



Evaluation of dental health among adolescents with mental disorders

Evaluacija zdravlja zuba kod adolescenata sa mentalnim poremećajima

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Abstract

Background/Aim. According to the World Health Organization (WHO), there is an increasing prevalence of mental disorders among children and adolescents worldwide. Previous studies have shown that people with mental disorders, regardless age, have an increased prevalence of dental caries due to several reasons. The aim of this study was to determine prevalence of dental caries in adolescents with mental disorders and to consider possible risk factors that might contribute to their current dental health status.

Methods. The study was conducted as an observational cross-sectional study. The study group comprised 70 randomly selected hospitalized adolescents with mental disorders. The control group comprised 70 randomly chosen mentally healthy adolescents. They were matched to the study group by gender and age. All the participants were subjected to targeted dental examination according to criteria recommended by the WHO. Collection of data related to mental disorders of the study group was obtained from the patient’s medical records. All collected data were organized

and analyzed by descriptive statistical parameters and regression models. **Results.** Majority of the study group patients were diagnosed with schizophrenia, schizotypal and delusional disorders (F20-F29), as well as behavioral and emotional disorders usually occurring in childhood and adolescence (F90-F98). Almost 90% of them were treated with antipsychotics of the second generation, as monotherapy or in combination with first-generation antipsychotics. Adolescents with mental disorders had significantly more carious and extracted teeth and three times less filled teeth than mentally healthy adolescents in the control group. The mean value of the decay-missing-filled teeth (DMF) index in the study group patients was also significantly higher than the mean value of DMF index in the control group subjects. **Conclusion.** It seems that mental disorder among adolescents mainly affects oral health indirectly, decreasing motivation of patients in maintaining oral hygiene.

Key words:
mental health; adolescent; oral health.

Apstrakt

Uvod/Cilj. Prema podacima Svetske zdravstvene organizacije (SZO), sve više je mentalnih poremećaja među decom i adolescentima širom sveta. Ranije sprovedena istraživanja pokazala su da osobe sa mentalnim poremećajima, bez obzira na starost, imaju veću učestalost karijesa, što se objašnjava na više načina. Cilj ovog istraživanja je bio da se odredi prevalencija karijesa kod adolescenata sa mentalnim poremećajima i razmotre mogući faktori rizika koji bi mogli doprineti zdravlju njihovih zuba. **Metode.** Istraživanje je sprovedeno po tipu opservacione studije preseka. Studijsku grupu je činilo 70 slučajno odabranih hospitalizovanih adolescenata sa mentalnim poremećajima. Kontrolnu grupu je činilo 70

slučajno odabranih mentalno zdravih adolescenata, koji su po polu i starosti odgovarali bolesnicima studijske grupe. Svim bolesnicima je izvršen detaljan stomatološki pregled, prema kriterijumima preporučenim od strane SZO. Podaci o mentalnim poremećajima adolescenata prikupljeni su iz istorija bolesti. Svi dobijeni podaci analizirani su deskriptivnim statističkim parametrima i regresionim modelima. **Rezultati.** Većina ispitanika studijske grupe bolovala je od shizofrenije, shizotipskih poremećaja i sumanutih poremećaja (F20-F29), kao i od poremećaja ponašanja i poremećaja emocija sa početkom u detinjstvu i adolescenciji (F90-F98). Skoro 90% ispitanika studijske grupe je lečeno antipsihoticima druge generacije, u vidu monoterapije ili u kombinaciji sa antipsihoticima prve generacije. Adolescenti sa mentalnim poremećajima imali su znatno

više karijesnih i ekstrahovanih zuba od zdravih adolescenata i tri puta manje zuba sa postavljenim ispunima. Srednja vrednost karijes, ekstrahovan, plombiran zub (KEP) indeksa, bila je, takođe, statistički značajno veća u studijskoj nego u kontrolnoj grupi ispitanika. **Zaključak.** Čini se da mentalni poremećaji kod adolescenata uglavnom indirek-

no utiču na oralno zdravlje, smanjujući motivaciju za održavanjem oralne higijene.

Ključne reči:
mentalni poremećaji; adolescenti; usta, zdravlje.

Introduction

According to the latest reports of the World Health Organization (WHO), mental disorders are the 3rd leading cause of disability of European citizens¹, and previous study suggests an increasing prevalence of mental disorders among children and adolescents worldwide².

