

# Oral hygiene and oral flora evaluation in psychiatric patients in nursing homes in Turkey

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## Abstract

**Context:** The World Health Organization has stated that psychiatric patients are a group of people who have oral and dental illnesses.

**Aims:** The aims of this study were to document the oral hygiene of individuals with chronic psychiatric illness, to determine the extraoral and intraoral findings, to detect the dominant microorganisms in oral flora, and to inform clinicians of these findings.

**Settings and Design:** The study included 100 patients (69 men and 31 women) with different psychiatric illnesses living in a nursing home. They were 19-96 years old (median, 48 years).

**Subjects and Methods:** The participants completed a questionnaire about patients' oral health. They underwent extraoral and intraoral examinations. Two swab samples were obtained from the oral mucosa of these patients. Gram preparations were analyzed for leukocytes, bacteria, and yeast.

**Statistical Analysis Used:** Chi-square test and z-test were used.

**Results:** All patients (100%) had the necessary equipment for oral hygiene; however, many (43%) patients had poor oral hygiene. There was a high prevalence of xerostomia (56%) and fissured tongue (61.4%) (among other tongue anomalies). The most commonly isolated microorganisms were coagulase-negative *Staphylococcus* (35.9%), *Streptococcus* spp. (30.3%), nondiphtheroid *Bacilli* (16.9%), *Staphylococcus aureus* (2.3%), *Candida* spp. (11.8%), and Gram-negative *Bacilli* (2.8%).

**Conclusions:** The oral hygiene of most patients was insufficient. The presence of Gram-negative *Bacilli* growth in the oral flora can be explained by poor hand hygiene. These findings suggest that it is useful to educate individuals about oral hygiene and hand hygiene and to inform the staff and families about this issue.

**Key words:** Bacteria types, oral and dental illnesses, psychiatric patients

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## Introduction

The term "chronic psychiatric illness" is used for people with psychiatric illnesses who have been hospitalized for a long time or who have often shown a significant deterioration in their working and social performances.<sup>[1]</sup> The World Health Organization has stated that psychiatric patients are a group of people who have oral and dental illnesses<sup>[2]</sup> due

to excessive carbohydrate consumption, bad oral hygiene, periodontal illnesses, etc.<sup>[3]</sup>

In our country, few studies have examined the profile of oral and dental health in psychiatric patients.<sup>[4,5]</sup> The aim of this study was to document the oral profile and oral

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hygiene of patients with chronic psychiatric illness living in nursing homes.

## Subjects and Methods

This study was approved by the Ondokuz Mayıs University Medical Research Ethics Committee (Samsun, Turkey) (number: 2012579) and by the Turkish Ministry of Family and Social Policy (Ankara, Turkey) (number: B. 17.4.ASM.0.55.00.00.605.01-1704). The study included 100 patients (69 men and 31 women) with different psychiatric illnesses living in a nursing home. They were 19-96 years old (median, 48 years).

Two specialists experienced in oral diagnosis and radiology took the patients' history and performed examinations. Each patient first completed a questionnaire about oral health, smoking, eating habits, xerostomia, bruxism, and dental status. They then underwent extraoral and intraoral examinations. The patients' dental status was examined under a light source, and mucosal and soft tissue pathologies/conditions were noted.

