ORIGINAL ARTICLE

Risk factors for severe dental anxiety among medical students

Faktori rizika od nastanka izrazitog straha od stomatološke intervencije kod studenata medicine

Slobodan M. Janković*, Dragana Aleksić[†], Zulfer Bahtijari*, Anica Jelić*,
Jelena Klačar*, Aleksandra Kovačević[‡], Nataša Mijailović*, Olivera
Milovanović*, Aleksandra Petrović*, Ana Radovanović*, Miroslav Sovrlić*,
Dejana Ružić Zečević*

*Faculty of Medical Sciences, University of Kragujevac, Kragujevac, Serbia, [†]Sector for
Pharmacy, Military Medical Academy, [‡]Faculty of Medicine of the Military Medical
Academy, University of Defence, Belgrade, Serbia

Abstract

Background/Aim. Severe dental anxiety (SDA) is the most severe form of dental anxiety, thus the aim of this study was to determine the factors associated with SDA in students of health-related disciplines. **Methods.** In this case-control study the cases were students with severe dental anxiety. The study was conducted at the Faculty of Medical Sciences, University of Kragujevac, Serbia. The participants were undergraduate students attending lectures during spring semester 2010/2011 (n = 1,812). A random sample of 800 students was assessed for the association between various risk factors and the severe dental anxiety. The main outcome measures were the data on demographics, dental anxiety, habits concerning oral hygiene, nutrition, general anxiety and (co)morbidity which were collected from the study participants by semi-structured question-naire. **Results.** Less frequent visits to the dentist (OR adjusted = 7.02 [2.65; 18.60]) and visiting the dentist only when there is a dental problem (OR adjusted = 8.08 [1.28; 50.93]) were associated with severe dental anxiety. The same was true for improper oral hygiene (OR adjusted = 4.25 [1.16; 15.60]). Factors as changing toothbrush more frequently (OR adjusted = 0.33 [0.14; 0.76]) and having chronic disease (OR adjusted = 0.01 [0.00; 0.09]) were inversely associated with severe dental anxiety. The level of education of students was not associated with severe dental anxiety. **Conclusion.** Inappropriate oral hygiene, less frequent changes of a toothbrush and less frequent visits to the dentist are important risk factors for severe dental anxiety.

Key words:
dental anxiety; students, medical; oral hygiene; dental care.

Apstrakt

Uvod/Cilj. Izraženi strah od stomatoloških intervencija spada u najsnažniji vid straha od zubara, te je cilj ove studije bio da se otkriju faktori koji utiču na nastanak izrazitog straha od stomatološke intervencije kod studenata fakulteta zdravstvene stuke. **Metode.** Učesnici u istraživanju bili su dodiplomski studenti Fakulteta medicinskih nauka Univerziteta u Kraguje-vcu, koji su pohađali nastavu tokom letnjeg semestra školske 2010/2011. godine (n = 1812). Metodom slučajnog uzorko-vanja određeno je 800 studenata kod kojih je utvrđivana po-vezanost različitih faktora rizika i nastanka izrazitog straha od stomatološke intervencije. Izabrana je studija slučaj – kontro-la, pri čemu su slučajeve činili studenti koji imaju izrazit strah od stomatološke intervencije. Svi učesnici istraživanja popu-nili su specijalno sastavljeni polu-strukturisani upitnik iz koga su dobijeni glavni ishodi studije: demografski podaci, stepen straha od stomatološke intervencije, navike vezane za higijenu usne duplje, način ishrane, stepen opšte anksioznosti i udru-žene bolesti. **Rezultati.** Ređi odlazak studenata kod stoma-tologa (Or$_{adjusted}$ = 7,02 [2,65; 18,60]) i odlazak samo kada su imali neki problem sa zubima (Or$_{adjusted}$ = 8,08 [1,28; 50,93]) bili su povezani sa izrazitim strahom od stomatološke inter-vencije. Isti rezultat je dobijen i kod studenata sa neadekvat-nom higijenom usne duplje (Or$_{adjusted}$ = 4,25 [1,16; 15,60]). Ređi nastanak izrazitog straha od stomatološke intervencije bio je povezan sa češćim menjanjem četkice za zube (Or$_{adjusted}$ = 0,33[0,14; 0,76]) i hroničnim oboljenjem (Or$_{adjusted}$ = 0,01 [0,00; 0,09]). Stepen obrazovanja studenata nije bio povezan sa izra-zitim strahom od stomatološke intervencije. **Zaključak.** Za nastanak izrazitog straha od stomatološke intervencije značaj-ni faktori rizika su neadekvatna higijena usne duplje, ređe menjanje četkice za zube i ređi odlazak kod stomatologa na kontrolne preglede.