Adolescence is a period between childhood and adulthood, from 14 to 18 years of age, and according to some studies, up to 25 years of age³. In this specific part of life, many problems and psychological disorders reach their peak⁴. The most common mental disorders in this period are depressive and anxiety disorders, obsessive-compulsive disorders and posttraumatic stress disorders⁴. Many of these patients are treated solely by psychotherapeutic methods, but some of them also need to receive pharmacological agents that are not approved for persons less than 18 years of age. Moreover, some severe mental disorders, like schizophrenia, depression, anxiety, attention deficit hyperactivity disorder and bipolar disorder, frequently require pharmacological treatment in adolescents⁵.

Dental caries is a major public health problem globally and it is the most widespread non-communicable disease⁶. Previous studies have shown that people with several mental disorders have an increased prevalence of dental caries⁷⁻¹⁰. This can be explained by several reasons: mental disorders lead to lack of motivation, lack of oral hygiene, fear to visit a dentist, difficulty to access health services and adverse effects of antipsychotic medication, mainly xerostomia, could be also present¹⁰.

In Serbia no research has been conducted to oral and dental health of this vulnerable group of psychiatric patients. Therefore, the aim of this study was to determine prevalence of dental caries, to register condition of teeth still present, and to consider possible risk factors that have possibly contributed to the current dental health status of adolescents with mental disorders.

Methods

The study was conducted as an observational cross-sectional study. It was adjusted to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement for improving the quality of observational studies¹¹. Also, it received approval of the Ethics Committee of the Clinic for Mental Disorders "Dr. Laza Lazarević" Belgrade and Community Health Center "Vračar" in Belgrade, Serbia. The research was conducted in accordance to the Declaration of Helsinki¹². The participation of all participants was voluntary. Each participant and their

legal representative (for persons under 18 years old) was informed, through a special brochure, of the type of the research, data collection procedure, and other aspects of the study; written consent was obtained from all participants or their legal representatives to use personal data for research purposes.

Two groups of participants were formed: the study group comprised 70 randomly selected adolescents with mental disorders, hospitalized at the Clinic for Mental Disorders "Dr. Laza Lazarević" in Belgrade ("bias-coin" randomization). The inclusion criteria for entering the study were that the patient was hospitalized, younger than 25 years and diagnosed with mental disorders (according to the 10th Revision of the International Classification of Diseases¹³) at least two years prior to the study. The exclusion criteria were hospitalized patients older than 25 years diagnosed with mental disorder in the period shorter than two years from the time of the survey, the simultaneous presence of severe somatic illnesses or severe disability, and inability to communicate or a refusal to cooperate. The control group comprised 70 randomly chosen mentally healthy adolescents ("bias-coin" randomization) who were being treated at the Community Health Center "Vračar" in Belgrade. They were matched to the study group by gender and age. The exclusion criteria were the diagnosis of any mental or somatic illness and the use of drugs that can cause oral changes or xerostomia (antibiotics, antifungals, blood pressure medication, corticosteroids, diabetes medication, etc.)¹⁴.

All the participants were subjected to targeted dental examination according to criteria recommended by the WHO¹⁵. Dental check-ups were carried out by the dentist (VDj) at the Clinic for Mental Disorders "Dr. Laza Lazarević" in Belgrade, and the Community Health Center "Vračar" in Belgrade. Examinations were performed in the daylight, using flat dental mirrors and sharp probes. Dental check-ups were carried out with the aim of measuring parameters of oral and dental health and assessing the decayed, missing, filled (DMF) index, which is used for oral health assessment¹⁶. Clearly visible lesions with cavities on tooth surfaces were registered as caries; teeth having only changes in transparency, but with intact surface and without cavitation were registered as being healthy.

Collection of data related to mental disorder of the study group was obtained from the patient's medical records.

All collected data were organized and evaluated using dedicated software (SPSS 23.0 Inc., Chicago, IL, USA) and were analyzed by descriptive statistical parameters and regression models. The descriptive statistical parameters were represented by the measures of central tendency

(mean value and median), measures of variability (standard deviation and variation interval) and were expressed in percentages. The methods for testing the differences in numerical data (age, DMF index) were represented by the *t*-test of independent groups. If there were no grounds for application of parametric statistical methods, the Mann-Whitney test was applied. For testing data of different categories (gender, parents education level, etc.), the Pearson's χ^2 -test was used. The relationship between the DMF index and independent variables used in this study was evaluated using a linear regression model - univariate (individually for each of the independent variables) and multivariate (if any of independent variables was statistically significant in univariate regression analysis). Level of significance was set at $p \leq 0.05$.

