

IMPACT OF ANXIETY ON SELF-PERCEIVED ORAL HEALTH AMONG MEDICAL STUDENTS

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UTICAJ ANKSIOZNOSTI NA SAMOPROCENU ORALNOG ZDRAVLJA MEĐU STUDENTIMA MEDICINE

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ABSTRACT

Objective. Oral health can affect mental health in many ways, and vice versa. Anxiety significantly impacts oral health and it can lead to gum disease, cavities, dry mouth and bruxism. It can also cause bad oral health habits. The aims of our study were to investigate the prevalence of anxiety among medical students and to determinate the impact of anxiety on oral health habits and self-perceived oral health.

Methods. This study presents cross-sectional study. It included the medical students from the Faculty of Medical Sciences, University of Kragujevac, Serbia. The Zung Self-Rating Anxiety Scale (SAS) was used to quantify anxiety levels and Oral Health Questionnaire for Adults was used to assess the self-perceived oral health. Data were analysed using the SPSS software, chi-square test was performed to determinate correlation between categorical variables, and Bonferroni analysis was performed to identify the precise significance between groups.

Results. The assessment of self-perceived anxiety showed that 39% of students had symptoms of anxiety. Significant positive correlation was found between anxiety and gender and self-perceived gum condition. Significant negative correlation was found between anxiety and shame because of teeth, avoidance of smiling and the use of dental floss. The post hoc Bonferroni analysis revealed that women exhibited anxiety more often than men, better gum health was linked to lower anxiety, embarrassment about teeth or avoiding smiling was associated with higher anxiety, and unexpectedly, flossing was more common among anxious participants.

Conclusion. The influence of anxiety on oral health is not sufficiently recognized. We found high prevalence of anxiety among medical students and determined correlation with certain oral health aspects. Medical students are vulnerable group and promotion and preventive programs should be more available.

Key words: anxiety; oral health; students.

SAŽETAK

Cilj. Oralno zdravlje može uticati na mentalno zdravlje na više načina, i obrnuto. Anksioznost znatno utiče na oralno zdravlje i može dovesti do bolesti desni, karijesa, suvoće usta i bruksizma, kao i do loših navika u vezi sa oralnim zdravljem. Ciljevi naše studije bili su da ispitamo prevalenciju anksioznosti među studentima medicine i da utvrdimo uticaj anksioznosti na oralne navike i samoprocenu oralnog zdravlja.

Metode. Ova studija predstavlja studiju preseka u koju su uključeni studenti medicine Fakulteta medicinskih nauka Univerziteta u Kragujevcu. Korišćena je Zungova skala za samoprocenu anksioznosti (SAS) za kvantifikaciju nivoa anksioznosti, a Upitnik o oralnom zdravlju za odrasle za samoprocenu oralnog zdravlja. Podaci su analizirani korišćenjem SPSS softvera, hi-kvadrat test je korišćen za utvrđivanje korelacije između kategorijskih varijabli, a Bonferroni analiza je sprovedena da bi se identifikovala precizna značajnost između grupa.

Rezultati. Samoprocena anksioznosti pokazala je da je 39% studenata imalo simptome anksioznosti. Utvrđena je značajna pozitivna korelacija između anksioznosti i pola, kao i samoprocene stanja desni. Značajna negativna korelacija nađena je između anksioznosti i stida zbog izgleda zuba, izbegavanja osmeha i korišćenja zubnog konca. Post hoc Bonferroni analiza pokazala je da žene češće ispoljavaju anksioznost nego muškarci, da je bolje zdravlje desni povezano sa nižim nivoom anksioznosti, da su stid zbog zuba ili izbegavanje osmeha povezani sa višim nivoom anksioznosti, a neočekivano, zubni konac češće su koristili anksiozni ispitanici.

Zaključak. Uticaj anksioznosti na oralno zdravlje nije dovoljno prepoznat. Utvrdili smo visoku prevalenciju anksioznosti među studentima medicine i identifikovali korelaciju sa određenim aspektima oralnog zdravlja. Studenti medicine predstavljaju ranjivu grupu, te bi promotivni i preventivni programi trebalo da budu dostupniji.

Cljučne reči: anksioznost; oralno zdravlje; studenti.