Two swab samples were afterward obtained from the patients' oral mucosa with the help of transport medium culture rods. One numbered sample was Gram-stained. The other sample rod was cultivated in sheep blood agar and eosin-methylene blue medium followed by incubation for 24-48 h. Gram preparations were analyzed for leukocytes, bacteria, and yeast. The cultivated bacteria colonies on the incubated media were identified based on the colony morphology using culture media, Gram-stain, catalase, and coagulase, urea, and indole tests. Gram-positive and Gram-negative cocci were typed respectively with Gram-stain, catalase, coagulase, urea, and indole tests. Catalase and coagulase-positive *Staphylococcus isolates* are called *S. aureus* but catalase-positive and coagulase-negative *S. isolates* are called coagulase-negative *staphylococcus*. Also *Streptococcus* were typed with their hemolytic states how alpha-hemolytic *Streptococcus*, beta-hemolytic *Streptococcus*, and Gram-positive *Bacilli* were classified as nondiphtheroid *Bacilli* because Gram-positive *Bacilli* are in other oral pathogen groups, except for *Corynebacterium diphtheriae* and obligatory anaerobes that can be produced in routine bacteria culture. According to reproduction and indole and urea test results in their medium, the Gram-negative bacteria were determined to be Gram-negative *Bacilli* and were different from bacteria, which are produced in routine bacteria culture and could not be identified. The yeast colonies were incubated for 48 h. The yeast was identified, based on the culture and the Gram-stain results.

In the cultures where Gram-positive leukocytes were detected, if microorganisms were detected without an

oral lesion, an inflammatory response was considered; if the patient had an oral lesion, it was considered a factor of infection. In sample cultures having no Gram-positive leukocytes, the microorganism was considered to be colonized.

For statistical analysis, the Chi-square test and z-test were used.

## Results

All patients (100%) had the necessary equipment for oral hygiene (e.g. toothbrush, toothpaste, etc.). Tables 1-3 present the information obtained from the questionnaire, the extraoral examination, and the intraoral examination, respectively. The frequency of hypermobility (70.6%), a temporomandibular disorder sign detected on extraoral examination, was higher than the frequency of other joint findings ( $P = 0.041$ ,  $z = -2.04$ ).

**Table 1: Information from the patient's questionnaires**

Information from the questionnaire	Number of patients
Patient has the necessary equipment for oral hygiene	100
Smoking habits	68
Willingness for dental treatment	
Yes	60
No	40
Excessive consumption of starchy foods between meals	66
Xerostomia <sup>a</sup>	56
Dental status <sup>a</sup>	
Dentulous	74
Edentulous	16
Use of dental prosthesis <sup>a</sup>	
Removable	13
Fixed	2
Bruxism <sup>a</sup>	3
Parafunctional habits <sup>a</sup>	8

<sup>a</sup>This information is based on information from patient's questionnaires and intraoral examination findings

**Table 2: Extraoral examination findings**

Extraoral examination findings	Number of patients
Submandibular abscess	1
Angular cheilitis	5
Herpes labialis	1
Mucocele (on lower lip)	1
TMJ disorders	
TMJ palpation (+)	3
TMJ muscles palpation (+)	1
Clicking	5
Crepitation	3
Hypermobility	25

TMJ=Temporomandibular joint

The oral hygiene status of the patients was evaluated from the intraoral examination findings. Hygiene disorder was more common in men than in women, and this difference was statistically significant ( $P < 0.05$ ). The frequency of pathological dental attrition was statistically and significantly higher than the frequency of abrasion ( $P < 0.001, \chi = 3.63$ ).

Table 3: Intraoral examination findings	
Intraoral examination findings	Number of patients
Oral hygiene	
Good	25
Mild	32
Poor	43
Periodontal disease	
Gingivitis	28
Periodontitis	53
Mucosal and soft tissue pathology	
candidosis	8
Leukoplakia	2
Hyperkeratosis	10
Traumatic erythema	3
Traumatic ulcer	4
Radiation mucositis	1
Apthous stomatitis	1
Epulis fissuratum	1
Superficial abscess	2
Gingival pigmentation	2
Gingival hyperplasia	1
Irritative fibroma	1
Vascular malformation	2
Tongue anomaly or pathology	
Fissured tongue	27
Geographic tongue	8
Hairy tongue	3
Atrophic tongue	6
Tooth wear	
Pathologic attrition	16
Abrasion	1
Erosion	12
Abfraction	1

There were significant differences between tongue anomalies and tongue pathologies ( $\chi^2 = 32.182, P < 0.001$ ). The frequency of fissured tongue was 61.4% and considerably higher in comparison to other tongue anomalies. However, there was no gender difference with respect to disease distribution ( $\chi^2 = 1.605, P = 0.658$ ).