Results

Socio-demographic characteristics of all participants are shown in Table 1. The groups were comparable in terms of age and gender (Table 1). Statistically significant difference between these groups was observed only in terms of place of residence; all patients from the control group lived in urban area, while only 52% of the study group lived in this type of area. Only 29.3% of the study group patients had both of parents with high school education, which was quite opposite to the control group patients.

Majority of the study group patients were diagnosed with schizophrenia, schizotypal and delusional disorders (F20-F29), as well as behavioral and emotional disorders, with onset usually occurring in childhood and adolescence (F90-F98) (Figure 1).

Table 1

Socio-demographic characteristics of all participants

Socio-demographic characteristics	Study group	Control group	<i>p</i>
Gender, n (%)			
male	36 (48.0)	38 (50.7)	^a 0.435
female	39 (52.0)	37 (49.3)	
Age (years), mean \pm SD; Med (min-max)	18.87 \pm 3.05; 18 (15–25)	19.21 \pm 3.15; 19 (15–26)	^b 0.494
Place of residence, n (%)			
urban area	39 (52.0)	75 (100.0)	^a 0.000
peri-urban area	17 (22.7)	0 (0)	
rural area	19 (25.3)	0 (0)	
Father education level, n (%)			
without any school	0 (0)	0 (0)	^a 0.168
elementary school	8 (10.7)	0 (0)	
high school	22 (29.3)	10 (13.3)	
college	13 (17.3)	16 (21.3)	
faculty	1 (1.3)	32 (42.7)	
there is no father figure in family	20 (26.7)	7 (9.3)	
don't know/didn't sure	11 (14.7)	10 (13.3)	
Mother education level, n (%)			
without any school	1 (1.3)	0 (0)	^a 0.238
elementary school	11 (14.7)	3 (4.0)	
high school	22 (29.3)	13 (17.3)	
college	10 (13.3)	29 (38.7)	
faculty	0 (0)	27 (36.0)	
there is no mother figure in family	20 (26.7)	3 (4.0)	
don't know/didn't sure	11 (14.7)	0 (0)	

n (%) – number (percentage) of patients; *p* – significance; SD – standard deviation; Med – median; min – minimum; max – maximum; ^a χ^2 – test; ^b*t* – test of independent groups.

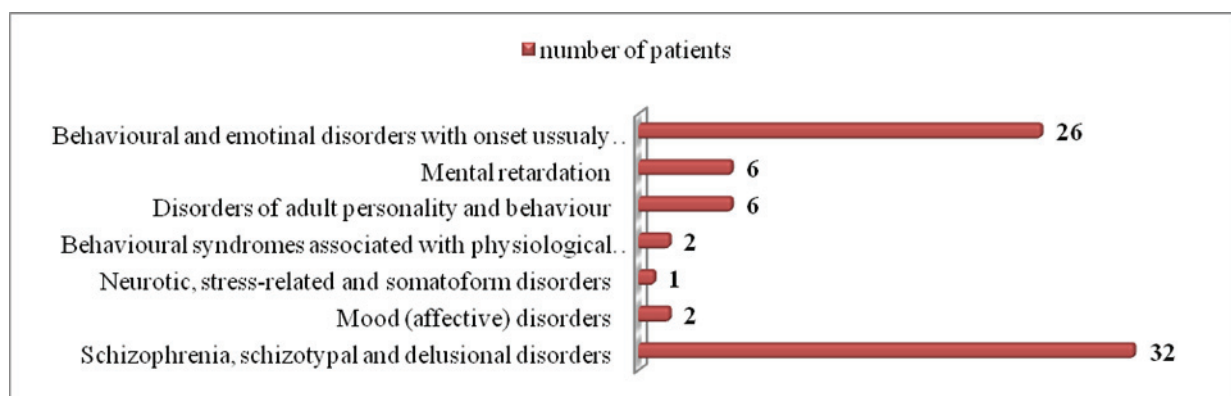


Fig. 1 – Distribution of mental disorder diagnosis among the study group patients.

Concerning schizophrenia, schizotypal and delusional disorders (Figure 2), majority of patients were diagnosed with acute and transient mental disorders. Among the study group patients with behavioral and emotional disorders, with onset usually occurring in childhood and adolescence (Figure 3), most of them were diagnosed with mixed behavioral disorders and emotions.

