

Periodontal status and treatment needs of a group of epileptics attending a tertiary health facility

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Abstract

Objective: To assess the periodontal status and determine the treatment needs of a group of epileptics receiving treatment at the Lagos University Teaching Hospital with a view to planning adequate preventive dental health service for them.

Method: One hundred and fifty consecutive epileptic patients aged 10years - 74years (31.5 ± 16.5 years) attending the neurology out-patient clinic of the Lagos University Teaching Hospital within a 6-month period were selected. An equal number of patients randomly selected from individuals accompanying patients for treatment and those for dental check-up as part of medical check-up for employment or school admission formed the control group. Both groups were made to fill questionnaires and were examined to determine their periodontal status and treatment needs. The Community Periodontal Index of Treatment Needs (CPITN) was used to assess the periodontal status and treatment needs.

Result: Percentage of persons with healthy periodontium was lower in the epileptics (7.3%) than in the control group (18.0%). The difference in the prevalence of periodontal disease between the two groups was highly significant. ($p=0.006350$). Higher proportion of female epileptics (6 of 54) exhibited healthy periodontium than their male counterpart (5 of 96). Most subjects in both groups needed scaling and polishing and oral hygiene instructions (OHI) (epileptics 86.7%, control 77.3%). None of the subjects in both groups needed complex periodontal treatment.

Conclusion: The periodontal status of epileptic patients seen in this study was poorer than that of controls. Improving their oral health awareness through active oral health education may be a means of solving this problem.

Key Words: Epilepsy, periodontal status, periodontal treatment needs

Introduction

Epilepsy is a clinically complex phenomenon with varying underlying causes. Epilepsy affects about 0.5-3.7% of the general population^(1,2) with higher rates in the rural areas⁽²⁾. In most communities in Nigeria, epilepsy is believed to be a spiritual and highly infectious disease⁽³⁾ resulting in such patients been stigmatized and ostracized. The adverse effect of this harsh environmental attitude on social interaction, education, career or employment opportunities further worsen their psychological wellbeing; and therefore the general health of the patients. The main treatment options for patients suffering from epilepsy are antiepileptic drugs (AEDs), surgical treatment

or vagus nerve stimulation⁽⁴⁾. However, more than 80% of the patients are controlled on AEDs⁽⁵⁾. AEDs has a range of adverse effects, from blurred vision, drowsiness, dizziness, ataxia, gastrointestinal upset, skin rashes to muscle pain and oral pathological alterations⁽⁴⁾. These oral pathological alterations include gingival enlargements (GE), xerostomia, glossitis, stomatitis, ulcerations, slow tissue regeneration, postsurgical gingival bleeding^(6,7). Other possible side effects of AEDs may include bone loss, which can lead to osteoporosis over the long-term of use⁽⁸⁾. Small teeth, late erupting, and root abnormalities have also been observed by Girgis et al⁽⁹⁾ and Scully⁽¹⁰⁾. From review of the literature about the effects of all types of AEDs on the oral health of patients with epileptic seizures,

Angelica et al⁽⁴⁾ found that the most common oral side effect of AEDs was GE. Effective plaque control through adequate oral hygiene measures is essential to maintain good periodontal health. These oral hygiene procedures are however often neglected by many epileptic patients due to the unsupportive environment. Andre et al⁽¹¹⁾ showed in their study; association between periodontal disease and seizure severity that patients with epilepsy have an increased likelihood of having poor oral hygiene, and that the prevalence of periodontal disease was closely associated with the level of oral hygiene. GE makes it much more difficult for patients to practice proper oral hygiene, hence encouraging plaque accumulate more easily, which triggers inflammatory changes in the gums, leading to gingivitis and, fast progression towards periodontitis⁽¹¹⁾. GE interference with proper oral hygiene measures may also result in development of caries⁽¹²⁾. Since oral health contributes to general health, self-esteem, and quality of life, it is significant to address the periodontal health needs of these patients. This study aims to determine the periodontal status of this group of patients and identify their periodontal treatment needs with the intention of planning an adequate preventive dental service for them to ensure good periodontal health now and in the future.