INTRODUCTION

Mental health includes our emotional well-being, our social relationships and inner life. Because of this impact on individual lives there is an urge to keep it at optimal levels. Optimal mental health means that the individual participates in the world fully and to the best of their ability. Mental health impairment can affect all age groups; it is not discriminating towards ethnicity, gender or economic status (1). The most investigated mental health issues in the group of students are depression and anxiety, with much more data available for depression (2). People of younger age, while being in the educational process, face a lot of stress and emotional changes through that part of their life so that they can start to express some of the symptoms of anxiety and depression, or even to fully develop the named diseases (3).

In comparison with depression, anxiety has greater potential not to be recognized and treated adequately. This may be due to very wide ways of in which anxiety can express its symptoms, that can vary from physiological symptoms such as fatigue, headache, abdominal pain, shortness of breath to intense feeling of panic and fear (4, 5). Anxiety can affect concentration and working memory. It can impact the decision-making process and in that way it can interfere with students' process of learning and practice in medical care (6).

Prevalence of anxiety among medical students is less investigated than depression, and its prevalence was different depending of the countries, from 20% in Brazil to 48% and 67% in Pakistan and India. In Europe, about 30% of medical students suffer from anxiety or depression (7). A systematic review that included medical colleges across Europe found that the frequency of anxiety varied between 7.7–65.5% (8).

Oral health can affect mental health in many ways, and vice versa. Anxiety significantly impacts oral health and it can lead to gum disease, cavities, dry mouth and bruxism. It can also cause bad oral health habits, such as decreasing frequency of tooth brushing and flossing, and excessive consumption of coffee, cigarettes or alcohol abuse (9). Chronic anxiety weakens the oral immune system, potentially leading to various forms of gum disease. Bruxism can cause defects in teeth surfaces that will affect smiling and increase self-consciousness, and even avoiding or reducing communication (10). Dry mouth is often a symptom of anxiety, when there is not enough saliva to reduce the acids in the mouth so individuals become more affected by tooth decay and bad breath, further emphasizing the relationship between anxiety and oral health (11). Good oral health contributes to overall wellbeing.

The aims of our study were to investigate the prevalence of anxiety among medical students and to

determinate the impact of anxiety symptoms on oral health habits and self-perceived oral health.

SUBJECTS AND METHODS

This study was conducted as a cross-sectional study. It included the medical students from the Faculty of Medical Sciences, University of Kragujevac, Serbia. Permission to conduct this research was in accordance with the local legislation and institutional requirements of the Faculty of Medical Sciences. Questionnaires were handed out after the regular lectures, with approval of the professors and the acceptance of students to participate in the study. Partially filled questionnaires were not assessed.

To quantify the anxiety levels we used the Zung Self-Rating Anxiety Scale (SAS), a 20-item self-report assessment tool. In response to the claims, a person should answer how much each one applies to them in the one to two weeks leading up to the test. Each query is graded from 0 to 4 using a Likert-type scale. A raw score of 36 was the proposed cut-off point in 1980, as well as according to recent studies (12, 13).

Oral Health Questionnaire for Adults recommended by the World Health Organisation was used to assess the self-perceived oral health, oral health conditions, and oral health habits. It contains 16 questions about oral health habits, oral health condition, and frequency of dental visits and subjective feeling of the oral condition. The questionnaires were validated and used in the Serbian language (13, 14).

Data were analysed using the Statistical Package for Social Sciences Software, version 21 (SPSS, Chicago, Illinois, version 21.0). Frequency tables were generated for descriptive data. A chi-square test was used to assess the correlation between categorical variables. Correlation coefficients measure the strength of the relationship between two variables, and the Pearson correlation coefficient (r) measures the strength and direction of the relationship between two variables. The level of significance was measured as $p < 0.05$. Post hoc analysis – Bonferroni analysis, was performed for the categorical variables that showed significance, to determinate precise significance between investigated groups. Bonferroni use adjusted p value, where 0.05 is divided by the number of performed tests.

RESULTS

200 students from University of Kragujevac, Faculty of Medical Sciences participated in this study, 50% of whom were male, and 50% were female, aged between 18 and 35. For the purpose of the study, the students were divided into the group of students aged 18 to 21 (57%) and 22 to 35 years (43%), with the median age of 21.18 ± 2.25 .