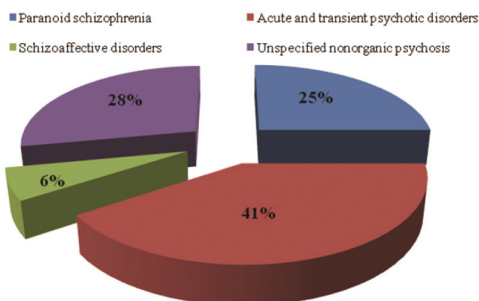


Fig. 2 – Distribution by diagnosis categories of schizophrenia, schizotypal and delusional disorders among the study group patients.

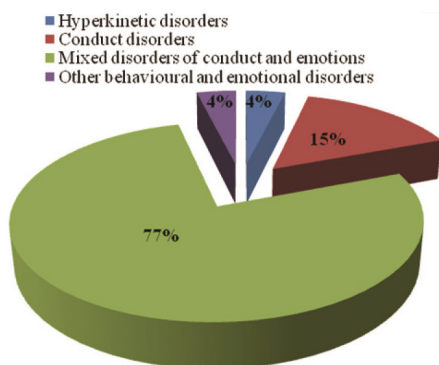


Fig. 3 – Distribution by diagnosis categories of behavioral and emotional disorders among the study group patients, usually occurring in childhood and adolescence.

All patients from the study group were treated with an average of 3.27 ± 0.83 (2 to 5) psychiatric drugs (Table 2). Almost 90% of them were treated with antipsychotics of the second generation, as monotherapy or in combination with first-generation antipsychotics (Table 2). Also, almost half of the study group patients were treated with antidepressant drugs, while 70.7% were treated with anxiolytics.

In addition to the above mentioned groups of psychiatric drugs, 40% of the patients received hypnotics, 65.3%

mood stabilizers, while only 6.7% of study group patients received anticholinergics (Table 2).

Table 2
Medical data of the study group patients

Medical characteristics	Study group
Number of medications per patient, mean \pm SD; Med (min-max)	3.27 ± 0.83 ; 3 (2–5)
Typical antipsychotics, n (%)	
yes	21 (28.0)
no	54 (72.0)
Atypical antipsychotics, n (%)	
yes	67 (89.3)
no	8 (10.7)
Antidepressants, n (%)	
yes	34 (45.3)
no	41 (54.7)
Anxiolytics, n (%)	
yes	53 (70.7)
no	22 (29.3)
Hypnotics, n (%)	
yes	30 (40.0)
no	45 (60.0)
Mood stabilizers, n (%)	
yes	49 (65.3)
no	26 (34.7)
Anticholinergics, (%)	
yes	5 (6.7)
no	70 (93.3)

n (%) – number (percentage) of patients; p – significance; SD – standard deviation; Med – median; min – minimum; max – maximum.

Adolescents with mental disorders had significantly more carious and extracted teeth, and three times less filled teeth than mentally healthy adolescents in the control group (Table 3). The mean value of the DMF index in the study group patients (6.45 ± 3.48) was also significantly higher than the DMF index in the control group subjects (2.75 ± 2.12). The difference in all four observed source variables between the groups was statistically significantly different and significantly less favorable for the study group (Table 3).

In terms of socio-demographic characteristic, there was no statistically significant difference in the value of the DMF index among participants in both groups (Table 4). Also, in relation to the characteristics of the mental disorder, no statistically significant significance was found in mean values of the DMF index within the study group patients (Table 5).

Table 3
Distribution of carious, extracted and filled teeth and the value of the decay-missing-filled teeth (DMF) index

Variables	Study group		Control group		p^a
	mean \pm SD; Med (min-max)	%	mean \pm SD; Med (min-max)	%	
Carious teeth	4.31 ± 2.69 ; 4 (0–8)	66.7	0.64 ± 0.86 ; 0 (0–3)	23.3	0.000
Extracted teeth	1.45 ± 1.51 ; 1 (0–4)	22.5	0.37 ± 0.65 ; 0 (0–2)	13.6	0.000
Filled teeth	0.69 ± 1.14 ; 0 (0–5)	10.8	1.68 ± 1.53 ; 1 (0–5)	61.1	0.000
DMF index	6.45 ± 3.48 ; 7 (0–12)	100	2.75 ± 2.12 ; 2 (0–9)	100	0.000

% – percentage of patients; p – significance; SD – standard deviation; Med – median; min – minimum; max – maximum; ^aMann-Whitney test.