Materials and method

One hundred and fifty consecutive fully or partially dentate epileptic patients aged 10years to 74years attending neurology out-patient clinic of the Lagos University Teaching Hospital within a 6-month period were recruited for this study. Subjects suffering from diabetes and other debilitating illnesses such as rheumatoid arthritis, Acquired Immune Deficiency Syndrome (AIDS) and malignant blood disorders; and those on long term medications such as non-steroidal anti-inflammatory drugs, immunosuppressive drugs and corticosteroids were excluded from participating in this study. Pregnant subjects and those undergoing orthodontic treatment were also excluded. One hundred and fifty control group subjects were randomly selected from individuals accompanying patients for treatment and those for dental check-up as part of medical check-up for employment or school admission. The subjects of control group were matched for age and sex with epileptic group. They had similar dental and medical inclusion criteria as the epileptics, but had no history of epilepsy. Prior to dental examination, a questionnaire was administered to each consented participant to record demographic information such as age, gender and educational status. The epileptic and drug history of the epileptic group was confirmed from their medical case record. The WHO Community Periodontal Index of Treatment Needs (CPITN) was used to assess the periodontal condition as described by Ainamo et al⁽¹³⁾ and with modification by Cutress et al⁽¹⁴⁾. Clinical Dental

Examination was conducted on all subjects by one author (M.E.S) under adequate light with the patient sitting on an ordinary upright chair using plain mouth mirrors and specially designed WHO light weight, ball point and colour coded periodontal probes. Ten index teeth (17, 16, 11, 26, 27, 37, 36, 31, 46, 47) in six sextants (17-14, 13-23, 24-27, 37-34, 33-43, 44-47) were examined in adults over 20 years and only six index teeth (16, 11, 26, 36, 31, 46) for those under 20 years to avoid the recording of deepened sulci associated with eruption as periodontal pockets. For the same reason, pockets were not scored in subjects under 15years, only bleeding and calculus. Each index tooth was examined on four sites (labial, lingual/palatal, mesial and distal) according to the following criteria: Code 0, healthy gums; Code 1, no pocket, bleeding on probing observed; Code 2, calculus detected during probing; Code 3, pocket 4-5mm deep; Code 4, pocket 6mm deep or more. One, the highest score was recorded as the CPITN score for each sextant. Where no index tooth was present, all the remaining teeth in the sextant were examined and the highest score was recorded for that sextant. Prevalence of bleeding, calculus and pocket sextants was assessed as percentage of subjects affected. Prevalence of healthy sextants was assessed by percentage of subjects having 6 healthy sextants. Severity of periodontal condition was assessed by the mean number of sextants coded 0, 1 or higher, 2 or higher, 3 or higher and 4⁽¹³⁾. The subjects were thereafter grouped into Treatment Need (TN) categories based on the highest CPITN score recorded using the following criteria: TN 0: CPITN code 0 in all sextants; no periodontal treatment required TN 1: CPITN code 1; oral hygiene Instruction (OHI) i.e. Need for improved personal oral hygiene.TN2: CPITN code 2 and 3; requires scaling (professional cleaning of teeth), removal of plaque retentive factors and OHI.TN 3: CPITN code 4; requires complex periodontal treatment in addition to scaling, removal of plaque retentive factors and OHI Approval to carry out this study was obtained from the Medical Ethical Committee of the Lagos University Teaching Hospital and all the subjects that participated in this study gave informed consent.

Table 1. Age distribution in epileptic and control groups

| Age group (years) | Epileptic | | Control | |
|-------------------|------------|------------|------------|------------|
| | Frequency | % | Frequency | % |
| 10-14 | 12 | 8.0 | 13 | 8.0 |
| 15-19 | 37 | 24.7 | 37 | 24.7 |
| 20-29 | 39 | 26.0 | 38 | 25.3 |
| 30-44 | 26 | 17.3 | 28 | 18.7 |
| 45-54 | 18 | 12.0 | 16 | 10.6 |
| 55-64 | 11 | 7.3 | 10 | 6.7 |
| 65-74 | 7 | 4.7 | 8 | 5.3 |
| Total | 150 | 100 | 150 | 150 |



Table 2. Prevalence of periodontal disease and sex of epileptics

| Sex | Healthy Periodontium | | Disease Present | | Total | |
|--------------|----------------------|------------|-----------------|-------------|------------|------------|
| | Freq. | % | Freq. | % | Freq. | % |
| Male | 5 | 5.2 | 91 | 94.8 | 96 | 100 |
| Female | 6 | 11.1 | 48 | 88.9 | 54 | 100 |
| Total | 11 | 7.3 | 139 | 92.7 | 150 | 100 |