Ključne reči:
anksioznost, stomatološka; studenti medicine; usta, higijena; zubi, nega i lečenje.

Correspondence to: Olivera Milovanović, Faculty of Medical Sciencies, University of Kragujevac, Svetozara Markovića 69, 34 000, Kra-gujevac, Serbia. Phone/fax.: +381 34 306 800 ext 225, E-mail: olivera.milovanović@fondmt.rs

Introduction

Dental anxiety is exaggerated, fearsome psychological reaction of a person to possible or immediate dental intervention which seems to that person as being harmful or dangerous. Severe dental anxiety (SDA) is the most severe form of dental anxiety [1]. The prevalence of SDA is relatively high: in a study on urban population of Goteborg, Sweden, SDA was encountered in 6.7% when scale of dental anxiety with 10 questions was used, and in 5.4% with Corah's dental anxiety scale [1]. It is about four times higher in persons between 18 and 39 years of age than in persons older than 60 [2]. In Norway SDA was found among 11.3% of 25-year-old males and 19.8% of females of the same age, showing that it affects mostly younger people [3]. Severe dental anxiety has negative impact on dental and oral cavity health. In patients with SDA the average number of Decayed, Missing and Filled teeth (DMF) score is 18.6 ± 5.6, and deterioration of dental and oral cavity health, expressed as the presence of root remnants, could be found in as much as 57% of cases [4].

There are many factors potentially associated with SDA, but their absolute and relative importance was differently estimated in previous studies. While some of the studies found association of general anxiety with the SDA [2], other studies did not reach such conclusion [5]. Kirova et al. [6] found that age, level of education and type of labor correlate with the Corah's scale score, while sex of the patients did not. In a case/control study conducted on general population in Denmark, SDA was associated with fear of drilling, negative dentist contacts, general fear tendency, avoidance of treatment and increased oral symptoms [7]. Predictors of SDA in general French population were younger age, living on a farm and unskilled labor [8].

There are few published studies dealing with the prevalence and/or predictors of SDA in the population of university students. The study on 503 university students from various fields was conducted in Pakistan, showing that the prevalence of high to severe dental anxiety was 21.6% among males and 24% among females [9], much higher than in general population. Although there is little data on the prevalence among students of health-related disciplines, SDA in this subpopulation could adversely affect their attitude towards the patients with dental problems and aggravate their future communication with patients.

The aim of our study was to investigate the prevalence and risk factors associated with SDA in medical students.

Methods

Our study was conducted at the Faculty of Medical Sciences, University of Kragujevac, a higher public education institution situated at the town of Kragujevac, Serbia. The study population consisted of all the students of undergraduate studies who attended lectures regularly in spring semester of the school year 2010/2011 (n = 1.812).

The study was conducted on a random sample of 800 students in April and May, 2011. Demographic data and data on dental anxiety, habits concerning dental and oral cavity hygiene, nutrition, general anxiety and (co)morbidity were obtained from an anonymous structured questionnaire. All the data were obtained after previous written consent of the study participants, and the study protocol was approved by the Ethics Committee of the Faculty of Medical Sciences, University of Kragujevac.