Table 4**The mean value of the decay-missing-filled teeth (DMF) index among patients in both groups by socio-demographic characteristics**

Socio-demographic characteristics	Study group		Control group	
	mean ± SD	<i>p</i>	mean ± SD	<i>p</i>
Gender				
male	6.25 ± 3.17	^a 0.823	3.00 ± 2.27	^a 0.402
female	6.64 ± 1.82		2.49 ± 2.16	
Place of residence				
urban area	6.49 ± 3.23	^b 0.846	–	–
peri-urban area	6.00 ± 3.89			
rural area	6.79 ± 3.75			
Father education level				
without any school	7.75 ± 2.91	^b 0.602	–	^b 0.314
elementary school	6.27 ± 3.60		3.30 ± 1.64	
high school	5.15 ± 3.65		2.25 ± 2.57	
college	–		2.59 ± 2.37	
faculty	6.95 ± 3.55		2.43 ± 2.07	
there is no father figure in family	6.27 ± 3.44		3.70 ± 1.57	
don't know/didn't sure	–		–	
Mother education level				
without any school	7.73 ± 3.61	^b 0.518	2.00 ± 2.00	^b 0.863
elementary school	6.59 ± 3.39		2.38 ± 1.90	
high school	5.70 ± 3.83		3.03 ± 2.10	
college	–		2.74 ± 2.57	
faculty	6.70 ± 3.33		2.33 ± 2.31	
there is no mother figure in family	5.18 ± 3.47		–	
don't know/didn't sure	–		–	

SD – standard deviation; *p* – significance; ^aMann-Whitney test; ^bKruskal-Wallis test.

Table 5**The mean value of the decay-missing-filled teeth (DMF) index among the study group patients by medical data**

Medical data	mean ± SD	<i>p</i>
Diagnostic category		
F20-F29	5.94 ± 3.78	^a 0.198
F30-F39	2.50 ± 2.12	
F50-F59	9.50 ± 2.12	
F60-F69	8.17 ± 1.48	
F70-F79	8.50 ± 1.52	
F90-F98	6.46 ± 3.48	
Number of medications per patient		
2	6.43 ± 3.65	^a 0.848
3	6.13 ± 3.30	
4	6.77 ± 3.59	
5	7.00 ± 4.69	
Typical antipsychotics		
yes	6.71 ± 3.91	^b 0.553
no	6.35 ± 3.33	
Atypical antipsychotics		
yes	6.39 ± 3.51	^b 0.653
no	7.20 ± 3.42	
Antidepressants		
yes	6.00 ± 3.45	^b 0.292
no	6.83 ± 3.51	
Anxiolytics		
yes	6.04 ± 3.39	^b 0.062
no	7.45 ± 3.70	
Hypnotics		
yes	6.60 ± 3.69	^b 0.636
no	6.36 ± 3.37	
Mood stabilizers		
yes	6.88 ± 3.36	^b 0.155
no	5.65 ± 3.62	
Anticholinergics		
yes	7.60 ± 3.21	^b 0.462
no	6.37 ± 3.51	

SD – standard deviation; ^aMann-Whitney test; ^bKruskal-Wallis test; *p* – significance.

By defining the mean value of the DMF index of adolescents with mental disorders as a outcome, none of independent variables were statistically significant in the univariate regression analysis (Table 6), so the multivariate regression model was not formed.

Table 6**The value of the decay-missing-filled teeth (DMF) index among adolescents with mental disorders analyzed by the univariate linear regression model**

Independent variables	Univariate linear regression model	
	#B (95% CI)	<i>p</i>
Gender	0.391	0.630
Age	0.173	0.761
Place of residence	0.096	0.843
Father educational level	-0.008	0.969
Mother educational level	-0.242	0.221
Diagnostic category	0.143	0.267
Number of medications per patient	0.255	0.605
Typical antipsychotics	-0.362	0.688
Atypical antipsychotics	0.612	0.642
Antidepressants	0.829	0.308
Anxiolytics	1.417	0.109
Hypnotics	-0.244	0.768
Mood stabilizers	-1.224	0.149
Anticholinergics	-1.229	0.450
Psychoactive substances	-0.310	0.232

#Unstandardized coefficient B; CI – confidence interval; *p* – significance.