P-value = 0.183

Table 3. Percentages of Periodontal disease measured by CPITN for epileptic and control groups.

| Group | No. Exam | No Dentate | % Persons Coded | | | | | Total PD |
|-----------|----------|------------|-----------------|-----|------|-----|-------|----------|
| | | | H | B | C | P1 | Total | |
| Epileptic | 150 | 150 | 7.3 | 6.0 | 85.4 | 1.3 | 92.7 | |
| Control | 150 | 150 | 18 | 4.7 | 74.0 | 3.3 | 82.0 | |

The prevalence of periodontal disease was higher in the epileptics than in the control group. P value = 0.006350 (highly significant). $X^2 = 7.7$

H - Code 0 as highest score i.e. healthy tissue.

B - Code 1 as highest score i.e. bleeding on probing.

C - Code 2 as highest score i.e. calculus and Plaque retentive factors.

P1 - Code 3 as highest score i.e. pathological pocket 4-5mm deep.

P2 - Code 4 as highest score i.e. pathological pocket 6mm deep or more.

CPITN - Community Periodontal Index of Treatment Needs.

PD = Periodontal Disease.

The Epi info (version 6) statistical software was used for data entry validation and analysis. Associations and differences were said to be significant when the p-values were equal to or less than 0.05. (P<0.05)

Result

Three hundred subjects participated in this study: one-hundred and fifty epileptics and one-hundred and fifty controls with age ranging from 10 years to 74 years. The epileptic group consisted of 96 males and 54 females with mean age of 31.5+ 16.5 years, while the control group was made up of 94 males and 56 females with a mean age of

31.3 years + 16.4 years. There were more subjects in the 15-19 years and 20-29 years age groups in both epileptic and control groups (Table 1).

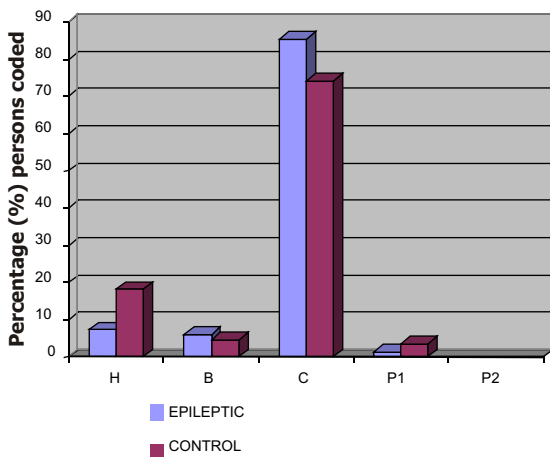
The prevalence of periodontal disease was found to be high in both sample groups, although higher in the epileptics (92.7%) than in the control group (82.0%). Healthy periodontium was recorded in eleven subjects (7.3%) among the epileptics and twenty-seven (18%) in the control group. Higher proportion of female epileptics (6 of 54) exhibited healthy periodontium than their male counterpart (5 of 96) (Table 2). However, the difference is insignificant (p=0.204). Most subjects had more severe periodontal condition than bleeding in both epileptic and control groups. The number of subjects with bleeding as the worst periodontal condition was nine (6%) in epileptics and seven (4.7%) in the control group. The number of subjects with calculus as the highest score was very high in both epileptics (128; 85.4%) and controls (111; 74%) groups. Two (1.3%) of the epileptics had shallow pockets as the highest score, while it was five (3.3%) in the control group. None of the subjects had deep pockets in both epileptic and control groups (Table 3). The percentage of persons with healthy periodontium was generally lower in the epileptics for all age groups except in the 65-74 year old. The number of subjects with calculus as the highest score was very high in both epileptic and control for all age groups, with lower values in the control group. The difference in the prevalence of periodontal disease between the two groups was highly significant (P value =0.006350) (Table 4 & Figure 1). The severity of periodontal disease measured by the mean number of sextants (MNS) affected by disease was higher in the epileptics than in the control group. The MNS that was healthy was 2.0 in the control group and 1.3 in the epileptics (Table 5). The MNS with gingival bleeding or higher score was 4.7 in the epileptic and 4.0 in the control group. Virtually all sextants have gingival bleeding in the age groups 45-54 years and 55-64 years in the epileptics, and 55-64 years and 65-74 years in the control group. The severity of calculus was higher in the epileptics than in the control group in all age groups except in age groups 15-19 years and 65-74 years. The MNS with calculus or higher score was 4.2 in the epileptics and 3.7 in the control group. All six sextants had calculus in 55-64 years age group in the epileptics. The severity of shallow pockets was equal in both epileptic and control groups, MNS was 0.1 (Table 6 & Figure 2). The majority of subjects in both sample groups needed calculus removal and oral hygiene instructions (OHI); 130 (86.7%) in epileptics and 116 (77.3%) in the control group. Nine subjects (6%) in the epileptics and seven (4.7%) in the control group needed only OHI. The MNS requiring periodontal treatment ranged from 3.6 to 6 in the epileptics, and 3.1 to 5.3 in the control group. None of the subjects in both groups needed complex periodontal treatment.