Based on the expected study power of 80%, the probability of the statistical error type 1 (α) of 0.05, two-way testing of difference in frequencies of risk factors between the study groups using $\chi2$-test, and the expected difference of 12% in reasons for visiting a dentist (with frequency of 40% for a reason in one of the groups) we calculated a minimal sample size of 605 students in both groups [10]. In order to compensate for response failure, we decided to work with a sample of 800 students.

The study sample of 800 students was chosen randomly from the study population in following way: a list of all students was taken from the Faculty's offices and the students on the list were numbered from 1 to 1,820; then, using the function "randbetween" from the Microsoft Excel program, version 2007, 800 the students were chosen from the list.

The design of our study was of the case-control type, with the aim to assess the association between various risk factors and the occurrence of SDA. The study participants completed the Corah's dental anxiety self-rating scale. The Corah's dental anxiety scale consists of 4 items with score range from 4 to 20. Participants who score 15 or higher on the Corah's dental anxiety scale were considered to belong to the group with SDA. The cases were all students from the study sample with the SDA, i.e. having a score of 15 or higher on Corah's dental anxiety scale [1, 2]. The controls were selected from the study sample after matching with the cases by age and sex. From the matching students we selected four study participants for each case (sex- and age- matched), using the function "randbetween" from the Microsoft Excel program, version 2007. No exclusion criteria were employed for both cases and controls.

In order to identify potential risk factors, the following groups of variables were measured: socio-demographic data (sex, age, year of study, average grade, number of repeated academic years, monthly income of students' families and having a chronic disease), pattern of visiting dentist (frequency of visiting a dentist, reason for visiting a dentist, having a chosen dentist, using private or public dental service, having frightening experience with a dentist and family attitude towards visiting a dentist), pattern of keeping dental and oral cavity hygiene (frequency of brushing teeth, use of a dental floss, frequency of changing a toothbrush and average duration of brushing teeth), dental status (number of extracted permanent teeth, number of filled permanent teeth and number of decayed permanent teeth and halitosis) and feeding habits (frequency and quantity of sweets consumed and frequency and quantity of uncooked fruits and vegetables consumed). The variables were measured using structured questionnaire.

Dental anxiety was measured by the Corah's dental anxiety scale [1, 2]. General anxiety was measured by the Zung self-rating anxiety scale score. This scale consists of 20 self-

reported items related to anxiety symptoms with a total score range from 20 to 80. The score range 20–44 indicates normal state, 45–59 mild to moderate anxiety levels, 60–74 marked to severe anxiety levels and 75–80 extreme anxiety levels [11].

The prevalence of each risk factor was determined for both cases and controls. The differences between cases and controls in the observed characteristics were assessed by the Student t-test for continuous variables and the $\chi 2$-test for frequencies. The differences were considered significant if probability of null hypothesis was less than 0.05. In order to estimate the association between potential risk factors and

SDA, crude and adjusted odds ratios (OR) with 95% confidence intervals (95% CI) were calculated using logistic regression [12, 13].

Results

The total number of students enrolled in the study was 800, out of who 620 students responded to the questionnaire (response rate 77.5%), and were included in final data analysis. Baseline characteristics of the cases and controls, and the differences between them, are shown in Table 1. The differ-

Table 1

Socio-demographic data, pattern of visiting the dentist, pattern of keeping dental and oral cavity hygiene, dental status and feeding habits in the study group and controls*

