



Oral health and the symptoms of schizophrenia

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ABSTRACT

The objectives of this study were to evaluate the oral health of a group of schizophrenic outpatients and a control group without psychiatric illness. The study also aimed to assess the influence of positive and negative symptomatology on oral health among outpatients with schizophrenia. The DMF-T Index (sum of decayed, missing and filled teeth) and the Community Periodontal Index of Treatment Needs (CPITN) were assessed in both groups. We evaluated the psychopathological state of the patient group using the Positive and Negative Syndrome Scale (PANSS). The schizophrenic patients had higher scores than the control group with respect to decayed teeth (4.39 vs. 0.72), missing teeth (5.66 vs. 1.50), the DMF-T index (13.51 vs. 7.8) and CPITN (2.32 vs. 1.04); and lower scores for filled teeth (3.53 vs. 5.54). The PANSS negative subscale score correlated positively with the oral health variables studied, whereas the PANSS positive subscale score correlated negatively and exclusively with the number of missing teeth. Age and smoking status affected oral health in both groups, but even when the influence of these factors was considered, the oral health of the patients was poorer than that of the control group.

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1. Introduction

Physical health problems in people suffering from schizophrenia have been generally underestimated in the past, despite the existing scientific evidence that these individuals have poorer physical health and shorter life expectancy in comparison to the general population (Stiefel et al., 1990; McCreadie, 1993; Thomas et al., 1996; Velasco et al., 1997; Lewis et al., 2001; Thakore et al., 2002; Ryan et al., 2003; McCreadie et al., 2004; Tang et al., 2004; Kilian et al., 2006). In recent years, concern regarding the detection and treatment of physical problems in this population has increased. One of the physical health areas given little attention in this group of patients is oral health (Dicks, 1995; Chalmers et al., 1998; McCreadie et al., 2004). Most of the existing literature has been published in specialty journals in the field of oral health, and the majority of the studies have focused on hospitalized patients (Friedlander and Liberman, 1991; Phillips et al., 1995; Thomas et al., 1996; Kalish, 1997; Velasco et al., 1997; Griess et al., 1998a; Chuong, 1999; Diz Dios et al., 2000; Lewis et al., 2001; Blumensohn et al., 2002; Friedlander and Marder, 2002; Tang et al., 2004; Yaltirik et al., 2004).

The available evidence suggests a higher prevalence and severity of periodontal disease among patients with schizophrenia, as compared to the general population (Bohlmann et al., 1986; Friedlander and Brill, 1986; Ikeda et al., 1986; Barnes et al., 1988; Clark, 1992; Angelillo et al., 1995; Kenkre and Spadigam, 2000; Lewis et al., 2001; Dickerson et al., 2003; Ramon et al., 2003; Stanfield, 2004; Leucht et al., 2007). Multiple interrelated factors have been considered in efforts to explain this relationship.

Antipsychotic drugs, some antidepressants and lithium can cause xerostomia, which is associated with several dental disorders, including caries, gingivitis glossitis, stomatitis, parotiditis, fissured tongue and tongue atrophy, and oral ulcers (Friedlander and Norman, 2002). The incidence of these symptoms is often increased by the concomitant use of anticholinergic drugs, which are prescribed with high-potency antipsychotics in order to alleviate the Parkinsonian side effects of these psychiatric drugs (Friedlander and Marder, 2002). The consequence of the resulting hyposalivation is the worsening of periodontal diseases and rapid development of caries. These conditions are exacerbated by the consumption of chewing gum, sweets and drinks with a high sugar content in response to the patients' xerostomia and corresponding constant feeling of thirst (Friedlander and Liberman, 1991). In addition, there are biochemical, immunological and microbiological changes in saliva composition that lead to an increase in the risk of infections. Similarly, the occurrence of treatment side effects that affect orofacial musculature—e.g., acute dystonias, pseudoparkinsonism, and tardive dyskinesia—contributes

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to a higher prevalence of periodontal diseases and even difficulty in dental treatment (Friedlander and Marder, 2002). In addition, owing to the clinical characteristics of psychiatric disorders, a high percentage of patients lack the skills, physical dexterity and/or motivation to adopt and maintain good oral hygiene habits. Moreover, it seems that the majority visit the dentist only when they have serious oral problems and do not bother with routine dental checks. These facts may explain the higher proportion of teeth with caries and of extractions as compared with the general population (McCreadie et al., 2004; Persson et al., 2009). Furthermore, there seems to be a tendency among dentists to treat psychiatric patients by extracting the teeth that cause pain instead of carrying out complex treatments of preservation or restoration (Griess et al., 1998a; Ramon et al., 2003).

