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Diagnosis of Dental Diseases in Children with Epilepsy

Matrizaev Lochinbek Yo'ldosh O'g'li
Urgench Ranch University Of Technology

Abstract: Background: Children with epilepsy are at increased risk of dental diseases because of the disease itself, the side effects of long-term antiepileptic therapy, comorbid neuropsychiatric disorders and difficulties in maintaining oral hygiene and cooperating during dental treatment. Aim: To summarise current evidence on the prevalence and structure of dental diseases in children with epilepsy and on the methods used for their diagnosis, and to propose a diagnostic algorithm for dental examination of this group. Methods: A narrative review of clinical, epidemiological and laboratory studies indexed in PubMed, Scopus, Google Scholar and eLIBRARY was carried out; quantitative results of comparative clinical studies were extracted and presented in tables and figures. Results: In a study of 100 children with epilepsy and 80 healthy controls, the mean dmf score was 4.1 versus 2.2 and the gingival index 1.16 versus 1.01. Among 107 children and adolescents aged 6–18 years, those taking antiepileptic drugs had higher DMFt (6.80 vs 4.65), CPITN (1.68 vs 0.96) and OHI-S (2.50 vs 1.53) scores. Drug-induced gingival enlargement, gingival bleeding in patients taking valproate, dental trauma during seizures and changes in the composition and antioxidant properties of oral fluid are additional diagnostic targets. Conclusion: Dental examination of children with epilepsy should include a structured medical history, index assessment of caries, hygiene and periodontal status, evaluation of drug-related oral effects and, where possible, analysis of oral fluid, and should be coordinated with the child's neurologist.

Keywords: epilepsy, children, dental caries, gingival enlargement, antiepileptic drugs, oral hygiene, oral fluid, dental diagnosis

Introduction

Epilepsy is a disease of the brain defined by an enduring predisposition to generate epileptic seizures and by the neurobiological, cognitive, psychological and social consequences of this condition [1]. Around 50 million people worldwide live with epilepsy, which makes it one of the most common neurological diseases [2], and a meta-analysis of international studies estimated the point prevalence of active epilepsy at 6.38 per 1,000 persons [3]. In many children, epilepsy is combined with intellectual disability, cerebral palsy, autism spectrum disorder or behavioural disorders, which complicates both everyday oral care and professional dental treatment.

Oral diseases remain the most common chronic conditions worldwide: untreated caries of permanent teeth was the most prevalent of all conditions assessed in the Global Burden of Disease study [4], and periodontal diseases affect a large proportion of the population from childhood onwards [5]. In children with neuropsychiatric disorders the prevalence of caries and gingival inflammation is higher and the severity of dental pathology is greater than in their healthy peers, which is explained by common risk factors such as poor oral hygiene, dietary habits, low dental compliance and limited access to care [6]. In patients with epilepsy, seizures create a risk of injuries to the teeth and soft tissues, and long-term antiepileptic therapy can cause gingival enlargement, bleeding, xerostomia and

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other oral side effects [7].

The literature on methodological approaches to dental diagnosis and prevention in children with epilepsy is fragmented, and the role of local factors, including the properties of oral fluid, has not been sufficiently studied. The aim of this article is to summarise current evidence on the prevalence and structure of dental diseases in children with epilepsy and on the methods used for their diagnosis, and to propose a diagnostic algorithm for dental examination of this group of patients.

Materials and Methods

A narrative review of the literature was carried out. Publications were identified in the PubMed, Scopus, Google Scholar and eLIBRARY databases using combinations of the keywords “epilepsy”, “children”, “dental caries”, “gingival enlargement”, “antiepileptic drugs”, “oral health”, “oral fluid” and “oxidative stress”. Comparative clinical studies of children with epilepsy, epidemiological studies, reviews and studies of the oral microbiota and oral fluid published in English and Russian were included; studies that did not report dental outcomes were excluded.