Variables	Study group (n = 46)	Controls (n = 184)	Statistical significance (p)	Crude OR (95% CI)
Sex, n (%)				
male	7 (15%)	28 (15)	1.000	1.00 (0.41, 2.46)
female	39 (85)	156 (85)		
Age (years), x̄ ± SD	22.6 ± 3.7	22.1 ± 2.5	0.247	1.07 (0.96, 1.19)
Frequency of visiting a dentist, n (%)				
< once in 2 years	9 (20)	11 (6)		
once in 2 years	11 (24)	17 (9)	0.000**	2.21 (1.58, 3.09)
once per year	18 (39)	59 (32)		
≥ 2 times per year	8 (17)	97(53)		
Reason for visiting a dentist, n (%)				
primarily when there is a problem	41(89)	109(59)	0.000**	5.64 (2.13, 14.94)
primarily for check-up	5 (11)	75 (41)		
Number of decayed permanent teeth, x̄ ± SD	1.8 ± 1.5	1.0 ± 2.5	0.030**	1.15 (0.97, 1.36)
Halitosis, n (%)	1/34/11	10/156/18		
yes	1 (2)	10 (5)	0.028**	2.70 (1.26, 5.82)
no	34 (74)	156 (85)		
do not know	11 (24)	18 (10)		
Frequency of brushing teeth times per day, x̄ ± SD	2.4 ± 0.8	2.7 ± 0.8	0.013**	0.56 (0.35, 0.89)
Frequency of changing a toothbrush, n (%)				
once per 2 months or more frequently	21 (46)	65 (35)		
every 2–6 months	17(37)	99 (54)		
every 6–12 months	6 (13)	13 (7)	0.214	0.95 (0.62, 1.46)
once per year or more rarely	2 (4)	7 (4)		
Average duration of brushing teeth (minutes), x̄ ± SD	2.8 ± 1.0	3.2 ±1.4	0.090	0.77 (0.57, 1.04)
Frequency of fresh fruits intake, n (%)				
every day	19 (41)	114 (62)		
3–4 times per week	12 (26)	47 (26)	0.002**	1.79 (1.29, 2.46)
once per week	6 (13)	15 (8)		
rarely	9 (20)	8 (4)		
Frequency of fresh vegetables intake, n (%)				
every day	19 (41)	114 (62)		
3–4 times per week	12 (26)	47 (26)	0.006**	1.62 (1.18, 2.23)
once per week	6 (13)	15 (8)		
rarely	9 (20)	8 (4)		
Having a chronic disease, n (%)				
yes	1 (2)	29 (16)	0.014**	0.12 (0.02, 0.90)
no	45 (98)	155 (84)		
Having frightening experience with a dentist, n (%)				
yes	23(50)	45 (24)	0.001**	3.09 (1.58, 6.03)
no	23 (50)	139 (76)		
Zung Self-Rating Anxiety Scale score, x̄ ± SD	34.7 ± 9.2	33.5 ± 8.6	0.421	1.02 (0.98, 1.05)

*For the sake of clarity, variables with frequency of an event less than 2% and some less important variables with insignificant differences between the cases and the controls are not shown in the table; **Significant difference; OR – odds ratios; CI – confidence interval.

ences between the cases and controls were not significant in terms of age, sex, year of study, average grade, number of repeated academic years, monthly income of students families, frequency of visiting a dentist, number of extracted permanent teeth, number of filled permanent teeth, use of a dental floss, frequency of changing a toothbrush, average duration of brushing teeth, using private or public dental service, frequency and quantity of sweets consumed, quantity of uncooked fruits and vegetables consumed, family attitude towards visiting a dentist and the Zung self-rating anxiety scale score.

However, significant differences between the cases and controls were found in: the reason for visiting a dentist, the number of decayed permanent teeth, halitosis, frequency of brushing teeth, having a chosen dentist, frequency of uncooked fruits and vegetables consumed, having a chronic disease and having frightening experience with a dentist.

The results of the logistic regression analysis (Cox & Snell R square 0.405, Nagelkerke R square 0.633, Hosmer-Lemeshow Chi square 21.05, df = 8, $p = 0.007$) with adjustment for potential confounders are shown in Table 2. The

(see Tables 1 and 2), after adjustment confidence limits of these odds ratios included the value of one.

The interaction between risk factors which are likely to have an additive risk for SDA was investigated (Table 3). The analysis did not show a clear synergistic effect for any of factors that were individually associated with SDA. Although adjusted odds ratios were still significant and their confidence limits excluded the value of one when the frequency of visiting a dentist interacted with the reason for visiting a dentist, or when the reason for visiting a dentist interacted with halitosis, synergistic effects could not be confirmed because adjusted odds ratios did not increase, but remained closer to one than odds ratios for individual factors.