The patients' culture samples indicated coagulase-negative staphylococci, *Streptococcus* spp., and nondiphtheroid *Bacilli* - oral flora microorganisms' members that are likely to proliferate. On the other hand, *S. aureus*, *Candida* spp., and Gram-negative *Bacilli* were isolated from the oral cultures of some patients. Table 4 presents the distribution of other microorganisms. In the cultures, coagulase-negative *Staphylococcus* and *Streptococcus* spp. bacteria were much more isolated than microorganisms that can be produced in other routine cultures ( $P < 0.001$ ).

Table 5 presents the distribution, types, and numeric values of effective microorganisms of intraoral infections. Nondiphtheroid *Bacilli* were isolated more often from gingivitis patients, whereas *Candida* spp. was mostly isolated from periodontitis patients. However, this difference was not statistically significant ( $P > 0.05$ ).

Table 4: Distribution of the microorganisms

Microorganism species	Number (%)
Gram-positive microorganisms	
Coagulase-negative <i>Staphylococcus</i>	64 (35.9)
<i>Streptococcus</i> spp.	54 (30.3)
Alfa-hemolytic <i>streptococcus</i>	49 (27.5)
Beta-hemolytic <i>streptococcus</i>	5 (2.8)
Nondiphtheroid <i>Bacilli</i>	30 (16.9)
<i>Staphylococcus aureus</i>	4 (2.3)
Fungi	
<i>Candida</i> spp.	21 (11.8)
Gram-negative microorganisms	
Gram-negative <i>Bacilli</i>	5 (2.8)

Gram-positive microorganisms are a normal member of the oral flora. Thus, they were not an infection factor if there were no leukocytes in the microscopic examination of the samples

Table 5: Distribution, types and numeric values of effective microorganisms of intraoral findings

Effective microorganisms	Intraoral findings								
	Gingivitis	Periodontitis	Abscess	Hyper-ceratosi	Atrophic tongue	Fissured tongue	Traumatic ulceration	Gingival hyperplasia	Anguler cheilitis
Gram-positive									
Coagulase-negative <i>staphylococcus</i>	5	12	1	1		3	1		
Alfa hemolytic <i>streptococcus</i>	2	4	1	1		1			
Beta hemolytic <i>streptococcus</i>	1	1		1					
Nondiphtheroid <i>Bacilli</i>	6	4							
<i>Staphylococcus aureus</i>				1					1
Fungi									
<i>Candida</i> spp.	3	8		1	1	2		1	1

## Discussion

Chronic psychiatric patients are a group of patients requiring special care because they have more oral and dental diseases and need more treatment.<sup>[6]</sup> These patients have high levels of tooth decay and periodontal illnesses because of factors such as poor dietary habits, poor oral hygiene, adverse effects of medication, deterioration in executive functioning, long-term hospitalization, insufficient care from family and society, exclusion from society, reluctance to have dental treatment or the reluctance of some dentists to treat these patients, and difficulties such as insufficient sedation.<sup>[7]</sup>

This study showed that the patients' oral hygiene was insufficient, although they had the necessary equipment for oral hygiene. Most patients were smokers. Most patients had tooth loss and needed prosthetic restoration; however, they rejected dental treatment. Some patients were reluctant to seek necessary dental treatment (e.g. prosthetic treatment, restorative treatment, surgical treatment). Most patients stated that they had regular oral hygiene habits, and the staff verified them; the researchers believed that living in nursing homes was an opportunity for these patients to maintain and improve their oral health. Tiller *et al.*<sup>[8]</sup> stated that hospitalization of these patients was important for them to maintain and improve their oral health; they suggest that cooperation by oral health services and the hospital would facilitate the patients' access to oral dental health services. Nicol *et al.*<sup>[9]</sup> mention the need to consider a longer term format of training programs for care staff with regular refresher courses being provided to ensure that improved oral health care is sustained in nursing homes.