Dental outcomes in the reviewed studies were compared on the basis of standard indices: caries experience was assessed by the dmft/DMFT index according to the World Health Organization criteria [8], oral hygiene by the simplified oral hygiene index OHI-S [9], and gingival inflammation by the gingival index of Löe and Silness [10]. For each comparative study, the sample, the comparison groups and the mean values of the indices were extracted from the original publication without modification; the results were synthesised descriptively, and no pooled statistical analysis was performed.

Results

Prevalence and structure of dental diseases. Comparative clinical studies show that children with epilepsy have poorer oral health than healthy children. Caries, oral hygiene and gingival status were examined in epileptic children in one of the first comparative studies of this group [11]. In a retrospective cohort study of 100 children with epilepsy and 80 healthy controls matched for age, gender and socioeconomic status, the mean dmf score was 4.1 ± 2.1 in children with epilepsy and 2.2 ± 2.6 in healthy children, and the gingival index was 1.16 ± 0.42 and 1.01 ± 0.11, respectively, while caries of permanent teeth and orofacial injuries did not differ significantly [12]. Among 107 children and adolescents aged 6–18 years with epilepsy, those taking antiepileptic drugs had higher DMFt (6.80 ± 5.16 vs 4.65 ± 3.72; p = 0.02), CPITN (1.68 ± 0.60 vs 0.96 ± 0.29; p = 0.0001) and OHI-S (2.50 vs 1.53; p = 0.0001) scores than those not taking medication [13] (Figure 1). At the same time, a study of 57 paediatric patients receiving monotherapy or polytherapy found no significant differences in plaque index, gingival index and DMFT/dmft compared with healthy controls and no cases of gingival hypertrophy [14]. The main studies are summarised in Table 1.

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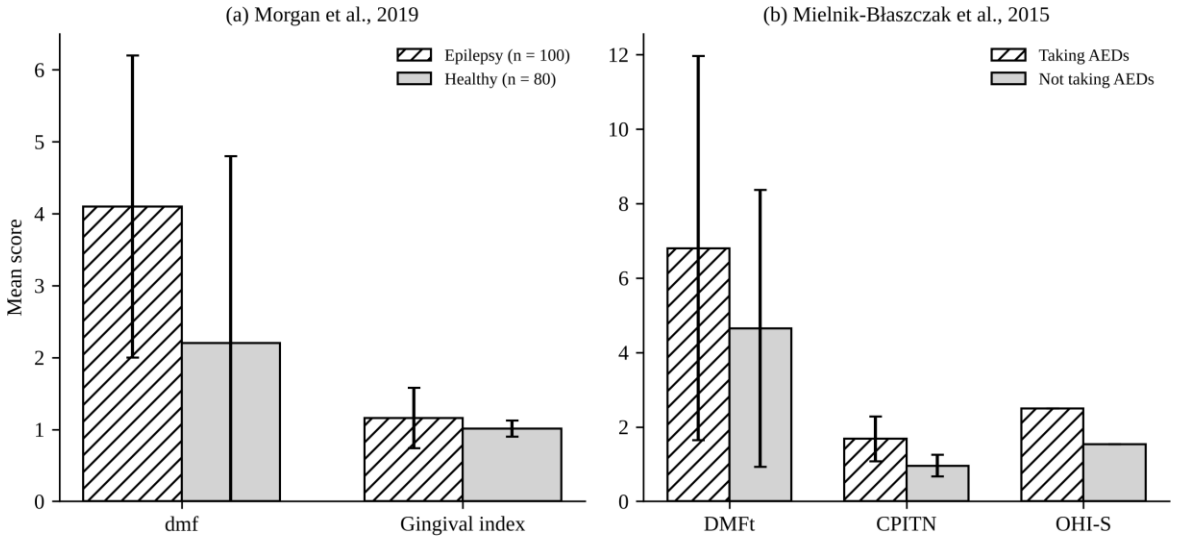