Positive symptoms such as hypochondriac delirious ideas involving the mouth may trigger bizarre behaviors leading to self-harm, including glossectomies, self-extraction of teeth, and self-inflicted injuries in the gingival mucosa using fingernails, cigarettes, or other objects (Friedlander and Liberman, 1991; Brown and Lambert, 1995).

In addition, more than three-quarters of people suffering from schizophrenia smoke heavily. Smoking is associated with emphysema, lung cancer, heart diseases and oral cancer (Friedlander and Marder, 2002).

Finally, some authors support the idea that schizophrenia is not due solely to a neurodevelopmental disorder, but rather to a general developmental disorder with subtle anatomical anomalies, several minor physical differences in the area of the mouth having been found in people with schizophrenia (Kirkpatrick et al., 2007).

The objective of this cross-sectional and observational study was to assess the oral health status of a sample of people with schizophrenia seen in community care units (not hospitalized), as well as to compare these patient profiles with those of the general population. In addition, the study aimed to explore the influence of schizophrenic symptomatology on oral health.

2. Methods

2.1. Patients and controls

The study was carried out in five outpatient centers in Vizcaya, Spain. Initially, all the patients at the day centers ($n = 77$) were candidates for our study. Eleven of them were not included in the research: one patient was admitted to a hospital and the other 10 refused to participate. There were thus 66 patients who completed the study. A written informed consent was obtained after a thorough description of the study to the participants. In the case of the six patients disqualified due to their disability, the consent was signed by their legal representatives. The study was approved by the Clinical Research Ethics Committee of the Basque Health Service and was in accordance with the Declaration of Helsinki.

The inclusion criteria for the group of psychiatric patients were as follows: (1) diagnosed with schizophrenia (DSM-IV-TR) (American Psychiatric Association, 2000); (2) have had the psychiatric condition for at least 2 years; (3) have taken antipsychotic medication for at least 2 years; (4) being treated as an outpatient in a day center; and (5) over 20 years old (at least 18 years old at diagnosis).

The controls for the comparative study were volunteers (health professionals and university students). The criteria for inclusion were no medical history of psychiatric illness or treatment with any antipsychotic medication. The control group was matched with the patient group, and the rate of drop-out in the control group was adjusted to that of the patient group.

2.2. Clinical assessments

The clinical history of patients was obtained, and their psychopathological state was assessed using the Positive and Negative Syndrome Scale (PANSS) (Kay et al., 1987). The subscales of the PANSS that describe positive and negative symptomatology were applied separately. The PANSS negative subscale (PANSS-N) includes the following symptoms: blunted affect, emotional withdrawal, poor rapport, passive social withdrawal, difficulty in abstract thinking, lack of spontaneity and flow of conversation, and stereotyped thinking. The PANSS positive subscale (PANSS-P) includes delusions, conceptual disorganization, hallucinatory behavior, excitement, grandiosity, suspicious/persecution and hostility.

Dental examinations were undertaken by a team consisting of a dentist and an experienced assistant; they used portable equipment. The examinations were carried

out in the corresponding centers. The specific dental examinations performed for both groups (patients and control) were the following:

- *Assessment of the DMF-T index:* With a standard round mouth mirror and a dental explorer, we determined the number of permanent teeth with caries (D, decayed), missing teeth (M) and restored teeth (F, filled). The dental explorer is an instrument with a hook-shaped edge used to determine the presence of tooth decay on tooth enamel. The sum of these three values gives the DMF-T index for that person. The criterion for caries was that used by the World Health Organization (WHO, 1977). If a restored tooth had recurrent caries, the tooth was considered to be “with caries”. Third molars were excluded from the study.
- *Assessment of the modified Community Periodontal Index of Treatment Needs (CPITN):* Periodontal probing was performed with a mouth mirror and a WHO periodontal probe; the teeth were divided into sextants, and the highest probing value (that is, depth to which the probe could be inserted, in millimeters) was recorded for each tooth. The average pocket depth for each patient was calculated using the arithmetic mean of the maximum values recorded for the teeth examined (Cutress et al., 1987). The coding used for the index was: 0—healthy; 1—bleeding; 2—supragingival and subgingival calculus, overhanging restorations; 3—pockets of 4–5 mm; 4—pockets of >6 mm; and X—excluded sextant.

2.3. Statistical analysis

Statistical analysis was performed with the Statgraphics Plus program. The comparison of average values of measurements taken from the two groups (patients vs. control) was carried out using two-tailed Student's *t*-test. For data lacking a normal distribution, the nonparametric Mann–Whitney test was used for the comparison of medians. The strength of the association between qualitative variables was analyzed using Pearson's Chi-square test, and the relationship between dental and psychopathological measurements was determined using Spearman's correlation.

The influence of age, smoking status, and gender on oral parameters in both groups of individuals was investigated using a general linear model. The diagnostic group and gender were considered between-subjects factors, and the age and the number of cigarettes smoked were considered covariates. Only the variables that maintained significant differences at a level of $p < 0.05$ were included in the model. Post hoc analysis was performed by means of the Bonferroni method.

3. Results

From the initial samples of 77 individuals in each group (all Caucasian), 66 patients and 66 controls completed the study. The patient group, composed of 42 men (63.6%) and 24 women (36.4%), had an average age of 40.0 years (S.D. 11.2). In the control group consisting of 38 (57.6%) men and 28 (42.4%) women, the average age was 39.5 years (S.D. 10.9). The groups were thus comparable in terms of age ($t = 0.2343$ $p = 0.8150$) and gender ($\chi^2 = 0.29$, $p = 0.5931$).

In the control group, 39% of individuals smoked an average of 18 cigarettes/day (S.D. = 11); in the patient group, there were 71% of smokers (27 ± 10 S.D. cigarettes/day). This represents a significant difference in the proportion of smokers ($\chi^2 = 12.26$, $p < 0.001$) and the number of cigarettes smoked per day (Mann–Whitney test = 904, $p < 0.001$); both measures were higher for the patient group.

Average values for the dental health of the patient and control groups are given in Table 1. Patients had higher scores than the control group (free of psychiatric disease) for the following variables: D, M, DMF-T and CPITN; the controls had significantly higher scores for the variable F. A detailed description of the measures included in the CPITN index (Velasco and Bullón, 1999) is presented in Supplemental Table 1.

We investigated the effects of age, smoking status and gender on the differences found, and we observed that age and smoking were associated with worse dental health (DMF-T index) and greater need for periodontal treatment (CPITN index) in both patients and controls (Table 2). Taking into account the influence of age and smoking habits, the differences found in DMF-T and CPITN indexes between patients and controls remain significant, with higher values observed in the patient group. Gender did not affect the oral parameters measured in any group.

Analysis of each parameter individually (D, M and F) revealed that smoking affected the number of missing and decayed teeth, whereas age also affected the value of M (statistical analysis is shown in Supplemental Table 2). The M and D values were higher among smokers compared with non-smokers, and M was also higher for older

Table 1

Comparison of decayed, missing and filled teeth, DMF-T and CPITN index in schizophrenic patients and a control group.

	Psychiatric patients (n = 66)	Control group (n = 66)		p
D	4.39 (3.99)	0.72 (1.23)	W = 909.5	<0.001
M	5.66 (7.13)	1.50 (2.03)	W = 1281.5	<0.001
F	3.53 (3.19)	5.54 (3.62)	W = 2908.5	<0.001
DMF-T	13.51 (7.27)	7.80 (4.41)	t = 5.45	<0.001
CPITN	2.32 (0.81)	1.04 (0.87)	W = 603.0	<0.001

Values are expressed as the mean and (S.D.).

