

# Tooth wear among patients suffering from mental disorders

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## Summary

**Aim.** Assess oral health, treatment needs and the correlation between tooth wear and medications in patients with psychiatric disease.

**Methodology.** 92 patients (40 male and 52 female) admitted in the Department of Neurology and Psychiatry of the Umberto I Hospital of Rome underwent an oral and dental clinical examination in accordance according to World Health Organization Basic Methods Criteria. One dentist performed all clinical examinations, training and calibration was carried out by an experienced clinical examiner. To measure the degree of inter-examiner agreement Kappa statistics was calculated. Level of tooth wear was assessed using the tooth wear classification of Johansson et al. Exact psychiatric pathology and medications of each patient were registered. The Statistical Package for the Social Sciences (SPSS Inc., Chicago, Ill.) was used to analyze the data. A value of  $P < 0.05$  was considered statistically significant.

**Results.** 34.78% of the sample regarding tooth wear demonstrated score 2. Men demonstrated 30% score 2, and 20% score 3 and 4 whereas female patients 38.46% score 2, 7.69% score 3 and none score 4.

**Conclusions.** Chronic exposure to neuroleptic drugs can cause phenomena of bruxism. There is a direct correlation between tooth wear, psychiatric disorders and administration of certain drugs. Poor oral hygiene and extensive unmet

needs for dental treatment were widespread among psychiatric patients.

**Key words:** tooth wear, psychiatric disorders, bruxism.

## Introduction

Wear is described as the progressive loss of material from the contracting surfaces of a body, caused by relative motion at the surface (1, 2). Tooth wear is a complex, multifactorial phenomenon with the interplay of biological, mechanical, chemical and tribological factors (2). Over the last fifty years we have witnessed a general improvement of the oral hygiene, surely due to awareness campaigns, prevention and large scale access to dental services. In spite of all these measures that certainly improved the oral and dental health status; teeth because of their function undergo a slow but gradual wear due to normal aging (3-5), so it may be considered a physiological process with an expected annual rate of wear of approximately  $11\mu\text{m}$  (6); in some cases, this wear is accentuated by diseases, disorders and administration of certain drugs through their side effects (dry mouth, salivary gland hypofunction, muscle rigidity) could lead to a significant friction between the occlusal surfaces of teeth resulting in increased wear. Therefore amount of tooth wear depends on factors such as muscular forces, lubricants, patient diet habits and the type of the restorative material used (7). Specifically erosion-related wear is increasing in the general population (8, 9). The presence of teeth worn has become a common phenomenon in modern dentistry especially in aging population (2, 10). This could be the result of the increased interest in retaining teeth as opposed to having them extracted (11). However tooth wear is a clinical finding in all age groups (12-14). The terms attrition, abrasion, erosion and abfraction all have been used to describe the loss of tooth structure (2), but they only describe clinical manifestations of a number of events without including the causative factor (15). Attrition which is defined as a gradual loss of hard tooth substance from occlusal contacts with an opposing dentition or restoration, is related to aging but may be accelerated by extrinsic factors such as parafunctional habits of bruxism, traumatic occlusion in the partially edentulous dentition and malocclusion (16, 17). Clinically occlusal wear attributable to attrition will produce equal and matching wear facets on opposing teeth (18, 19).

Abrasion is the loss of tooth substance through mechanical means, independent of occlusal contact (20). The most common cause of dental abrasion is tooth brushing (16, 21). Abfraction describes loss of tissue in the cervical region as a result of crack formation during tooth flexure (10, 19). Mastication and malocclusion play a major role in abfraction lesions (22). Dental erosion is defined as loss of tooth structure by a non bacterial chemical process (18, 20). The source of acid can be endogenous, such as from gastric reflux, or exogenous from acidic foods and drinks (23); the distribution and wear pattern of erosion is specifically associated with origin of the acid and the posture of the head when the acid is present (24, 25). Patients with bulimia or gastric reflux present the lingual surfaces of their maxillary anterior teeth severely affected while their mandibular teeth are protected from the erosive effect by the tongue and saliva (24). To determine if tooth wear is a result of abfraction, erosion, abrasion or erosion is really difficult since these factors could act together with other ones masking in this way the true nature of tooth wear (18).

According to literature, tooth wear is more likely to be associated with bruxism than with temporomandibular joint disorders (TMJD). Although an association between tooth wear and TMJD has been reported (26, 27), most studies indicate that TMJD is not a risk factor for tooth wear (28-34). Bruxism on the other hand has been consistently implicated in tooth wear etiology (28, 35-37).