Figure 1. Dental indices in children with epilepsy according to comparative clinical studies: (a) children with epilepsy and healthy controls; (b) children with epilepsy taking and not taking antiepileptic drugs (mean ± SD)

Table 1. Comparative clinical studies of oral health in children with epilepsy

Study	Sample	Comparison	Main result
Morgan et al., 2019 (Egypt)	100 children with epilepsy, 80 healthy controls	Epilepsy vs healthy	dmf 4.1 vs 2.2; gingival index 1.16 vs 1.01 (both higher in epilepsy); no difference in permanent caries and injuries
Mielnik-Błaszczak et al., 2015 (Poland)	107 patients aged 6–18 years with epilepsy	Taking vs not taking AEDs	DMFt 6.80 vs 4.65 (p = 0.02); CPITN 1.68 vs 0.96 (p = 0.0001); OHI-S 2.50 vs 1.53 (p = 0.0001)
Tripodi et al., 2023 (Italy)	21 monotherapy, 18 polytherapy, 18 controls	AED therapy vs healthy	No significant differences in plaque index, gingival index, DMFT/dmft; no gingival hypertrophy

Note: AEDs – antiepileptic drugs; dmf/DMFt – caries experience in primary/permanent teeth; CPITN – Community Periodontal Index of Treatment Needs; OHI-S – simplified oral hygiene index. Compiled by the author from the cited publications.

Antiepileptic therapy and oral tissues. Antiepileptic drugs are an important factor in the development of dental pathology. Phenytoin and, less often, other anticonvulsants cause drug-associated gingival enlargement, which begins in the interdental papillae, impairs oral hygiene and may require surgical treatment [15]. The risk of gingival overgrowth increases with poor plaque control, younger age, the dose and duration of therapy and the combination of several drugs [16]. Valproate may cause thrombocytopenia and impaired platelet function with gingival bleeding, carbamazepine and some other drugs reduce salivary flow, and seizures themselves lead to fractures of teeth and injuries of the tongue, lips and cheeks; in adults with epilepsy, a higher number of missing teeth and more extensive prosthetic needs have been reported than in the general population [17]. The main oral effects of antiepileptic therapy and their diagnostic significance are summarised in Table 2.

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Table 2. Oral effects of antiepileptic therapy and their diagnostic significance

Drug / factor	Oral manifestation	Diagnostic action
Phenytoin; less often phenobarbital, valproate	Gingival enlargement, mainly of the anterior interdental papillae	Gingival index, assessment of enlargement, plaque control
Valproate	Thrombocytopenia, platelet dysfunction, gingival bleeding	Bleeding indices; blood count before invasive treatment
Carbamazepine, lamotrigine and other AEDs	Xerostomia, stomatitis, rarely severe mucosal reactions	Salivary flow rate, examination of the oral mucosa
Sugar-containing liquid medications	Increased caries risk	dmft/DMFT, dietary history
Seizures	Fractures of teeth, bites of the tongue, lips and cheeks	History of trauma, radiography

Note: AEDs – antiepileptic drugs. Compiled by the author on the basis of the cited publications.

Oral microbiota and oral fluid. The oral microbiome includes several hundred bacterial taxa, many of which are still uncultivated [18], and culture-independent methods have shown that the salivary microbiome is highly individual [19]. Under conditions of reduced salivary flow and poor hygiene, the shift of the microbiota towards cariogenic and periodontopathogenic species may be accompanied by bacterial infections of the oral mucosa [20]. Oral fluid is also a source of biochemical markers: oxidative stress parameters in saliva are associated with periodontal disease and with particular types of bacteria [21], and periodontitis is accompanied by changes in nitric oxide production, systemic inflammation and lipid metabolism [22]. Saliva-based “omics” methods are regarded as a promising non-invasive diagnostic tool in paediatrics [23], and in children with developmental disabilities antioxidant intervention has been shown to reduce oxidative stress [24]. Studies of lipid peroxidation and antioxidant enzymes in the oral fluid of children with epilepsy are, however, scarce.

