi: 10.1111/j.1875-595x.2000.tb00568.x.
21. Al-Malik M.I., Rehbini Y.A. Prevalence of dental caries, severity, and pattern in age 6 to 7-year-old children in a selected community in Saudi Arabia. J Contemp Dent Pract. 2006 doi: 10.5005/jcdp-7-2-46.
22. Al-Shammery A.R. Caries experience of urban and rural children in Saudi Arabia. J Publ Health Dent. 1999 doi: 10.1111/j.1752-7325.1999.tb03236.x.
23. AlDosari A.M., Wyne A.H., Akpata E.S., Khan N.B. Caries prevalence and its relation to water fluoride levels among schoolchildren in Central Province of Saudi Arabia. Int Dent J. 2004 doi: 10.1111/j.1875-595X.2004.tb00299.x.
24. Alhabdan Y.A., Albeshr A.G., Yenugadhati N., Jradi H. Prevalence of dental caries and associated factors among primary school children: a population-based cross-sectional study in Riyadh, Saudi Arabia. Environ Health Prev Med. 2018 doi: 10.1186/s12199-018-0750-z.
25. Alkarimi H.A., Watt R.G., Pikhart H., Sheiham A., Tsakos G. Dental caries and growth in school-age children. Pediatrics. 2014 doi: 10.1542/peds.2013-0846.
26. Amin T.T., Al-Abad B.M. Oral hygiene practices, dental knowledge, dietary habits and their relation to caries among male primary school children in Al Hassa, Saudi Arabia. Int J Dent Hyg. 2008 doi: 10.1111/j.1601-5037.2008.00310.x.
27. Marcenes W, Kassebaum NJ, Bernab´e E et al. Global burden of oral conditions in 1990–2010: a systematic analysis. J Dent Res 2013 92: 592–597.
28. Lucas-Rinco´n SE, Robles-Bermeo NL, Lara-Carrillo E et al. Interproximal caries and premature tooth loss in primary denti- tion as risk factors for loss of space in the posterior sector: a cross-sectional study. Medicine (Baltimore). 2019 98: e14875.
29. Medina-Sol´ıs CE, A´vila-Burgos L, M´arquez-Corona ML et al. Out-of-pocket expenditures on dental care for schoolchildren aged 6 to 12 years: a cross-sectional estimate in a less-developed country setting. Int J Environ Res Public Health 2019 16: 1997.
30. Medina-Sol´ıs CE, A´vila-Burgos L, Borges-Yan~ez SA et al. Eco- logical study on needs and cost of treatment for dental caries in schoolchildren aged 6, 12 and 15 years: data from a national survey in Mexico. Medicine (Baltimore) 2020 99(7): e19092.
31. Garc´ıa-Cort´es JO, Medina-Sol´ıs CE, Loyola-Rodriguez JP et al. Dental caries' experience, prevalence and severity in Mexican adolescents and young adults. Rev Salud Publica (Bogota) 2009 11: 82–91.
32. International Association for the Study of Pain [homepage on the Internet]. Task Force on Taxonomy. Part III: Pain Terms, a Current List with Definitions and Notes on Usage. Seattle: IASP Press; 1994.
33. Pau AK, Croucher R, Marcenes W. Prevalence estimates and associated factors for dental pain: a review. Oral Health Prev Dent 2003 1: 209–220.
34. Pau A, Viswanath KP, Croucher R. Validation of a dental pain screening questionnaire in a semi-urban hospital setting in South India. Int Dent J 2010 60: 113–121.
35. Cohen LA, Bonito AJ, Akin DR et al. Toothache pain: behav- ioral impact and self-care strategies. Spec Care Dentist 2009 29: 85–95.
36. Nomura LH, Bastos JL, Peres MA. Dental pain prevalence and association with dental caries

and socioeconomic status in schoolchildren, Southern Brazil, 2002. Braz Oral Res 2004 18: 134–140.
37. Krisdapong S, Prasertsom P, Rattanarangsima K et al. School absence due to toothache associated with sociodemographic factors, dental caries status, and oral health-related quality of life in 12- and 15-year-old Thai children. J Public Health Dent 2013 73: 321–328.
38. Guskuma RC, Lages VA, Hafner MB et al. Factors associated with the prevalence and intensity of dental pain in children in the municipalities of the campinas region, s~ao paulo. Rev Paul Pediatr 2017 35: 322–330.
39. Escoffi´e-Ramirez M, A´vila-Burgos L, Baena-Santillan ES et al. Factors associated with dental pain in mexican schoolchildren aged 6 to 12 years. Biomed Res Int 2017 2017: 7431301.