Bruxism is defined as the oral activity characterized by grinding or clenching of teeth without the presence of food (38). The symptoms that confirm the presence of this disease are: grinding noise, pain in jaw muscles, pain in the temporomandibular joint (TMJ), headaches and neck pain. Clinically patients who suffer from bruxism present: tooth wear, sucking the cheeks, tongue jagged, tooth fracture, ankylosis, failure of dental prosthesis or dental restoration due to wear temporomandibular joint disorders and difficulty in prosthetic rehabilitation. However, it is appropriate to differentiate two types of bruxism: awake bruxism and sleep bruxism. Bruxism is a very common condition, most people it is estimated around 80-90% at least once in their lifetime had symptoms of grinding (39), the prevalence of the phenomenon is estimated between 5-8% in general population according to the majority of the authors (40-46). Sleep bruxism is an oral habit characterized by a rhythmic activity of the temporomandibular muscles that causes a forced contact between dental surfaces during sleep. It is accompanied by tooth clenching or grinding that can be loud enough to be heard by the bed partner. A Canadian study reported an 8% prevalence of tooth grinding during sleep (47). A Finnish twin cohort study, reported tooth grinding at least once a week in 3.7% of the women and 3.8% of the men (48). Another 2 international studies found a rate of 10% of sleep tooth grinding (49, 50). Anxiety disorders and stress are known factors for exacer-

bating sleep bruxism (51-53); about 69% related their sleep bruxism or its aggravation to stress or anxiety (54).

## **Materials and methods**

A sample of: 92 patients (40 male and 52 female) with average age of 40 years were submitted to our investigation. All subjects gave their consent to participate in this study. The patient selection was made randomly among the patients at the Day Hospital of the Department of Psychiatry at the Sapienza University of Rome. All patients were medically balanced; none was under a psychotic attack and were all capable of understanding the supplied information. The fact that the screening was completely free of charge guaranteed a heterogeneous sample in terms of socio-economic status and oral health. Indeed, the examinations, not necessarily conducted in the presence of pain, involved both dentally healthy subjects and subjects affected by different dental diseases. Clinical examination was conducted by the same calibrated operator registering:

- i) oral hygiene status, utilizing the Green and Vermillon Simplified Oral Hygiene Index (OHI-S) (55)
- ii) degree of tooth wear using a method derived from the criteria set by Johansson et al. (56)
- iii) the type of psychiatric diagnosis and drug therapies in place.

For each individual were made four three intra-oral photographs and a facial profile. The purpose and procedures of the study were explained to the participants and informed consent was obtained. Information on diagnosis and treatments was collected from the patient's medical charts and files. Moreover during the phases of the anamnesis a series of questions have been carried out based on a table formulated by the working group. Interviews typically began with a standard questionnaire. It consisted of sociodemographic information, sleep/wake schedule, physical health queries, and questions related to sleep and mental disease symptoms. All questions required were made for entire diagnostic descriptions according to the International Classification of Sleep Disorders (ICSD) (57) and the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV) classifications (58). The duration of interviews ranged from 20 to 60 min and were all completed in one session. The ICSD (57) suggests the following as minimal criteria for sleep bruxism: (I) the presence of teeth grinding during sleep; and (II) at least one of the following associated features: abnormal tooth wear, muscular discomfort, or sound associated with the tooth grinding.

## **Classification of tooth wear**

Various systems for classifying and evaluating the wear of the teeth exist. Tooth wear indices are the

most popular method of quantifying wear over a long period of time as they are readily available and do not require special equipment (59). Many of these use a five-point scale based on severity of dental wear. Intra-examiner reliability are of key importance for the usefulness of these methods, and reliability of these approaches has been confirmed in many studies, but no method is universally accepted (60). Measurements can also be recorded by the use of laser profilometry (61) or stereomicroscopy images and computerized image fitting (62). 3D laser scanning can be used to scan the surface of a replica to construct a 3D image for quantifying the wear more accurately (63). In addition to traditional rating systems there have been recently introduced sophisticated and complex wear simulators, but a clear correlation between *in vitro* and clinical data has not been established (26). Moreover clinical performance of dental biomaterials cannot be precisely predicted and oral environment cannot be simulated simply because standard oral conditions doesn't exist (64). However, the usefulness of all these innovative diagnostic tools in a clinical setting is questionable despite improved accuracy and reliability they have a high cost and require specialized hardware and software restricting their use in everyday dental practice (65).