Discussion

In both groups, approximately the same number of subjects was gender-related, which indicates homogeneity of the sample and allows adequate interpretation of the results of the study group. Gender and age are individual characteristics who determined general and oral health¹⁷. A study on the global burden of diseases, injuries and risk factors from 2015, indicates that the incidence of dental caries of permanent teeth is the greatest in the age group of 15 to 19 years and gradually decreases in older age groups¹⁸.

However, in addition to individual characteristics, environmental factors also influence health, as well as the interaction of individual characteristics with environmental factors and *vice versa*¹⁷. Thus, poor economic conditions are recognized as factors that have negative effects on health; education is also a factor that plays a significant role in developing skills and knowledge needed for positive lifestyle changes¹⁷. As the sample of this study consisted of adolescents that are in the educational period of life, it is important to analyze the parent or guardian education level as well, because they can contribute to development of positive lifestyles if they themselves understand their importance. This study showed that in most adolescents with mental disorders both parents had a high school education (29.3%). Also 26.7% of the study group patients did not have father or mother figure in their family. Cianetti et al.¹⁹ have shown that dental caries presence was higher in children where the mothers' and fathers' educational level was lower. Also, Crocombe et al.²⁰ have shown that children, whose parents had higher education level have approximately half of the relative risk of caries, compared to children whose parents had low levels of education.

Also, nearly 50% of adolescents with mental disorders lived in periurban and rural areas, in opposite to participants of the control group, where 100% of patients were living in urban area. Many previous studies have shown a significantly higher prevalence of dental caries with rural residence location²¹⁻²³. The latest national research on the health of citizens of the Republic of Serbia, precisely points to the importance of access to health services, which depends on many factors, and also on the distance of the health service¹⁷. Moreover, the results of this national survey have shown that the rural population often experience barriers to obtain the dental health care (19.3%)¹⁷.

In the present study, the most common diagnostic category of mental disorders in the study group were schizophrenia, schizotypal and delusional disorders (42.7%), which is

similar to previous studies about oral health of psychiatric patients²⁴⁻²⁶. Velasco-Ortega et al.²⁴ have shown in their research about actual dental status and treatment needs of older adults with and without chronic mental disorders in Spain, that 56% of the study group patients suffered from schizophrenia. Also, research about prevalence of bucco-dental pathologies in patients with psychiatric disorders in Venezuela showed that even 60% of patients had schizophrenia as most common mental disorder²⁵. On the other hand, Bertaud-Gounot et al.²⁶ have shown that 36.6% of psychiatric inpatients in Rennes, France, had schizophrenia. Djordjevic et al.²⁷ in their research have come to conclusion that oral diseases, especially dental caries and periodontal disease, are much more prevalent in patients with schizophrenia than in healthy population, possibly due to the nature of this psychiatric disorder, length of hospital treatment and oral-side effects of psychotropic medications used for schizophrenia²⁷. Schizophrenia is a chronic mental disorder characterized with disturbances in thoughts, behavioral changes, and impaired cognitive functions. All this affect a person's ability to carry out daily activities and maintain oral hygiene²⁸.

The patients of the study group in the present study were treated with the average number of 3.27 ± 0.73 psychotropic drugs (2 to 5), and the most used medications were antipsychotics of the second generation (89.3%), anxiolytics (70.7%) and mood stabilizers (65.3%). Okamoto et al.²⁹ have reported that patients with schizophrenia, who used antipsychotics, and especially anxiolytics, show higher level of hypo-salivation. Hyposalivation consequently leads to a buildup of dental plaque on marginal gingiva, which is a major etiologic factor for the occurrence of caries³⁰.

The mean value of DMF index of the study group patients in our study was 6.45 ± 3.48 , which is two times higher than in participants of the control group (0.64 ± 0.86). Also, results of our study point that the study group patients had seven times higher mean value of carious teeth, four times higher mean value of extracted teeth, and even four times lower mean value of filled teeth than the control group participants. This indicates that adolescents with mental disorders and their parents have a lack of motivation for rehabilitation of carious teeth and weak habits in maintaining oral hygiene, which is confirmed by previous studies^{31,32}.

Conclusion

Results of this study suggest that mental disorders mainly affect oral health indirectly, decreasing motivation of patients in maintaining oral hygiene.

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