Table 4. Percentages of periodontal disease measured by CPITN for Epileptics and control according to age group.

| Group | Age Grp (yr) | No. Exam | No Dentate | % Persons Coded PD | | | | |
|------------------|--------------|----------|------------|--------------------|------|-------|------|---------|
| | | | | H | B | C | P1 | Total % |
| Epileptic | 10-14 | 12 | 12 | 8.3 | - | 91.7 | - | 91.7 |
| | 15-19 | 37 | 37 | 10.8 | 10.8 | 78.4 | - | 89.2 |
| | 20-29 | 39 | 39 | 7.7 | 10.3 | 82.0 | - | 92.3 |
| | 30-44 | 26 | 26 | 3.9 | 3.9 | 92.2 | - | 96.1 |
| | 45-54 | 18 | 18 | - | - | 100.0 | - | 100.0 |
| | 55-64 | 11 | 11 | - | - | 81.8 | 18.2 | 100.0 |
| | 65-74 | 7 | 7 | 28.6 | - | 71.4 | - | 71.4 |
| Control | 10-14 | 13 | 13 | 23.1 | - | 76.9 | - | 76.9 |
| | 15-19 | 37 | 37 | 24.3 | - | 75.7 | - | 75.7 |
| | 20-29 | 38 | 38 | 21.0 | 5.3 | 65.8 | 7.9 | 79.0 |
| | 30-44 | 28 | 28 | 14.3 | 3.6 | 82.1 | - | 85.7 |
| | 45-54 | 16 | 16 | 12.5 | 25.0 | 50.0 | 12.5 | 85.7 |
| | 55-64 | 10 | 10 | - | - | 100.0 | - | 100.0 |
| | 65-74 | 8 | 8 | 12.5 | - | 87.5 | - | 87.5 |

H - Code 0 as highest score i.e. healthy tissue.
 B - Code 1 as highest score i.e. bleeding on probing.
 C - Code 2 as highest score i.e. calculus and Plaque retentive factors.
 P1 - Code 3 as highest score i.e. pathological pocket 4-5mm deep.
 P2 - Code 4 as highest score i.e. pathological pocket 6mm deep or more.
 CPITN: Community Periodontal Index of Treatment Needs.
 PD: Periodontal disease

Figure 1. Percentages of periodontal disease measured by CPITN for epileptics and control groups.



H - Code 0 as highest score i.e. healthy tissue.
 B - Code 1 as highest score i.e. bleeding on probing.
 C - Code 2 as highest score i.e. calculus and Plaque retentive factors.
 P1 - Code 3 as highest score i.e. pathological pocket 4-5mm deep.
 P2 - Code 4 as highest score i.e. pathological pocket 6mm deep or more.
 CPITN - Community Periodontal Index of Treatment Needs.

Table 5. Severity of periodontal disease in epileptic and control groups

| Group | No. Exam | No Dentate | MNS Coded | | | | |
|-----------|----------|------------|-----------|-----|-----|-----|----|
| | | | H | B | C | P1 | P2 |
| Epileptic | 150 | 150 | 1.3 | 0.5 | 4.1 | 0.1 | - |
| Control | 150 | 150 | 2.0 | 0.3 | 3.6 | 0.1 | - |

H- Sextant coded 0
 B- Sextant coded 1
 C- Sextant coded 2
 P1- Sextant coded 3
 P2- Sextant coded 4
 MNS= mean number of sextants affected per person.