The degree of tooth wear for each tooth was classified according to a method that is derived from the criteria set out by Johansson et al. (48). The dental wear evaluation procedure was performed with the patient sitting upright in a dental chair, wiping the surfaces of teeth with a jet of air and cotton wool. Degree of wear was estimated by direct vision or by using a mirror according to five criteria:

- Score 0: no visible facet in the enamel. Morphology of the occlusal/incisal intact.
- Score 1: marked wear facets in enamel. Morphology of the occlusal/incisal altered.
- Score 2: wear into the dentin. The dentin is exposed occlusal/engraved or on an adjacent tooth surface. The morphology of the occlusal/incisal has changed in shape with a reduction in height of the crown.
- Score 3: extensive wear into dentin. Dentine area larger (> 2 mm square) exposed to occlusal/incisal. The morphology of the occlusal/incisal totally lost locally or generally. Substantial loss of height of the crown.
- Score 4: wear in the secondary dentin.

### Statistical analysis

Statistical analysis was performed using SPSS Inc, ver. 13.0, Chicago, IL, USA. Chi-squared test was used for statistical evaluation of proportions. Students T-test for 2 independent means was applied. In cases with more than 2 independent means we used the ANOVA test. Moreover wherever necessary a linear regression analysis was performed. A p-value of less than 0.05 was considered significant. A 95% CI was used in all analysis.

### Data reliability

In order to check intra-examiner and inter-examiner levels of data consistency:

- Both examiners received a 6 month training in assessing these measures and indices.
- Kappa statistics were calculated regarding tooth wear, oral and hygiene status; inter-examiner value for the first examiner respectively was 0.86, 0.84, and 0.88, 0.86, for the second one.
- Each examiner was calibrated separately against the experienced supervisor.
- Recalibration sessions were conducted periodically through data collection; every 15 patients a random sample of three patients were re-examined separately by both investigators in order to ensure data reliability. During the cross-checking sessions each examiner was blinded to previous data collected and to information regarding the patient's anamnesis.
- Upon reexamination no significant differences in scores were noticed.
- Data were entered in two different personal computers by the two examiners, the two data files were compared in order to detect entry errors. The two files resulted identical.

### Results

The sample was composed of 92 patients; 56.52% were women and 44.48% were men (Fig. 1):

- 5% of male patients and 8% of female patients showed values between 0.3 and 0.6, as evidence of a satisfactory state of oral hygiene (Fig. 2).
- 13% of male patients and 13% of female ones showed values between 0.7 and 1.8 as evidence of a medium degree of oral hygiene (Fig. 2).
- 83% of male patients and 79% of female ones reported values between 1.9 and 3.0 corresponding to a poor oral hygiene (Fig. 2).

The mental disorders registered during the examination of the sample are:

- 1) paranoid schizophrenia
- 2) disorders of language
- 3) dysthymia
- 4) schizophrenia
- 5) residual psychosis
- 6) mental retardation
- 7) schizophrenia undifferentiated
- 8) psychoneurosis
- 9) personality disorders
- 10) depressive disorders
- 11) psychosis
- 12) adjustment disorders
- 13) disorders of power
- 14) moderate depression
- 15) anxious depressive syndrome
- 16) affective syndrome dipolar
- 17) affective disorders of the personalities
- 18) bipolar disorder grade II
- 19) alcoholism.

Side effects of the various medications received from the patients are reported in Table 1.

Grade 2 tooth wear was registered in 34.78% of the patients whereas grade 1 in 23.19% of the patients,

grade 0 19.57%, grade 3 13.04% and grade 4 8.70% (Fig. 3).

By comparing the degree of tooth wear in the two sexes separately we observed a greater degree of wear fe-

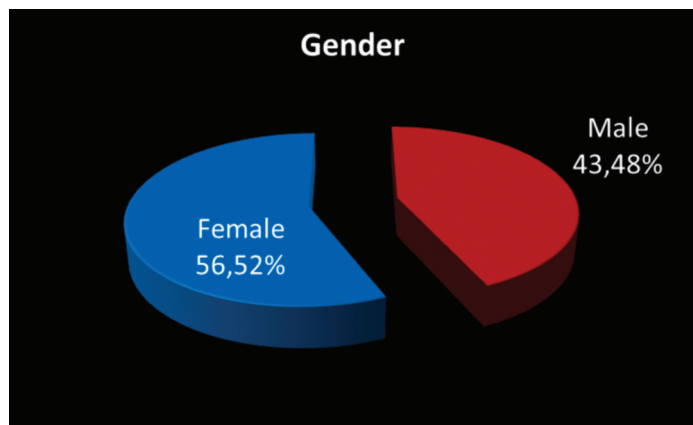


Figure 1. Percentages of male and female patients of the sample.