Table 1. Descriptive analysis of socioeconomic characteristics and oral health related questions, total number and percentage, and separate percentage by the anxiety levels.

Variables	N	%	< 36%	> 36%
Gender				
Male	100	50.0	73.9%	26.1%
Female	100	50.0	48.9%	51.1%
Age groups				
18-21	114	57.0	59.1%	40.9%
22-35	86	43.0	63.9%	36.1%
Number of natural teeth				
20-28	29	14.5	64.0%	36.0%
29-32	171	85.5	60.5%	39.5%
Pain/discomfort in tooth				
Yes	86	43.0	53.8%	46.2%
No	100	50.0	65.6%	34.4%
Don't know	13	6.5	76.9%	23.1%
Frequency of tooth brushing				
Once a week	1	0.5	100.0%	0.0%
2-6 times a week	5	2.5	100.0%	0.0%
Once a day	29	14.5	59.3%	40.7%
More times per day	165	82.5	59.7%	40.3%
Tooth paste with fluoride				
Yes	108	54.0	54.8%	45.2%
No	7	3.5	50.0%	50.0%
Don't know	83	41.5	67.9%	32.1%
Last visit to dentist				
<6 months	112	56.0	55.0%	45.0%
>6 months	41	20.5	64.9%	35.1%
>1 but <2 year	33	16.5	77.4%	22.6%
>2 year	14	7.0	57.1%	42.9%
The main reason of dental visit				
Consultation	20	10.0	43.8%	56.3%
Pain in tooth, gum, mucosa	61	30.5	62.5%	37.5%
Regular check	41	20.5	57.5%	42.5%
Routine check	77	38.5	65.2%	34.8%
Do you use cigarettes?				
Yes	46	23.0	52.4%	47.6%
No	143	71.5	62.9%	37.1%
How often do you use cigarettes?				
Every day	25	12.5	50.0%	50.0%
Few times a week	6	3.0	40.0%	60.0%
Once a week	5	2.5	75.0%	25.0%
Few times a month	11	5.5	60.0%	40.0%

As for the self-perceived oral health, the students assessed themselves as follows: 85.5% answered that they had 29 to 32 of their natural teeth, 82.5% brushed their teeth more than 2 times per day, but 49.1% did not know if their tooth paste contains fluoride. The majority of them did not use plastic or wooden tooth pick (78.4% and 42.5%) and 59.1% used tooth floss. More than a half of students (56%) had their last dental check less than 6 months ago and in 38.5% the main reason of their visit was a routine check, while 30.5% had some issue with gums, teeth or oral mucosa. Considering the habits of students we found out that 71.5% of students are non-smokers and 37% did not consume alcohol. Among

Table 1a. Cont'd.

Variables	N	%	< 36%	> 36%
Last drink in 30 days				
One drink	36	18.0	51.4%	48.6%
2-3 drinks	42	21.0	61.1%	38.9%
4-5 drinks	48	24.0	66.7%	33.3%
Don't drink	74	37.0	62.3%	37.7%
Teeth condition				
Excellent	66	33.0	67.8%	32.2%
Very good	78	39.0	58.6%	41.4%
Good	36	18.0	52.9%	47.1%
Average	13	6.5	75.0%	25.0%
Bad	2	1.0	50.0%	50.0%
Don't know	3	1.5	33.3%	66.7%
Gum condition				
Excellent	82	41.0	69.3%	30.7%
Very good	64	32.0	62.1%	37.9%
Good	29	14.5	44.4%	55.6%
Average	13	6.5	38.5%	61.5%
Bad	2	1.0	100.0%	0.0%
Don't know	2	1.0	0.0%	100.0%
Difficulty with biting food				
Very often	4	2.0	0.0%	100.0%
Often	3	1.5	33.3%	66.7%
Sometimes	15	7.5	42.9%	57.1%
No	170	85.0	64.1%	35.9%
Don't know	4	2.0	75.0%	25.0%
Difficulty with chewing food				
Very often	4	2.0	33.3%	66.7%
Often	2	1.0	0.0%	100.0%
Sometimes	20	10.0	52.6%	47.4%
No	167	83.5	64.1%	35.9%
Don't know	3	1.5	33.3%	66.7%
Difficulty talking				
Very often	2	1.0	0.0%	100.0%
Often	2	1.0	0.0%	100.0%
Sometimes	5	2.5	40.0%	60.0%
No	184	92.0	63.3%	36.7%
Don't know	2	1.0	50.0%	50.0%
Dry mouth				
Very often	3	1.5	50.0%	50.0%
Often	17	8.5	41.2%	58.8%
Sometimes	68	34.0	57.8%	42.2%
No	106	53.0	67.4%	32.6%
Don't know	1	0.5	0.0%	100.0%