Discussion

Very few studies have dealt directly with the periodontal condition of epileptics⁽¹⁵⁻¹⁷⁾. Thus, direct comparison with these previous studies may not be appropriate due to the difference in methodology. Also, not many studies utilized the CPITN. The high prevalence of periodontal disease found in both the epileptic and control groups in this study is reflective of the general poor oral and periodontal health awareness of

Table 6. Severity of periodontal disease in epileptics and control according to age group

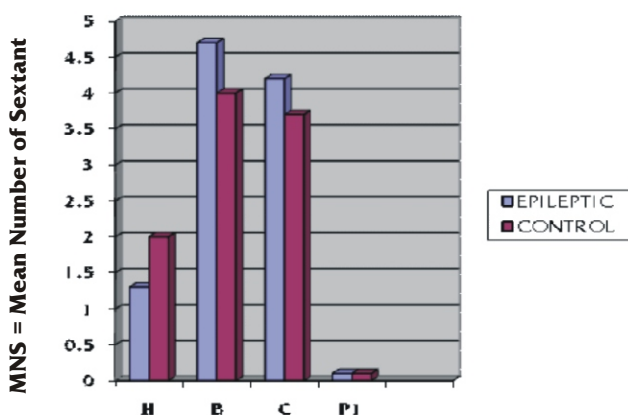
| Age Grp. (Yrs) | No. Exam | No. Dentate | MNS Coded | | | | |
|---------------------|----------|-------------|---|-----|-----|-----|----|
| | | | H | B | C | P1 | P2 |
| 10-14 | 12 | 12 | 1.7 | 0.4 | 3.9 | - | - |
| 15-19 | 37 | 37 | 1.5 | 0.7 | 3.8 | - | - |
| 20-29 | 39 | 39 | 1.7 | 0.7 | 3.6 | - | - |
| 30-44 | 26 | 26 | 1.6 | 0.3 | 4.1 | - | - |
| 45-54 | 18 | 18 | 0.1 | 0.6 | 5.3 | - | - |
| 55-64 | 11 | 11 | - | - | 2.9 | 3.1 | - |
| 65-74 | 7 | 7 | 1.7 | - | 4.3 | - | - |
| Epileptic | | | | | | | |
| 10-14 | 13 | 13 | 2.0 | 0.3 | 3.7 | - | - |
| 15-19 | 37 | 37 | 2.1 | - | 3.9 | - | - |
| 20-29 | 38 | 38 | 2.6 | 0.3 | 2.9 | 0.2 | - |
| 30-44 | 28 | 28 | 2.0 | 0.2 | 3.8 | - | - |
| 45-54 | 16 | 16 | 1.9 | 0.8 | 2.5 | 0.8 | - |
| 55-64 | 10 | 10 | 0.5 | 0.5 | 5.0 | - | - |
| 65-74 | 8 | 8 | 0.7 | - | 5.3 | - | - |
| Control | | | | | | | |
| H- Sextant coded 0 | | | B- Sextant coded 1 | | | | |
| C- Sextant coded 2 | | | P1- Sextant coded 3 | | | | |
| P2- Sextant coded 4 | | | MNS - mean number of sextants affected per person | | | | |

Table 7. Treatment Needs (TN) of epileptic and control groups

| Group | No of dentate subject | Treatment Needs (TN) | | | | MNS |
|------------|-----------------------|----------------------|--------|--------|--------|-----|
| | | % TN 0 | % TN 1 | % TN 2 | % TN 3 | |
| Epileptics | 150 | 7.3 | 92.7 | 86.7 | - | 4.2 |
| Control | 150 | 18.0 | 82.0 | 77.3 | - | 3.7 |

MNS - Mean number of sextants requiring treatment

The number of subjects and sextants requiring periodontal treatment were higher in the epileptics than in the control group.



H = Sextant coded 0 or higher
 B = Sextant coded 1 or higher
 C = Sextant coded 2 or higher
 P1 = Sextant coded 3 or higher
 P2 = Sextant coded 4

Nigerians⁽¹⁸⁻²²⁾. High prevalence of periodontal disease has been reported among adult Nigerians⁽²²⁾ however, the highest prevalence (92.7%) was recorded amongst the epileptic group with a highly significant difference (P= 0.006350) between it and the control group. This outcome is in agreement with previous studies^(7,11,23-25). The increasing periodontal disease prevalence noticed with increasing age may be due to the response to the psychological effect of the disease and environmental rejection which cause them to be more engrossed with their medical condition at the expense of their oral health.