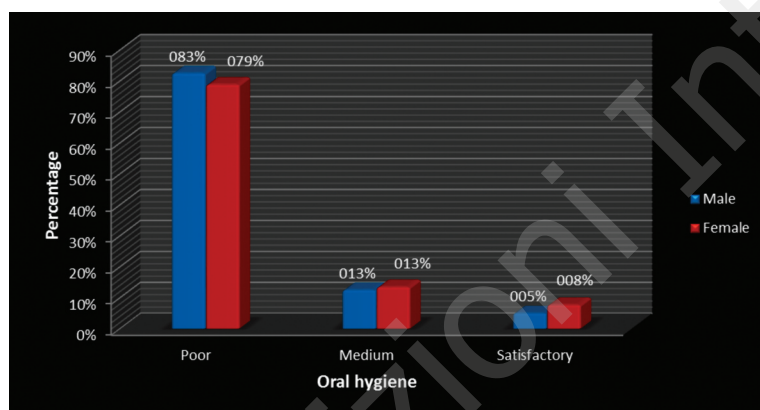


Figure 2. Oral hygiene of sample.

Table 1. Side effects of medications administered to the sample.

Drug	SIDE EFFECTS
<b>SEROQUEL:</b>	<i>drowsiness, dyspepsia, constipation, <u>dry mouth</u>, asthenia, rhinitis, tachycardia.</i>
<b>TRANQUIRIT:</b>	<i>drowsiness, dyspepsia, constipation, <u>dry mouth</u>, asthenia, rhinitis, tachycardia.</i>
<b>DEPAKIN CHRON:</b>	<i>gastric irritation, nausea, hyperammonemia, weight gain, transient loss of hair, aggression, hyperactivity, behavioral problems, ataxia, <u>tremors</u>, lethargy, drowsiness, hallucinations, anemia, skin rash.</i>
<b>LEPONEX:</b>	<i>constipation, hypersalivation, <u>dry mouth</u>, nausea, vomiting, anorexia, tachycardia, hypertension, <u>tremors, rigidity</u>, seizures, sweating, arrhythmias, myocarditis, delirium, respiratory depression, hyperlipidemia, skin reactions.</i>
<b>AKINETON:</b>	<i>constipation, <u>dry mouth</u>, nausea, vomiting, tachycardia, dizziness, confusion, euphoria, hallucinations, memory impairment, anxiety.</i>
<b>TAVOR:</b>	<i>drowsiness confusion, ataxia, amnesia, dependence, aggression, <u>muscle weakness, dry mouth</u>, gastrointestinal and visual disturbances.</i>
<b>CYMBALTA:</b>	<i><u>dry mouth</u>, gastrointestinal disturbances, constipation, eye dryness, difficulty of urination, headache, arrhythmias.</i>
<b>RIVOTRIL:</b>	<i>drowsiness, fatigue, dizziness, <u>muscle hypotonia, coordination disturbances</u>, restlessness, confusion, amnesia, dependence, hypersalivation, pruritic, visual disturbances.</i>
<b>FELISON:</b>	<i>drowsiness, confusion, ataxia, dependence.</i>

males; about 38% of females showed the grade 2 compared with 30% of males (Figs. 4, 5). Similarly 38% of the females showed grade 1 tooth wear while the percentage for males ranged around 20% (Figs. 4, 5). It is important however to note that while the degree of wear 4 reaches 20% in males, females have not presented a single case (Figs. 4, 5).

