



## The association between periodontal disease and seizure severity in refractory epilepsy patients



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### ABSTRACT

**Purpose:** Periodontal diseases are common in most populations and affect people at all socioeconomic levels. Evidence suggests that patients with epilepsy actually have higher risks of dental disease and increased oral health needs, but the frequency and consequences of poor controlled seizures on dental and periodontal health have not been reported before. We aimed to assess the impact of seizure frequency on periodontal status and oral hygiene in a sample of epilepsy patients.

**Methods:** One hundred and nine consecutive patients treated for epilepsy at the outpatient clinic of our University Hospital were invited to take part in an oral examination to determine their periodontal disease status, together with a control group. In addition, seizure frequency and use of medication were documented.

**Results:** In logistic regression model, patients were significantly more susceptible to bad oral hygiene, gingivitis and periodontitis than controls ( $p < 0.001$ ); seizure frequency was significantly related to bad oral hygiene ( $p = 0.010$ ), gingivitis ( $p < 0.001$ ) and periodontitis ( $p < 0.001$ ). Tooth brushing habits and presence of caries were associated with oral health in patients group.

**Conclusion:** Our study found a significant positive correlation between periodontal disease and seizure severity. Epilepsy patients need to focus more on their oral health and quality of oral hygiene.

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## 1. Introduction

Periodontal disease is a common oral infection and refers to gingivitis and periodontitis.<sup>1</sup> Since oral health contributes to general health, self-esteem, and quality of life,<sup>2</sup> it is significant to address the periodontal health needs of these patients. Few investigations have studied the oral health in persons with epilepsy<sup>3–5</sup> and showed a high prevalence of poor oral hygiene, periodontal disease and deteriorating of dental status. One study revealed that patients who have poorly controlled epilepsy and experience recurrent seizure have worse oral health in comparison with patients who are better controlled.<sup>3</sup> From these results, it seems that seizures may be an important feature determining the occurrence of oral health status.

The objectives of this study were to compare periodontitis and gingivitis condition in subjects with refractory epilepsy in order to determine the influence of seizure frequency on periodontal status.

## 2. Methods

This cross-sectional study was conducted in the school tertiary referral hospital of UNICAMP, Campinas. Patients who use this university hospital are homogeneous in terms of socioeconomic and educational status with lower income and were categorized as low-socioeconomic status.

We recruited one hundred and nine consecutive patients (60 women; mean age  $38.8 \pm 14$  years) from our outpatient clinic for refractory partial epilepsy (45 with extratemporal epilepsy and 64 with temporal lobe epilepsy). These patients had a diagnosis of refractory epilepsy confirmed by clinical, electroencephalographic and magnetic resonance imaging criteria from March 2008 to June 2009. Subjects with idiopathic and primary generalized epilepsy were not included.

Patients were accompanied by their partner or other close family member who acted as a comparison control. The control

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group comprised 100 healthy subjects (60 women;  $39.3 \pm 13.5$  years). The control subjects had no history of neurological illness.

All subjects gave their written informed consent to participate in the study, approved by the Internal Review Board of our institution.

Clinical evaluations and measurements were done by dentists, trained and calibrated. The examinations were performed using mouth mirrors and sickle-shaped probes under natural light and with the subjects sitting on an ordinary upright chair. Findings were recorded on a standardized screening sheet.

The level of oral hygiene, including a plaque index; and periodontal status, including gingivitis and pocket depth measured with a periodontal probe. The plaque index<sup>6</sup> was used to measure the level of oral hygiene. The criteria were as follows: 0 = no plaque in the gingival area; 1 = a thin plaque film adhering to the free gingival margin and adjacent area of the tooth, only recognizable by running a probe across the surface; 2 = moderate accumulation of soft deposits within the gingival pocket, on the gingival margin, and/or on the adjacent tooth surface; and 3 = abundant soft matter within the gingival pocket and/or on the gingival margin and adjacent tooth surface. Subjects with index scores 2 and 3 were considered to have bad oral hygiene. Periodontal status was determined using the gingival index of Loe<sup>7</sup> and the criteria were as follows: 0 = normal gingiva; 1 = mild inflammation: slight change in color, slight edema, and no bleeding on probing; 2 = moderate inflammation: redness, edema and glazing, and bleeding on probing; and 3 = severe inflammation: marked redness and edema, ulceration, and a tendency to spontaneous bleeding. Subjects with score 2 or 3 were considered to have gingivitis. Periodontal health was measured registering the deepest pocket on the most posterior tooth in each quadrant, and a central incisor in each jaw, or the tooth closest to it if the index tooth was missing. Subjects with a measured pocket depth of 4 mm or more on one or more of the index teeth were considered to have periodontitis.<sup>8</sup> The numbers of carious teeth were based on detection of untreated decayed teeth.

Evaluation of oral hygiene was assessed by frequency of tooth brushing: more than 1 time daily; 1 time daily; never. Dietary data was collected from a weekly sugar dietary score completed by each subject. The criteria were as follows: 1 = low amount; 2 = moderate amount and 3 = high amount. Smoking status was specified in current smoker or not smoker.