students who used cigarettes, 12.5% of them used them daily. In the last year, 50% of students had not had any tooth pain and 43% had felt tooth pain. Students graded their tooth condition mostly as very good or excellent (39% and 33%) while their gum condition was excellent or very

Table 1b. *Cont'd.*

Variables	N	%	< 36%	> 36%
Ashamed because of teeth				
Very often	4	2.0	0.0%	100.0%
Often	6	3.0	16.7%	83.3%
Sometimes	22	11.0	57.1%	42.9%
No	161	80.5	64.6%	35.4%
Don't know	2	1.0	50.0%	50.0%
Pressured or uncomfortable				
Very often	3	1.5	0.0%	100.0%
Often	3	1.5	66.7%	33.3%
Sometimes	31	15.5	56.7%	43.3%
No	153	76.5	64.0%	36.0%
Don't know	3	1.5	33.3%	66.7%
Avoid smiling				
Very often	3	1.5	0.0%	100.0%
Often	7	3.5	28.6%	71.4%
Sometimes	19	9.5	44.4%	55.6%
No	163	81.5	67.1%	32.9%
Don't know	3	1.5	0.0%	100.0%
Irregular sleep				
Very often	9	4.5	25.0%	75.0%
Often	6	3.0	50.0%	50.0%
Sometimes	25	12.5	54.2%	45.8%
No	154	77.0	65.0%	35.0%
Don't know	2	1.0	50.0%	50.0%
Take day off from faculty				
Often	3	1.5	50.0%	50.0%
Sometimes	19	9.5	68.4%	31.6%
No	173	86.5	60.8%	39.2%
Difficulty in daily activities				
Very often	4	2.0	0.0%	100.0%
Often	1	.5	100.0%	0.0%
Sometimes	13	6.5	69.2%	30.8%
No	175	87.5	61.9%	38.1%
Reduced social interaction				
Very often	6	3.0	40.0%	60.0%
Often	4	2.0	50.0%	50.0%
Sometimes	9	4.5	50.0%	50.0%
No	173	86.5	62.9%	37.1%
Wooden tooth pick				
Yes	79	39.5	59.7%	40.3%
No	85	42.5	61.3%	38.7%
Plastic tooth pick				
Yes	33	16.5	54.8%	45.2%
No	120	60.0	59.5%	40.5%
Tooth floss				
Yes	107	53.5	53.1%	46.9%
No	74	37.0	73.5%	26.5%

good (41% and 32%). 85% and 83.5% of students did not have any difficulties with biting or chewing food respectively, while 92% did not have difficulty speaking due to a teeth condition. 80.5% of them did not feel embarrassed and 81.5% did not avoid laughing or smiling because of the look of their teeth nor reduced social interaction with others (86.5%). Teeth did not impact sleep of the majority of students (77%) and they did not feel pressured because of the teeth (76.5%). Symptoms of dry mouth sometimes or more often were noted in 44% of students. Due to their teeth condition, most students did not have to take days off the work or faculty, and did not have any problems in their daily activities (86.5% and 87.5%). Detailed descriptive analysis can be seen in Table 1.

The assessment of the self-perceived anxiety showed that 61% of students did not have symptoms of anxiety but 39% of them did. The minimal value on the score was 22 and the maximum was 66, while the median value of the anxiety score was 36.12 ± 8.69 . The relationship between anxiety and self-perceived oral health, sex and age is shown in Table 2.