Discussion

The obtained results show that the students visiting a dentist less frequently and only when they have a dental problem are more prone to have SDA. The same is true for those with improper oral hygiene and having halitosis. On the other hand, the study participants changing toothbrush

Table 2

Crude and adjusted odds ratios (OR) of the risk factors for severe dental anxiety

Risk factors	Crude OR (95% CI)	Adjusted* OR (95% CI)
Frequency of visiting a dentist (< once in 2 years/once in 2 years/ once per year/≥ 2 times per year)	2.21 (1.58, 3.09)	7.02 (2.65, 18.60)
Reason for visiting a dentist (primarily when there is a problem/primarily for check-up)	5.64 (2.13, 14.94)	8.08 (1.28, 50.93)
Halitosis	2.70 (1.26, 5.82)	4.25 (1.16, 15.60)
Frequency of changing a toothbrush (once per 2 months or more frequently/every 2-6 months/every 6-12 months/once per year or more rarely)	0.95 (0.62, 1.46)	0.33 (0.14, 0.76)
Having a chronic disease	0.12 (0.02, 0.90)	0.01 (0.00, 0.09)
Study course: physician/dentist/ pharmacist/nurse/physiotherapist	1.54 (1.22, 1.94)	1.53 (0.93, 2.51)
Frequency of brushing teeth (times per day)	0.56 (0.35, 0.89)	0.46 (0.19, 1.07)
Having frightening experience with a dentist	3.09 (1.58, 6.03)	6.35 (0.56, 73.07)
Having a chosen dentist	0.50 (0.26, 0.95)	2.60 (0.59, 11.38)

*Adjusted for year of study†, average grade†, number of repeated academic years†, monthly income of a student's family†, frequency of visiting a dentist†, number of extracted permanent teeth†, number of filled permanent teeth†, use of a dental floss†, frequency of changing a toothbrush, average duration of brushing teeth†, using private or public dental service†, frequency and quantity of sweets consumed†, quantity of uncooked fruits and vegetables consumed†, parental education†, family attitude towards visiting a dentist†, area of residence†, parental age†, number of siblings†, Zung Self-Rating Anxiety Scale score†, study course, reason for visiting a dentist, number of decayed permanent teeth†, halitosis, frequency of brushing teeth, having a chosen dentist, frequency of uncooked fruits and vegetables consumed†, having a chronic disease and having frightening experience with a dentist.
†Crude and adjusted odds ratios are not shown in the table for the sake of clarity.

only significant associations were between severe dental anxiety and frequency of visiting a dentist ($OR_{adjusted}$ 7.02; CI 2.65, 18.60; $p = 0.000$), reason for visiting a dentist ($OR_{adjusted}$ 8.08; CI 1.28, 50.93; $p = 0.026$), halitosis ($OR_{adjusted}$ 4.25; 1.16, 15.60; $p = 0.029$), frequency of changing a toothbrush ($OR_{adjusted}$ 0.33; CI 0.14, 0.76; $p = 0.009$) and having a chronic disease ($OR_{adjusted}$ 0.01; CI 0.00, 0.09; $p = 0.002$). Although the crude odds ratios for frequency of brushing teeth, having frightening experience with a dentist and having a chosen dentist were significantly different from one

more frequently and having chronic disease also less frequently have SDA. Our results are partially in accordance with the results of a Danish study [7], since visiting a dentist rarely and only when there is a problem is actually avoidance of treatment. The association of avoidant behavior, poor oral hygiene and the SDA was also observed in several case reports [14]. It is interesting that the level of education of the students (year of study) was not associated with the occurrence of SDA, showing that only understanding of the problem is not helpful for relieving SDA.