D = decayed teeth; M = missing teeth, F = filled teeth; DMF-T: sum of D, M and F; CPITN: community periodontal index of treatment needs; W = Mann-Whitney test. t = Student's t-test. p = p-value.

compared with younger people in both groups. However, taking into account the influence of age and smoking, the numbers of M and D teeth were higher in patients than in the control group. Neither age nor smoking habits were significantly associated with the number of filled teeth in any group.

The mean \pm S.D. scores on the PANSS-P and PANSS-N subscales were 13.7 ± 5.1 and 20.7 ± 7.8 , respectively. In this study (Table 3), psychiatric patients who had a high number of decayed and missing teeth, poor overall dental health (measured using the DMF-T index), and great need of periodontal treatment (measured using the CPITN index) also had high scores on the PANSS subscale that measures the negative symptomatology of schizophrenia. A statistically significant positive correlation was found between all the aforementioned oral variables and the scores on the PANSS-N, except for filled teeth, for which the correlation was negative. Conversely, patients with high scores on the PANSS positive subscale for schizophrenia had also few missing teeth.

4. Discussion

Studies have been published analyzing the dental health of hospitalized psychiatric patients using the DMF-T index (Thomas et al., 1996; Velasco et al., 1997; Lewis et al., 2001; Ramon et al., 2003). These studies report average total scores of 27.2, 25.3, 19.1 and 26.7, respectively, figures that are much higher than those obtained in our study (DMF-T index = 13.5). Several factors may explain this difference. First, in contrast to our study, in which all the patients were schizophrenic, these other studies included individuals with a great diversity of diagnoses (schizophrenic individuals represented only 62.3%, 23%, or 64.2% of the sample in the various studies). Second, the average ages in these samples (58, 56 and 70 years) were higher than in our study, in which the average age of the patients was

Table 2

Analysis of DMF-T and CPITN index using a General Linear Method (GLM). For each measure the significant factors and covariates are shown.

Dependent variable	Factors	Covariates	F	d.f.	p
DMF-T index (GLM)	Diagnostic		31.31	3128	<0.001
			14.46	1	<0.001
	Cigarettes		20.54	1	<0.001
		Age	37.45	1	<0.001
CPITN index (GLM)	Diagnostic		66.24	3125*	<0.001
			52.07	1	<0.001
	Cigarettes		44.44	1	<0.001
		Age	43.65	1	<0.001

P = p-value.

d.f. = degrees of freedom.

CPITN: community periodontal index of treatment needs; DMF-T: sum of decayed, missing and restored teeth.

Diagnostic = patients and controls.

Cigarettes = number of cigarettes/day.

Age in years.

* Three patients were edentated.

Table 3

Correlation coefficient between scores on the PANSS negative subscale (PANSS-N) and PANSS positive subscale (PANSS-P) with D, M, F, DMF-T and CPITN.

	PANSS-N		PANSS-P	
	r	p	r	p
D	0.3456*	<0.005	0.1748	
M	0.2440*	<0.05	-0.3487*	<0.005
F	-0.2851*	<0.05	-0.1365	
DMF-T	0.3527*	<0.005	-0.2119	
CPITN	0.5330*	<0.005	-0.1340	

P = p-value.

R = Spearman's correlation coefficient.

D = decayed teeth; M = missing teeth, F = filled teeth. CPITN: community periodontal index of treatment needs; DMF-T: sum of D, M and F.

* Significant coefficient of correlation.

40 years. Third, our patients, who were not hospitalized, appear to have been in a better psychopathological state, especially in terms of negative symptomatology, than the hospitalized patients in the aforementioned studies. The lack of a need for hospitalization is likely to correspond to better self-care and personal hygiene.

In accordance with the possibility that the symptomatology of schizophrenia may be a risk factor for poor oral health, one study (Thomas et al., 1996) included a subgroup of 57 non-hospitalized persons with schizophrenia, with a mean DMF-T score of 16.1. This value is much lower than that obtained for the authors' hospitalized patients and closer to the results obtained in our study.