Significant positive correlation was found between anxiety and gender ($\chi^2=11.870$; $p=0.001$), and self-perceived gum condition ($\chi^2=13.775$; $p=0.032$). Significant negative correlation was found between anxiety and shame because of teeth ($\chi^2=10.683$; $p=0.030$), avoidance of smiling ($\chi^2=15.380$; $p=0.004$) and tooth flossing ($\chi^2=7.005$; $p=0.008$).

The results of the post hoc Bonferroni analysis showed a statistically significant association between gender and anxiety levels, with women more frequently exhibiting anxiety compared to men. Additionally, better gum health was associated with lower frequency of anxiety. Individuals who often felt embarrassed about their teeth or avoided smiling displayed significantly higher levels of anxiety, while those without such issues were less frequently anxious. Interestingly, flossing was more common among participants with anxiety, contrary to expectations (Table 3).

DISCUSSION

Psychological stress is a common feeling among university students and it affects their performance (15). It also impacts their mental and physical health by favouring unhealthy habits and influencing the interpersonal connections and with it increasing students' odds of developing mental health issues like anxiety and depression (16). Our results showed that every fourth student consumed cigarettes and used on average 4-5 drinks in a month.

Medical students are more vulnerable to high levels of stress compared to other college students because of frequency of exams, higher expectations of themselves, less time for exercise, social isolation or competition, and that's why medical students tend to have more prevalent anxiety (17). Nearly 40% of medical students in our research had anxiety symptoms.

Table 2: Correlation of anxiety with gender, age groups, and self-perceived oral health and oral health habits of students.

Variables	Pearson Chi-square value	Significance (p)	Pearson's R
Sex/gender	11.870	0.001*	0.255
Age groups	0.421	0.516	-0.048
Number of natural teeth	0.110	0.740	0.025
Pain/discomfort in tooth	3.852	0.146	-0.146
Frequency of tooth brushing	3.971	0.265	0.102
Tooth paste with fluoride	3.382	0.184	-0.131
Last visit to dentist	5.346	0.148	-0.114
The main reason of dental visit	2.766	0.429	-0.084
Do you use cigarettes?	1.467	0.226	-0.092
How often do you use cigarettes?	1.397	0.706	-0.111
Last drink in 30 days	1.965	0.580	-0.075
Tooth condition	4.306	0.506	0.083
Gum condition	13.775	0.032*	0.165
Difficulty with biting food	8.563	0.073	-0.215
Difficulty with chewing food	6.223	0.183	-0.121
Difficulty talking	6.112	0.191	-0.163
Dry mouth	6.360	0.174	-0.139
Ashamed because of teeth	10.683	0.030*	-0.216
Pressured or uncomfortable	4.909	0.297	-0.084
Avoid smiling	15.380	0.004*	-0.188
Irregular sleep	6.183	0.186	-0.172
Take day off from faculty	2.111	0.550	0.035
Difficulty in daily activities	5.865	0.209	-0.082
Reduced social interaction	1.878	0.758	-0.090
Wooden tooth pick	0.040	0.841	-0.016
Plastic tooth pick	0.213	0.644	-0.039
Tooth floss	7.005	0.008*	-0.207

*significant level, p value less than 0.05

It is confirmed by many researchers that anxiety among medical students is much more common in females than in males, and the severity of symptoms is much greater in females as well (18, 3). Also, the premedical students and students in first, second and third year of studies, female gender, are more affected by anxiety (19). This is in line with our study, where female medical students were twice more affected by the anxiety than male students. Gender gap might be a result of differences in brain chemistry and hormonal fluctuations, or how men and women tend to cope with stress differently (20).

People with anxiety are less likely to visit the dentist because of fear or stress. Therefore, their dental treatment goes untreated and more oral health issues arise (21). In our results, 43% of students had discomfort or pain in tooth and 10% and 7.5% had problems with biting and chewing food and every third student (30.5%) went to dentist because of the pain in tooth.

It is common for someone with anxiety or depression to develop problems like tooth decay and gum disease because they neglect their dental health (22). In Indian research, on 278 anxiety patients compared with healthy controls, anxiety increased the incidence of oral diseases, but other research did not find this connection (23, 24). Systematic review found positive association between

periodontitis and anxiety. We found a statistically significant correlation between anxiety and self-perceived gum condition of students that confirms previous positive findings between these variables, and majority of students with anxiety did not feel that they had excellent or very good gum health. We did not find a correlation between anxiety and self-perceived teeth condition and the most of students with anxiety felt that they have very good teeth condition.