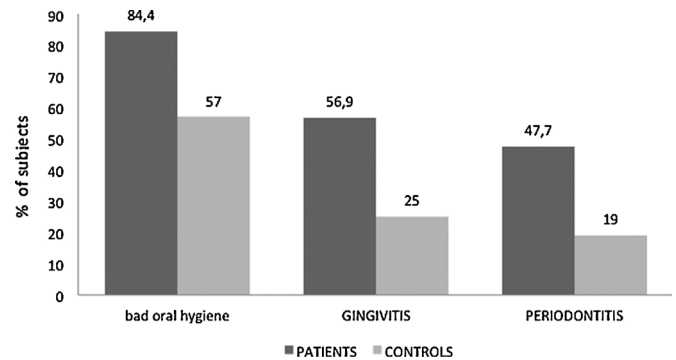
Seizure frequency and medication history was gathered from patient's history and examination and review of outpatient attending notes at the moment they came for the neurology appointment. Seizure rates were determined as the number of seizures at the month of subject's enrolment in the study.

### 2.1. Statistical analysis

We used Fisher' exact test to analyze the relationship between categorical variables related to oral health condition and periodontal disease. Logistic regression models were performed to study the association of bad oral hygiene, periodontitis, gingivitis condition and seizure frequency. The significance level was established at  $p < 0.05$ . Adjusted odds ratios and their 95% confidence intervals were calculated. Data were analyzed by means of SPSS 10.0 statistical package software.

### 3. Results

Sixty-four patients had mesial temporal lobe epilepsy and 45 had extratemporal lobe epilepsy (43 with frontal, one with parietal and one with temporo-parietal seizure onset). All patients were taking the same antiepileptic drugs therapy regularly (from 8 to 12 months at the moment of the appointment). Patients were treated



**Fig. 1.** Percentage of subjects with poor oral hygiene, gingivitis and periodontitis (patients and controls); statistical evaluation Fisher' exact test:  $p < 0.001$ .

with a combination of two or three antiepileptic drugs (including carbamazepine, lamotrigine, valproic acid, phenytoin, primidone, clobazam and topiramate). As shown in Fig. 1, oral hygiene was poorer among patients (84.4%); there was a significantly greater amount of dental plaque present compared with the control group ( $p < 0.001$ ). Additionally, more gingivitis was observed in patients (56.9%) compared with 25% in the control group ( $p < 0.001$ ) and periodontitis (47.7% and 19%, respectively patients and controls).

The results of the logistic regression model by groups (patients and controls) of bad oral hygiene, periodontitis and gingivitis are shown in Table 1, adjusted by age and sex. The variable "tooth brushing habits" was categorized in two groups as we combined 2 subjects who responded "never", with those with those who responded once daily; therefore the two groups were: (1) those who brushed teeth more than once daily and (2) those who

**Table 1**

Logistic regression model of bad oral hygiene, periodontitis and gingivitis by groups (patients and controls), adjusted by age and sex.

Bad oral hygiene	Coefficient	SD	p-Value	OD	95% CI
Age	0.08	0.02	<0.001	1.08	1.04–1.12
Constant	-2.50	0.68	<0.001	-	-
Dental caries	0.322	0.249	0.195	1.38	0.85–2.25
Gender	-0.06	0.34	0.857	0.94	0.48–1.85
Group	1.57	0.36	<0.001	4.83	2.36–9.88
Tooth brushing habits	-3.184	0.623	<0.001	0.04	0.01–0.14
(1) Weekly sugar dietary	0.315	0.489	0.520	1.37	0.53–3.58
(2) Weekly sugar dietary	-0.063	0.738	0.931	0.94	0.22–3.98
Periodontitis	Coefficient	SD	p-Value	OD	95% CI
Constant	-3.40	0.63	<0.001	-	-
Group	1.34	0.33	<0.001	3.81	2.00–7.26
Gender	0.01	0.32	0.966	1.01	0.54–1.90
Age	0.05	0.01	<0.001	1.05	1.02–1.08
Tooth brushing habits	-2.149	0.722	0.003	0.12	0.03–0.48
(1) Weekly sugar dietary	-0.252	0.584	0.667	0.78	0.25–2.44
(2) Weekly sugar dietary	0.096	0.789	0.904	1.10	0.23–5.16
Dental caries	1.279	0.237	<0.001	3.59	2.26–5.72
Smoking status	0.030	0.611	0.960	1.03	0.31–3.41
Gingivitis	Coefficient	SD	p-Value	OD	95% CI
Constant	-2.82	0.60	<0.001	-	-
Group	1.40	0.31	<0.001	4.07	2.20–7.53
Gender	-0.37	0.31	0.235	0.69	0.37–1.27
Age	0.05	0.01	<0.001	1.05	1.02–1.08
Tooth brushing habits	-3.065	0.722	<0.001	0.05	0.01–0.19
(1) Weekly sugar dietary	-0.436	0.590	0.460	0.65	0.20–2.05
(2) Weekly sugar dietary	0.280	0.809	0.729	1.32	0.27–6.46
Dental caries	1.246	0.254	<0.001	3.48	2.11–5.72
Smoking status	0.917	0.667	0.170	2.5	0.68–9.25

Abbreviations: SD, standard deviation; OD, odds ratio; CI, confidence interval.

Weekly sugar dietary: 1 (low and moderate amount of sugar) and 2 (high amount of sugar).

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