Regarding medications was found that about half of female patients taking the Depakine chon compared to 20% of male patients (Fig. 6). Moreover 20% of males receive Seroquel while 23% of female patients receive Tranquirit (Fig. 6). Figure 6 lists all drug therapies lists of the sample comparing the various rates between the sexe

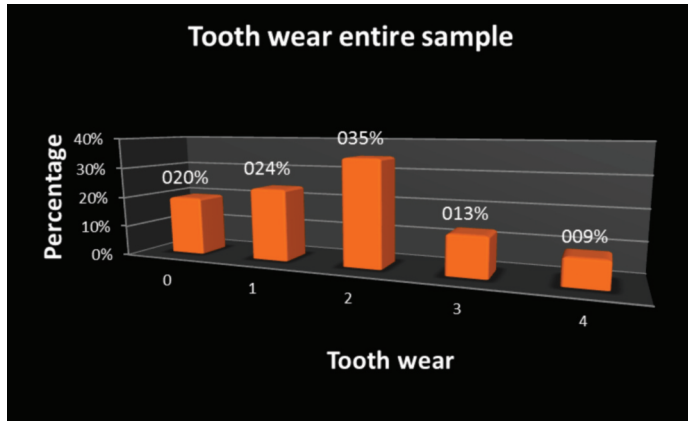


Figure 3. Tooth wear of patients.



Figure 4. Degree of tooth wear on male patients.

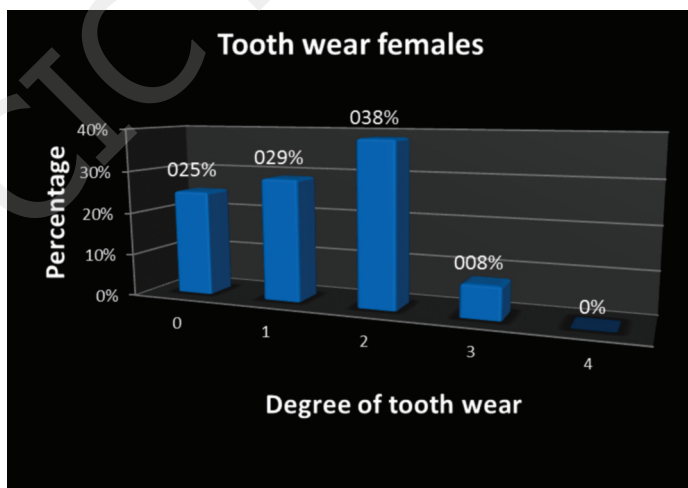


Figure 5. Degree of tooth wear on female patients.

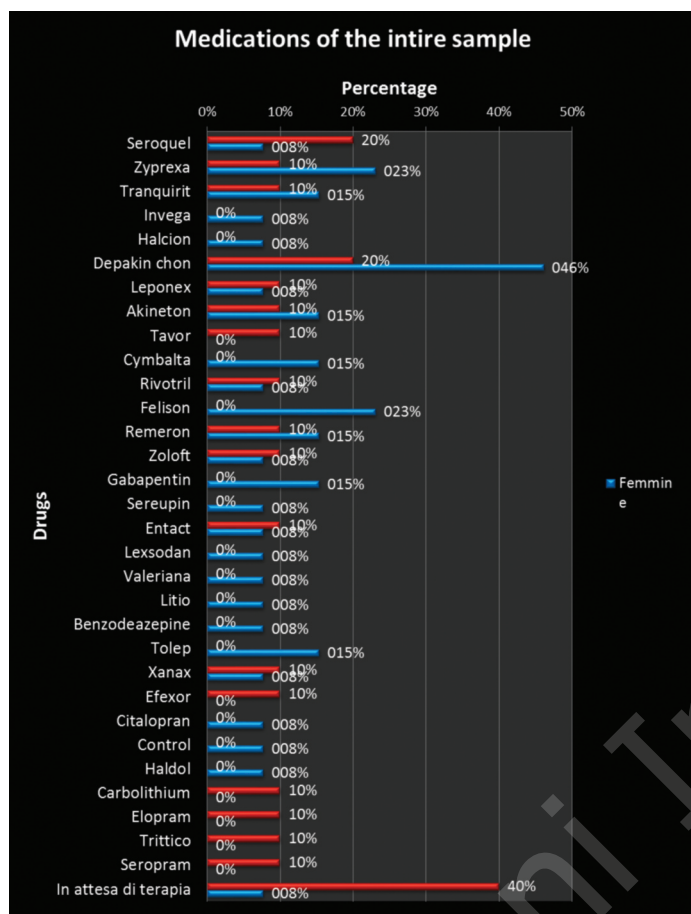


Figure 6. Medications administered to the entire sample.

## Discussion

Psychiatric patients are turning to the dentist much more rarely than the general population (66). Taking into account that the 2 main reasons that the general population avoids going to the dentist are dental care anxiety and the cost of care it is natural that those factors generally are accentuated in the population of patients suffering from mental disorders. Another reason that influences the low affluence of psychiatric patients to the dentist is pain insensitivity that mental disorders patients demonstrate and could be a result of the pathology itself or a side effect of the medications that they receive. Insensitive to pain associated with illness and injury, has been reported frequently in this population (67-73). It is important to underline that even if severe tooth wear has an impact on oral pain levels (74), in the population studied none of the patients examined referred oral or tooth pain. Pain insensitivity could lead to a delay in diagnosis and treatment.