Situation in people with anxiety and oral health hygiene can go both ways. Their anxiety causes them to obsess over their teeth, to the point where they can damage their teeth and gums, or to ignore their oral health because of other issues (25). Most of students in our research did not differ in the frequency of tooth brushing in comparison to the students without anxiety but there was significant correlation with flossing, and we found that individuals without present anxiety less used dental floss than the anxiety group. Our unexpected finding that anxious participants reported more frequent use of dental floss, may be partially explained by obsessive-compulsive traits, which have been associated with both increased anxiety and repetitive oral hygiene behaviours (26).

It is not clear whether anxiety causes medically serious dry mouth, but dry mouth itself can affect the health of

Table 3: Post hoc analysis (Bonferroni test) for variables that showed significance.

Variables	Anxiety levels (p value)	<36 (no anxiety) - number	>36 (with anxiety) - number	Adjusted p value**
Sex				
Male	<0.001*	65	23	0.0125
Female		46	48	
Gum condition				
Excellent	0.045	52	23	0.0035
Very good	0.841	36	22	
Good	0.057	12	15	
Average	0.089	5	8	
Bad	0.271	2	0	
Very bad	0.271	2	0	
Don't know	0.071	0	2	
Ashamed because of teeth				
Very often	0.027	0	3	0.005
Often	0.021	1	5	
Sometimes	0.698	12	9	
No	0.027	95	52	
Don't know	0.764	1	1	
Avoid smiling				
Very often	0.071	0	2	0.005
Often	0.071	2	5	
Sometimes	0.109	8	10	
No	0.000*	100	49	
Don't know	0.027	0	3	
Tooth floss				
Yes	0.009*	51	45	0.0125
No		50	18	

**0.05/number of performed tests; p value below the adjusted p value were considered significant

teeth, and many report experiencing dry mouth with anxiety. Since dry mouth involves less salivation than necessary, and saliva has its protective role, it is possible that the relationship plays a role in tooth health (27). More than 40% of students in our research felt symptoms of dry mouth.

Dental anxiety and irregular dental visits can lead to deterioration of teeth and gum which will eventually increase dissatisfaction with facial and dental appearance and lower satisfaction with the appearance of teeth which can be associated with embarrassment and feeling tense, and it can influence the oral health quality of life (28). Our results found significant correlation between anxiety and shame because of teeth and smiling, explaining the influence of anxiety on the self-esteem of medical students.

Anxiety as the mental illness that is becoming more common everyday among students should be addressed properly by the public health, health professionals, and educational institutions. Wider awareness of anxiety as a disease should be developed because it affects all aspects of life in a short and long term.

One limitation of this study is its cross-sectional design, which prevents conclusions about causality between anxiety and oral health. Future research should consider a longitudinal approach to better understand this relationship. Additionally, the exclusive use of

quantitative methods limits insight into students' subjective experiences; incorporating qualitative methods, such as interviews, could provide a deeper understanding. Additionally, the sample was limited to medical students from a single institution, which restricts generalizability. Expanding research to include students from other faculties and cultural contexts would allow for more comprehensive comparisons.

In conclusion, university students, especially medical students, are a vulnerable group for anxiety. There are not many studies focusing on the influence of anxiety on oral health and dental hygiene because of anxiety symptoms, and anxiety in general, are easy to be misdiagnosed and overlooked, or not prioritized as significantly as the other mental health issues. But the impact of bad mental health on overall health, including oral health, is more present and should be carefully monitored. Our results showed highly prevalent anxiety symptoms among medical university students and found correlation between anxiety and gender, use of dental floss, avoidance of smiling, being ashamed of teeth and self-perceived gum condition. The post hoc Bonferroni analysis revealed that women exhibited anxiety more often than men, better gum health was linked to lower anxiety, embarrassment about teeth or avoiding smiling was associated with higher anxiety, and unexpectedly, flossing was more common among anxious participants.

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