In this environment, patients with epilepsy are faced with social stigmatization and discrimination which result in psycho-social problems like unemployment, reduced social contacts, low self-esteem and poverty⁽⁷⁾. It has been shown that these psychosocial problems even in healthy individuals and particularly in patients with epilepsy may lead to negligence of oral health and oral hygiene procedure⁽¹¹⁾. The resultant inadequate oral hygiene favours increased accumulation of dental plaque which is considered one of primary etiological factors for periodontal disease. This may explain the higher prevalence of periodontal disease recorded in the epileptics in this study. These patients were more concerned about their medical condition and attendant psychosocial consequences thus oral health care is not considered a main concern spending less time and effort in cleaning their mouth effectively. This was evident in this study in that out of the thirty-nine (26%) who had previously visited a dentist, only five had professional prophylaxis (S&P). Meticulous attention to oral hygiene and regular professional prophylaxis are essential to maintenance of periodontal health.

The severity of periodontal disease was also found to be higher in the epileptics than in the control group in this study. The mean number of sextant affected by bleeding and calculus in the epileptics (4.7 and 4.2 respectively) was higher than in the control (4.0 and 3.7 respectively). This finding may be an indication of the failure of these patients to seek dental care for dental problems early unless they have severe pain. In the present study, very high percentage of the epileptic patients (92.7%) were found to require some form of periodontal treatment in concordance with the study of Ogunbodede et al⁽²⁶⁾ (80.4%) and Taskin et al⁽²⁷⁾ (97.7%). Majority (86.7%) of epileptics requiring periodontal treatment required scaling and polishing (S & P) and oral hygiene instruction (OHI), 6% required only OHI. This result is similar to the one recorded in a study in Benin city, Nigeria⁽²⁸⁾ in which 85% required S&P and OHI and 10.7% required OHI only. This further reflects the negligence of oral hygiene procedure and lack of regular dental visit which encourage accumulation of dental plaque in this group of patients.

Conclusion

This study reveals that the periodontal status was poor in both groups but poorer in the epileptics. The prevalence and severity of periodontal disease was higher in the epileptics than in the control group. The treatment needs of the epileptics was predominantly oral hygiene instructions and scaling and polishing (Treatment Need 2) and similar to that of the control group.

The findings in this study suggest that there is need to

institute oral health preventive measures and improve the oral hygiene behaviour of these patients. This can be achieved through active oral health education about importance of regular dental check-up and professional prophylaxis. There is also a clear need for effective collaboration between medical and dental practitioners in the management of epileptic patients. Physicians should not hesitate to inquire about their patients' oral health and should refer patients in need of dental attention to a dentist as early detection of periodontal disease will reduce the severity and improve treatment outcome. We suggest that routine dental check-up and regular professional prophylaxis should be incorporated into the management of this group of patients in order to achieve total health.