On examination it was found a general and widespread neglect of oral hygiene. During the clinical examinations we registered cases of gingival hyperplasia and in some cases dental abscesses that persisted for a long time. Patients suffering from long term psychiatric illness are on medication for long periods

suffering from xerostomia leading to gingivitis, periodontitis, stomatitis and increased risk of caries; therefore oral hygiene is of great importance for these patients (66, 75, 76). In some subjects we noted the presence of old incongruous dental prosthesis associated with a very poor hygiene. Males in our study in concordance with international literature (66) showed a lower index of oral hygiene than females and that value resulted statistically significant at the  $\chi^2$  test. The majority of the patients are not self-sufficient with regard to oral hygiene and in terms of access to dental care.

In our study we registered a high prevalence of tooth wear in our sample (80%) whereas in international literature in studies that involve general population of all ages this percentage doesn't exceed 20% (30,77). Wear at the majority of the patients involved sites of occlusal contact only a small part (7%) of the female population examined showed tooth surface loss with characteristics of erosion in noncontact areas and around contact areas typical of acid regurgitation resulting from gastroesophageal reflux disease (GERD). Interviewing this part of the sample didn't occur that they consume highly acidic carbonated beverages or fruit juices. Habitual sucking of lemons other fruits or tomatoes weren't referred.

On the basis of the presence of both clinical and anamnestic indicators authors retain that the majority (93%) of the registered wear at the sites of occlusal contact derives from either awake bruxism (60%) or sleep bruxism (40%).

Authors retain that there is an association between bruxism psychiatric disorders and their medications that can cause phenomena such as: dry mouth, muscle stiffness, hypofunction of salivary glands. Given the nature of our study we cannot claim that surely medications and not the pathologies themselves cause bruxism but international literature support the correlation between medications and bruxism. It is worth noting that a psychological stress component may play a role, but not all tooth grinders have emotional problems (78). Another international study highlighted the use of the Naranjo Adverse Drug Reactions Probability Scale, which indicated a highly probable relationship between the bruxism and long-term exposure of neuroleptic therapy (79). Moreover various cases of antidopaminergic related bruxism have been reported (80). Furthermore suggested involvement of adrenergic, serotonergic, and dopaminergic systems in the pathogenesis of bruxism, as the side effects were relieved after propranolol was added to ongoing antipsychotic treatment (81). It has been postulated that disturbances in the central dopaminergic system, especially within the mesocortical tract, are linked to bruxism (82, 83) and selective serotonin reuptake inhibitors (SSRIs) induced bruxism (84, 85). SSRI-induced bruxism is considered to be a consequence of serotonergically mediated inhibition of the dopaminergic system.

Absence of tooth wear of grade 4 in our study in the female population and a 20% prevalence in the male one is probably reflecting the higher bite force of males compared to females (36).

It is worth noting underline the fact that authors faced an unexpected collaboration and will from the majority of the psychiatric patients to undergo a clinical examination, phenomenon that other authors in other studies have noted too (86).

## Conclusions

Our study in accordance with the international literature showed a high frequency of psychiatric patients who suffered from tooth wear. Many drugs administered during psychiatric therapy often act as an endocrine disruptor with a marked decrease in saliva, in other cases with stiffness muscle factors that will surely accentuate the level of wear of the teeth no longer lubricated by saliva. From the results shown by us and by a careful review of the literature we can say that certainly there is a correlation between tooth wear and administration of certain psychiatric drugs. Therefore it is more than necessary to introduce the figure of the dentist in psychiatric institutions in order to monitor the oral health of these patients. Prevalence of dental disease in this population usually is extensive because of disinterest in performing appropriate oral hygiene techniques and diminished sali-

vary flow. Special precautions must be taken when performing surgery and when prescribing or administering analgesics, antibiotics or sedative agents that are likely to have an adverse interaction with psychiatric medications. Preventive dental education use of saliva substitutes and anticaries agents are indicated. An improved understanding of the factors associated of tooth wear may lead to more effective interventions. Tooth wear is a public health problem and the multitude of indices and flaws in existing indices make published data difficult to elaborate, analyze and interpret.

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