Our results showing a positive correlation between negative symptomatology and poor dental health, as well as a greater need for periodontal treatment, are in accordance with those of Thomas et al. (1996), who found a direct relationship between longer hospitalization stays, more severe negative symptomatology and poor dental health. This suggests that the presence of negative symptomatology may often be associated with poor dental health. It is important to work with the patients with schizophrenia to improve basic self-care skills in order to achieve good dental health, and subsequently better general health, quality of life and self-esteem.

We did not find any positive correlation between the state of dental health and positive symptomatology. It seems that a good level of motivation, cooperation and healthy habits (in short, being adept with respect to daily skills such as hygiene and self-care) may be more influential factors in predicting improved dental health than the presence of bizarre behaviors secondary to hallucinations or delirious ideas concerning self-injury targeted at the mouth (such as a self-extraction due to the false belief of having a microchip in the tooth) (Friedlander and Liberman, 1991). The significant negative correlation between the PANSS positive subscale score and the number of missing teeth in patients may be explained by the fact that the youngest patients obtained higher scores on the PANSS-P test (Coefficient of correlation between age and PANSS-P score: $r = -0.300$, $p = 0.014$).

We have observed that smoking and age are associated with worse dental health and greater need for periodontal treatment in both patients and controls. Nevertheless, even after taking into account age and smoking habits, the oral health of patients was significantly worse than that of controls (Table 2). Additional factors may explain the differences observed. The antipsychotic medication causes xerostomia, which has been associated with caries and several oral diseases (Friedlander and Liberman, 1991; Friedlander and Norman, 2002). In addition, negative symptomatology may cause patients to visit the dentist only when they have severe oral problems that are difficult to treat. Patients with schizophrenia do not go for check-ups (preventive medicine) as routinely as do members of the general population (McCreadie et al., 2004); this fact may explain our finding of more filled teeth in the controls. There seems to be a tendency among dentists to treat psychiatric patients by extracting the teeth instead of carrying out complex preventative or restorative treatments (Griess

et al., 1998a; Ramon et al., 2003), which is consistent with our finding of three edentate patients and zero edentate controls (Table 2). On the other hand, the poor dental health of patients could be due to the high rates of perceived barriers to receiving medical care among this population, such as the limited dental care coverage provided by the public health care system (Dickerson et al., 2003; Salsberry et al., 2005). Differences in oral health between patients and controls seem to extend beyond those due to the high prevalence of periodontal disease among patients with severe psychiatric issues (Bohlmann et al., 1986; Friedlander and Brill 1986; Ikeda et al., 1986; Barnes et al., 1988; Clark, 1992; Angelillo et al., 1995; Velasco and Bullón, 1999; Kenkre and Spadigam, 2000; Lewis et al., 2001; Dickerson et al., 2003; Ramon et al., 2003; Stanfield, 2004; Leucht et al., 2007).

Despite all the clinical and social implications linked to poor dental health among people suffering from schizophrenia, there has been little research in this area. Studies undertaken to date support the need for intervention programs with the aim of achieving the objectives suggested by the WHO in their 1982 recommendations for improving the socio-psychological aspects of dental health (Barnes et al., 1988; Leopold et al., 1991; Ramon et al., 2003). In a study carried out in 1998, it was observed that psychiatric patients who had been successfully treated for oral health problems had a better quality of life and enhanced self-esteem. In addition, improved oral function led to an improvement in patients' general health (Griess et al., 1998b).

4.1. Limitations of the study

We did not take into account the possible differences in social class between patients and members of the control group. It is very likely that social status is another factor that should be taken into account when studying the relationship between schizophrenia and poor dental health, especially given that dental care is not covered by the free public health system in this country. However, we started from the assumption that, despite the fact that the majority of these patients do not work, other studies have not shown significant differences in social status between members of the patients' families and the general population (The Scottish Schizophrenia Research Group, 1987).

5. Conclusions

- The patients with schizophrenia in our study showed poorer oral health and greater need for periodontal treatment than the control group.
- The severity of the negative symptomatology was more strongly related to poor dental health than to positive symptomatology.
- The findings in this study confirm the urgent need for an intervention program to improve oral health in patients with schizophrenia in our country, including aspects such as prevention and early and prosthetic treatment.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at doi:10.1016/j.psychres.2010.09.012.

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