Table 3

**Interactions between the frequency of visiting a dentist and the reason for visiting a dentist
and the reason for visiting a dentist and halitosis**

Variables	Crude odds ratio (95% CI)	Adjusted* odds ratio (95% CI)
No difference in frequency of visiting dentist	1.0 (reference)	1.0 (reference)
Only frequency of visiting a dentist (<once in 2 years/once in 2 years/once per year/≥ 2 times per year)	2.21 (1.58, 3.09)	7.02 (2.65, 18.60)
Only reason for visiting a dentist (primarily when there is a problem/primarily for check-up)	5.64 (2.13, 14.94)	8.08 (1.28, 50.93)
Both frequency of visiting a dentist and reason for visiting a dentist	2.22 (1.65, 2.97)	4.87 (2.32, 10.20)
No halitosis	1.0 (reference)	1.0 (reference)
Only reason for visiting a dentist (primarily when there is a problem/primarily for check-up)	5.64 (2.13, 14.94)	8.08 (1.28, 50.93)
Only halitosis	2.70 (1.26, 5.82)	4.25 (1.16, 15.60)
Both reason for visiting a dentist and halitosis	2.21 (1.49, 3.28)	2.77 (1.31, 5.87)

*Adjusted for year of study, average grade, number of repeated academic years, monthly income of a student's family, frequency of visiting a dentist, number of extracted permanent teeth†, number of filled permanent teeth, use of a dental floss, frequency of changing a toothbrush, average duration of brushing teeth†, using private or public dental service, frequency and quantity of sweets consumed, quantity of uncooked fruits and vegetables consumed, parental education, family attitude towards visiting a dentist, area of residence, parental age, number of siblings, Zung Self-Rating Anxiety Scale score, study course, reason for visiting a dentist, number of decayed permanent teeth, halitosis, frequency of brushing teeth, having a chosen dentist, frequency of uncooked fruits and vegetables consumed, having a chronic disease and having frightening experience with a dentist.

Inspite of widespread beliefs that fear and anxiety of dental treatment is a simple continuum of frightening experience that occurred in the past, this link is not straightforward, and there are numerous examples where previous frightening experience does not exist in persons with very SDA [15]. Whether a person will develop SDA after a painful experience with a dentist depends a lot on her/his cognitive abilities; it was shown that younger and less educated more frequently develop SDA than others [2, 3, 16]. Besides, good verbal and nonverbal communication between dentist and patient, which reflects care, respect and empathy, is strong preventative factor against the development of SDA [17].

An interesting finding in our study was that the students with chronic diseases had fewer chances to develop SDA. This could be explained by observation that children with chronic illness use coping as their predominant strategy for adapting to common painful and stressful events [18], which helps them to avoid developing SDA.

Frequency of brushing teeth was associated with decreased chances of the SDA in our study. Although there are no other studies confirming such link, frequent teeth brushing and other positive elements of oral hygiene behavior were linked to good dental caries status in students [19] and avoidance of visiting a dentist was associated with poor oral hygiene [20], suggesting an indirect association advocating our results.

The factors associated with SDA in our study were not interacting with each other, but acted rather independently. When interactions were introduced in the logistic regression model, the odds ratios for the associated factors decreased instead to increase, confirming their independence.

Although in children aged 3–6 years [21] and 15-year-olds [22] SDA is positively correlated with general anxiety, our study shows that this is not the case in student population.

Our findings are in accordance with other studies of dental anxiety among patients older than 15 years, which either show that the correlation between SDA and general anxiety observed in children weakens with their transition to adolescence and adulthood [23], or do not find any correlation between SDA and general anxiety [24]. Previously published explanations of this phenomenon are only tentative, and further research is necessary for full understanding of this disagreement.

In our study we did not take into account variables representative of personality characteristics, which is serious limitation. It has already been shown in general population that neurotic extraverts who seek for novelty and experience brief dissociative periods and magical thinking are prone to develop SDA [25]. Perfectionism was found to be associated with general anxiety and distress in university students of health-related disciplines, and it might be associated with the SDA, as well [26]. Therefore, in order to better understand causes of SDA, future research of risk factors for SDA in medical students which will include personality traits is necessary.

Conclusion

The results of our study suggest that avoidant behavior in regard to visiting the dentist and poor oral hygiene are factors more frequently associated with SDA than patient's medical knowledge or previous negative experiences with the dentist.

Acknowledgements

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