Attrition is the loss of tooth structure caused by tooth-to-tooth contact during occlusion and mastication. The process is pathologic when the amount of tooth loss is extensive and begins to affect aesthetics and function. Areas softened by erosion are more susceptible to attrition.<sup>[10]</sup> In erosion, the acidic source is often foods or drinks, certain medications, chronic involuntary regurgitation (e.g. chronic alcoholism), and voluntary regurgitation (e.g. psychological problems, bulimia).<sup>[10]</sup> In this study, we diagnosed pathologic attrition in 16 patients and erosion in 12 patients. Pathological attrition and erosion were more frequent in patients' teeth than in other types of tooth wear. This result may be attributable to the drugs used by patients or because of diseases that they have.

Chronic psychiatry patients need to take medications for a long time. An adverse effect of these medications is xerostomia, a condition that frequently impairs oral health. Xerostomia can cause problems with speaking, chewing, swallowing, problems with wearing dentures, dental caries and intraoral infections.<sup>[10]</sup> In this study, more than one-half of the patients complained of xerostomia. Moreover, most patients had oral infections. This

suggested that these patients have frequent oral infections because they have insufficient oral hygiene, and they are deprived of the protective effect of saliva. Their average age was approximately 50 years. In addition, biochemical, immunological, or microbiological changes that may occur in the composition of saliva resulting from medication use decreases the quality of saliva and increases the risk of infection. *Candida*-type infections are especially likely to occur because the mechanical cleaning and moisturizing effects of saliva are decreased.<sup>[10,11]</sup>

Candidosis is the most common oral fungal infection in humans. In fact, *Candida albicans* may be a component of the normal flora: As many as 30-50% of people simply carried the organism in their mouths without clinical evidence of infection.<sup>[10]</sup> In this study, *Candida*-type microorganism was isolated in the oral flora of 21 (21%) patients. On clinical examination, 5 patients were diagnosed as having angular cheilitis, and 8 patients were diagnosed as having oral candidosis.

Dietary control is especially important in patients with xerostomia and candidosis. Xerostomia-associated eating and swallowing problems can inhibit intake of fiber-rich foods, restricting some people to a primarily soft and carbohydrate diet. Accordingly, patients must be counseled on a well-balanced nutritionally adequate diet and the importance of limiting sugar intake, particularly between meals.<sup>[12]</sup> In the present study, the patients with xerostomia were advised to use liquid or gel salivary products, to avoid caffeine-containing beverages, use fluids during meals and to have dental examinations at least every 6 months.

A fissured tongue is a relatively common condition that is characterized by the presence of numerous grooves or fissures on the dorsal tongue surface. The etiology is uncertain, but heredity, aging, local environmental factors have been proposed as the causes for this condition. Although most studies have shown that the prevalence of fissured tongue ranges from 2% to 5% of the overall population, some studies report the presence of fissured tongue in as many as 30% of the older adults.<sup>[10]</sup> In this study, 27 (27%) patients had a fissured tongue that may be because of high average age of the studied population. The frequency of fissured tongue was 61.4% in the study, which was considerably higher than the frequency of other tongue anomalies. In addition, microorganisms obtained from the oral mucosa of 4 patients with fissured tongue were factors [Table 5]. This may be because a fissure in the tongue is a suitable environment for the settlement and proliferation of microorganisms, saliva and tooth brushing cannot remove microorganisms, and these microorganisms cause oral mucosa infection. The patients with fissured tongue were advised to brush their tongues because debris entrapped in the grooves may act as a source of irritation.