References

- Dada TO. Epilepsy in Lagos. Nigeria. *Afr J Med* 1970; 1: 161-184.
- Bharucha NE, Shorvon SD. Epidemiology in Developing Countries. In: Engell, Jr, Pedley TA. *Epilepsy: A Comprehensive Textbook*. Philadelphia: 1997;105-118.
- Shorvon SD, Hart YM, Sander WAS, van Andel F. The management of epilepsy in developing countries: an "ICBERG" manual. (International Congress and Symposium series). Londod New York: Royal Society of Medicine Services, 1991.
- Angelica Lee Petrina Cornacchio, Jorge G. Burneo, Cecilia E. Aragon. The effects of antiepileptic drugs on oral health. *J Can Dent Assoc* 2011;77:1-7.
- Jacobsen PL, Eden O. Epilepsy and the dental management of the epileptic patient. *J Contemp Dent Pract* 2008;1:054-062.
- Cecilia E. Aragon, Jorge G. Burneo. Understanding the patient with epilepsy and seizures in the dental practice. *J Can Dent Assoc* 2007; 1:71-76.
- Liliana Pasarin, Ioana Rudnic, Irina Ursarescu, Sorina Solomon, Silvia Martu. Epilepsy-risk factor for the periodontal disease. *Rom J Oral Rehab* 2013; 1:94-98.
- Turner MD, Glickman RS. Epilepsy in the oral and maxillofacial patient: current therapy. *J Oral Maxillofac Surg* 2005; 63:996-1005.
- Girgis SS, Staple H, Miller WA, Sedrank N, Thompson D. Dental root abnormalities and gingival overgrowth in epileptic patients receiving anticonvulsant therapy. *J Periodontol* 1980; 5: 474-482.
- Scully C, Cawson R. Neurological disorders. In *Medical problems in dentistry*. Chapter 17. Oxford: Wright, 1999.
- Andre LF Costa, Clarissa Lin Yasuda, Wendel Shibusaki, Ana Carla Raphaelli Naha, s-Scocate, Claudio Fro'es de Freitas, Paulo Eduardo Guedes Carvalho, Fernando Cendes. The association between periodontal disease and seizure severity in refractory epilepsy patients. *Seizure: Euro J Epil* 2014; 3:227-230.
- Seymour RA. Selected side-effects: 7. Phenytoin and gingival overgrowth. *Prescribers J* 1992; 32: 124-126.
- Ainamo J, Barmes D, Beagril G, Cutress T, Martin J, Sardo-Infirri J. Development of the World Health Organization (WHO) Community Periodontal Index of Treatment Needs (CPITN). *Int Dent J* 1982; 32:281-291.
- Cutress TW, Ainamo J, Sardo-Infim J. The Community periodontal Index of Treatment Needs (CPITN). Procedure for population groups and individuals. *Int Dent J* 1987; 37:222-233.
- Seymour RA, Smith DG, Turnbull DN. The effect of phenytoin and sodium valproate on periodontal health of adult epileptic patients. *J Clin Periodontol* 1985; 12: 413-419.
- Dahllof G, Preber H, Eliasson S, Ryden H, Karsten J, Modeer T. Periodontal condition of epileptic adults treated long-term with phenytoin or carbamazepine. *Epilepsia* 1993; 34:960-964.
- Galas ZB, Borysewicz LM, Zgorzalewicz M, Borowicz AE. The effect of chronic carbamazepine, valproic acid and phenytoin medication on the periodontal condition of epileptic children and adolescents. *Funct Nerol* 1996; 11:187-193.
- Agbelusi GA, Sofola OO, Jeboda SO. Oral health knowledge, attitude and practices of pregnant women in the Lagos University Teaching Hospital. *Nig Qt J Hosp Med*. 1999; 9: 116-120.
- Sofola OO, Agbelusi GA, Jeboda SO. Oral health knowledge, attitudes and practices of primary school teacher in Lagos State. *Nig J Med*. 2002; 11: 73-76.
- Orenuga OO, Sofola OO. A Survey of the knowledge, attitude and practice of antenatal mothers in Lagos, Nigeria about the primary teeth. *Afr J Med Sci*. 2005;34:285-291.
- Sofola OO, Uti OG. Oral pain prevalence and related behaviors in residents, Southwest Nigeria. *J Dent Res* 2007; 86 (Spec Iss A). Abstr No 2749.
- Ka'rolyha'zy K, Kova'cs E, Kivovics P, Feje'rdy P, Ara'nyi Z. Dental status and oral health of patients with epilepsy: an epidemiologic study. *Epilepsia* 2003; 44:1103-1108.
- Karolyhazy K, Kivovics P, Fejerdy P, Aranyi Z. Prosthodontic status and recommended care of patients with epilepsy. *J Prosth Dent* 2005; 93:177-182.
- Ka'rolyha'zy K, Kivovics P, Hermann P, Feje'rdy P, Ara'nyi Z. Five-year follow-up of oral health and seizure condition of patients with epilepsy: a prospective observational study. *Comm Dent Health* 2010; 27:233-237.
- Sofola OO. Implications of low oral health awareness in Nigeria. *Nig Med J* 2010; 51:131-133.
- Ogunbodede EO, Adamolekun B, Akintomide AO. Oral health and dental treatment needs in Nigerian patients with epilepsy. *Epilepsia* 1998; 39: 590-594.
- TaskinGurbuz, Huseyin Tan. Oral health status in epileptic children. *Pedia Int* 2010; 52: 279-283.
- Ojehanon PI. The management of drug induced gingival overgrowth in epileptic patients in Benin City, Nigeria. Dissertation. 1995. West African College of Surgeon, Faculty of Dental surgery.