Discussion

The reviewed studies indicate that children with epilepsy, particularly those receiving long-term antiepileptic therapy, tend to have higher caries experience, poorer oral hygiene and more pronounced gingival inflammation than healthy children, although the results are not uniform and some studies with modern drugs have not found significant differences. This heterogeneity can be explained by differences in the drugs used, the duration of treatment, the presence of intellectual disability and the quality of preventive care. Genetic factors also contribute to individual caries susceptibility [25], and long-term population studies show that oral health can improve substantially when systematic prevention is organised [26].

On the basis of the reviewed data, a diagnostic algorithm for dental examination of children with epilepsy is proposed (Figure 2). It includes a structured medical history with information on the type of epilepsy and antiepileptic drugs, assessment of the child’s cooperation and seizure risk, clinical examination with index assessment of caries, hygiene and periodontal status, additional tests including oral fluid analysis, and an individual plan of prevention and treatment agreed with the neurologist and parents. The algorithm is a conceptual proposal and requires validation in prospective clinical studies. The main limitations of this review are its narrative design, the small number and heterogeneity of comparative studies and the lack of data on the oral fluid of children with epilepsy.

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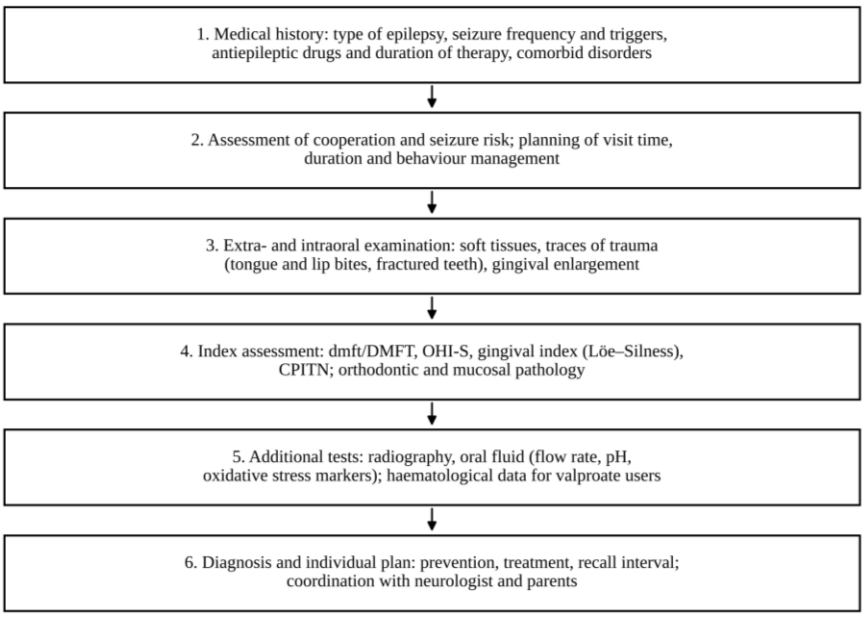


Figure 2. Proposed algorithm for dental examination of children with epilepsy

Conclusion

Children with epilepsy form a risk group for dental diseases: compared with healthy peers, they tend to have higher caries experience, poorer oral hygiene and more pronounced gingival inflammation, and antiepileptic therapy adds specific risks such as gingival enlargement, bleeding, reduced salivary flow and dental trauma during seizures. Diagnosis of dental diseases in these children should therefore be based on a structured medical history, standard indices of caries, hygiene and periodontal status, assessment of drug-related oral effects and, where possible, analysis of oral fluid; it is advisable to examine such children at shorter recall intervals, to train parents in oral hygiene, to prefer sugar-free forms of medication and to coordinate dental care with the neurologist. Further prospective studies are needed to validate the proposed diagnostic algorithm and to clarify the role of oxidative stress markers in oral fluid.

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