Temporomandibular joint (TMJ) disorders are common in the general population. Studies report that 50-75% of the population has one or more symptoms of TMJ disorder.<sup>[13]</sup> People with chronic psychiatric illnesses are more inclined to have TMJ symptoms and bruxism.<sup>[14]</sup> The results of this study showed that TMJ disorder was present in 37 (37%) patients, hypermobility in 25 (25%), pain in 4 (4%) and bruxism in 3 (3%). Despite the general notion that stress triggers bruxism, some studies report that anxiolytic drugs eliminate it. For example, one study found that diazepam decreases bruxism.<sup>[15]</sup> Our study supported these findings and in that there were few instances of TMJ disorder and pain symptoms and bruxism were rare.

Human and animal bites cause penetrating, laceration, crush, and fracture (i.e. tissue loss) types of wounds; they may cause infection, deformity, and serious complications that may even lead to death.<sup>[16,17]</sup> The risk of developing infection varies, depending on the pathogens in the oral flora of the biter. Many wound infections are polymicrobial. The predominant aerobic organisms recovered from the human bite wounds are alpha- and beta-hemolytic streptococci, *S. aureus*, *Staphylococcus epidermidis*, *Corynebacterium* spp., and *Eikenella corrodens*. *S. aureus* is historically associated with more severe bite wound infections; it frequently produces  $\beta$ -lactamase and is generally resistant to penicillin.<sup>[17]</sup> In this study, 4 patients had *S. aureus* in their oral flora. Knowledge of the dominant flora of patients can guide clinicians in determining empiric treatment for an infection until the culture results are reported.

## Conclusion

The oral hygiene of most patients was insufficient. People with psychiatric illnesses, the staff caring for them, and families of the patients should be informed regularly about oral care. When necessary, these patients should be directed to dental clinics that provide oral dental health services as an important part of the provision and maintenance of oral-dental health. The high prevalence of xerostomia that we found in our study can be attributed to the high average age of patients and the medications they use. Patients who have xerostomia should use commercial artificial saliva products and products that stimulate saliva (e.g. sugar-free gum) and should avoid drinks containing alcohol and caffeine. The prevalence of a fissured tongue in this study was higher than the prevalence reported by other studies conducted on overall populations. Patients with a fissured tongue should be encouraged to brush their tongue, because food and debris collected in the grooves may act as a source of microorganisms. Gram-positive cocci should be considered in treating injuries caused by deliberate or involuntary bites by people with psychiatric illnesses. Dominant Gram-negative bacillus growth in the oral flora of patients with psychiatric problems can be explained by

poor hand hygiene. It may be useful to educate patients and inform the staff on this issue and to observe patients more frequently.

## Limitations of the study

There are some limitations of this study. One, our study group included psychiatric patients, and we therefore had difficulties in taking a medical history. Thus, we based our findings on the patients' intraoral examinations. Two, the patients' dental examinations were not performed in a fully equipped dental clinic. Three, radiologic examinations of the patients could not be performed.

Further studies investigating the dental status of psychiatric patients should be performed. We recommend that researchers who conduct future studies on this issue examine patients, if possible in fully-equipped dental clinics and take dental radiographs.

Aerobic cultures were obtained from the samples. Therefore, anaerobic bacteria that can cause infection in the mouth could not be produced. For this reason, we did not aim to detect obligatory anaerobes in mixed infections with growing bacteria. The production and identification of obligatory anaerobes are difficult and require additional costs and additional testing.

We noted whether Gram-stain examination supported culture results. Since the isolated Gram-negative *Bacilli* were different from bacteria (e.g. *Escherichia coli*, *Klebsiella*, *Pseudomonas*) produced in routine bacterial culture, the methods used for typing were insufficient. Therefore, advanced methods such as genetic typing are required.

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This study was approved by Ondokuz Mayıs University Medical Research Ethics Committee (number: 2012579).

The study was performed at a special nursing home that cares only about psychiatric patients in Samsun, Turkey.

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