40. Kiwanuka SN, ˚Astrøm AN. Self-reported dental pain and associated factors in Ugandan schoolchildren. Norsk Epidemiol 2005 15: 175–182.
41. Dandi KK, Rao EV, Margabandhu S. Dental pain as a determinant of expressed need for dental care among 12-year-old school children in India. Indian J Dent Res 2011 22: 611.
42. Constante HM, Peres MA, Schroeder FC et al. Mediators between education and dental pain: a cross-sectional study to assess the role of dental services utilization. Eur J Oral Sci 2016 124: 62–67.
43. Freire Mdo C, Leles CR, Sardinha LM et al. Dental pain and associated factors in Brazilian adolescents: the National School- Based Health Survey (PeNSE), Brazil, 2009. Cad Saude Publica 2012 28(Suppl): s133–s145.
44. Slade GD. Epidemiology of dental pain and dental caries among children and adolescents. Community Dent Health 2001 18: 219–227.
45. Bastos JL, Nomura LH, Peres MA. Dental pain, socioeconomic status, and dental caries in young male adults from southern Brazil. Cad Saude Publica 2005 21: 1416–1423.
46. Barr^etto EP, Ferreira EF, Pordeus IA. Determinant factors of toothache in 8- and 9-year-old schoolchildren, Belo Horizonte, MG, Brazil. Braz Oral Res 2009 23: 124–130.
47. Kuhnen M, Peres MA, Masiero AV et al. Toothache and associated factors in Brazilian adults: a cross-sectional population- based study. BMC Oral Health 2009 9: 7.
48. Hafner MB, Zanatta J, Rasera Zotelli VL et al. Perception of toothache in adults from state capitals and interior cities within the Brazilian geographic regions. BMC Oral Health 2013 13: 35.
49. Santiago BM, Valen ca AM, Vettore MV. Social capital and dental pain in Brazilian northeast: a multilevel cross-sectional study. BMC Oral Health 2013 13: 2.
50. Zucoloto ML, Maroco J, Campos JA. Psychosocial and behav- ioral aspects of pain and perception of oral health. J Oral Facial Pain Headache 2017 31: 210–216.
51. Medina-Sol´ıs CE, Garc´ıa-Cort´es JO, Robles-Minaya JL et al. Clinical and non-clinical variables associated with preventive and curative dental service utilisation: a cross-sectional study among adolescents and young adults in Central Mexico. BMJ Open 2019 9: e027101.
52. Garc´ıa-Cort´es JO, Mariel-C´ardenas J, Guti´errez-Cantu´ F et al. Prevalence and factors associated with tooth loss in Mexican university students: a cross-sectional study. Acta Biocl´ınica 2019 9: 5–22.
53. Garc´ıa-Cort´es JO, Loyola-Rodr´ıguez JP, Loyola-Leyva A, et al. Socio-behavioral factors associated to caries prevalence and DMFT index in adolescents and young adults in a developing country. West Indian Med J; in press. https://doi.org/10.7727/ wimj.2016.515.
54. Kolenikov S, Angeles G.The Use of Discrete Data in Principal Component Analysis With Applications to Socio-Economic Indices. CPC/MEASURE Working paper No. WP-04-85; 2004.
55. Bagley SC, White H, Golomb BA. Logistic regression in the medical literature: Standards for use and reporting, with partic- ular attention to one medical domain. J Clin Epidemiol 2001 54: 979–985.
56. David J. Dental Caries Among Adolescents Implications for Planning Oral Health Services in India and Norway [disserta- tion]. Bergen: University of Bergen; 2006. p. 55.
57. Sheiham A, Maizels JE, Cushing AM. The concept of need in dental care. Int Dent J 1982 32: 265–270.
58. Celeste RK, Nadanovsky P, De Leon AP. Association between preventive care provided in public dental services and caries prevalence. Rev Saude Publica 2007 41: 830–838.
59. Mullally BH, Linden GJ. The periodontal status of irregular dental attenders. J Clin Periodontol 1994 21: 544–548.
60. Hyde S, Dupuis V, Mariri BP et al. Prevention of tooth loss and dental pain for reducing the global burden of oral diseases. Int Dent J 2017 67(Suppl 2): 19–25.

61. Pau A, Croucher RE, Marcenes W. Demographic and socio- economic correlates of dental pain among adults in the United Kingdom, 1998. Br Dent J 2007 202(9): E21.