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EVALUATING THE ORAL HYGIENE STATUS OF EPILEPTIC PATIENTS: A COMPREHENSIVE CLINICAL ASSESSMENT

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Abstract: Epilepsy represents one of the most prevalent chronic neurological disorders globally, affecting approximately 50 million people across all age groups, with a significant proportion comprising children and adolescents. The oral health status of epileptic patients presents a unique and complex clinical challenge, influenced by the interplay of seizure-related trauma, antiepileptic drug-induced gingival hyperplasia, salivary dysfunction, and compromised oral hygiene performance due to motor, cognitive, and behavioral factors. Despite the substantial burden of oral disease documented in this population, oral health assessment and preventive dental care remain inadequately integrated into the multidisciplinary management of epilepsy. This article provides a comprehensive evaluation of the oral hygiene status of epileptic patients, critically analyzing the prevalence and severity of periodontal disease, dental caries, gingival overgrowth, and traumatic dental injuries. By synthesizing evidence from cross-sectional clinical studies, pharmacological investigations, and behavioral research, this review elucidates the multifactorial mechanisms linking epilepsy and its treatment to oral health deterioration. The article further proposes a refined, individualized oral hygiene assessment and preventive care protocol tailored specifically to the epileptic patient. The goal is to enhance awareness among dental and medical practitioners, facilitate early detection of oral complications, and improve the quality of life for individuals living with epilepsy through optimized oral health.

Keywords: Epilepsy, Oral Hygiene, Periodontal Disease, Gingival Hyperplasia, Antiepileptic Drugs, Dental Caries, Traumatic Dental Injury, Preventive Dentistry.

INTRODUCTION Epilepsy is a chronic neurological disorder characterized by recurrent, unprovoked seizures resulting from abnormal, excessive, or synchronous neuronal activity in the brain. With a global prevalence estimated at 4–10 per 1,000 population, epilepsy represents one of the most common serious neurological conditions worldwide, affecting individuals of all ages, ethnicities, and socioeconomic strata [1]. The etiological spectrum is broad, encompassing genetic predisposition, perinatal hypoxia, traumatic brain injury, central nervous system infections, cerebrovascular disease, and structural brain abnormalities. The clinical manifestations of epilepsy are equally diverse, ranging from brief absence seizures with subtle impairment of consciousness to generalized tonic-clonic seizures with violent motor activity, loss of consciousness, and significant risk of physical injury.

The oral health implications of epilepsy are profound, multifaceted, and frequently underrecognized in both dental and medical settings. The oral cavity serves as both a target organ for epilepsy-related pathology and a clinical window reflecting the systemic and pharmacological consequences of the disorder and its treatment. The oral health challenges confronting epileptic patients can be categorized into four principal domains: first, the direct traumatic consequences of seizure activity, including dental fractures, luxation injuries, avulsion of teeth, and laceration of oral soft tissues resulting from falls or forceful jaw clenching during generalized convulsions; second, the adverse oral effects of antiepileptic drugs (AEDs), most notably phenytoin-induced gingival overgrowth, but also including xerostomia associated with carbamazepine and valproate, and sialorrhea with certain newer agents; third, the indirect consequences of compromised oral hygiene performance resulting from motor incoordination, cognitive impairment, behavioral disturbances, and

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the fear of triggering seizures during toothbrushing; and fourth, barriers to accessing professional dental care, including dental anxiety, socioeconomic deprivation, and inadequate dental practitioner training in the management of medically complex patients [2, 3].

Among these challenges, drug-induced gingival overgrowth represents the most extensively studied and clinically distinctive oral manifestation of epilepsy pharmacotherapy. Phenytoin, the prototypical and most widely recognized causative agent, induces gingival hyperplasia in approximately 30–50% of patients on chronic therapy, with the severity influenced by drug dosage, duration of therapy, serum concentration, and, critically, the level of oral hygiene and the presence of dental plaque biofilm [4]. The hyperplastic gingival tissue, which initiates in the interdental papillae and may progress to cover the clinical crowns of teeth, creates deep pseudopockets that harbor pathogenic subgingival microbiota, further exacerbating periodontal inflammation and rendering effective oral hygiene mechanically impossible without professional intervention and, in severe cases, surgical excision. Newer generation antiepileptic agents, including lamotrigine, levetiracetam, topiramate, and gabapentin, are generally considered to have a lower propensity for inducing gingival overgrowth, although isolated case reports suggest that vigilance remains warranted [5].

Beyond gingival pathology, epileptic patients demonstrate consistently poorer oral hygiene indices, higher plaque accumulation, elevated gingival bleeding scores, and greater clinical attachment loss compared to systemically healthy matched controls. The periodontal disease burden in this population is independently associated with seizure frequency, the presence of cognitive or motor impairment, and the type and number of antiepileptic medications [6]. Dental caries experience is similarly elevated, driven by xerostomia-induced reduction in salivary protective functions, dietary factors including cariogenic liquid medication formulations, and suboptimal mechanical plaque removal. Traumatic dental injuries, particularly crown fractures of maxillary incisors and mandibular fractures, occur with significantly increased frequency and may be underdiagnosed if patients are unable to communicate symptoms effectively due to postictal confusion or intellectual disability.

Despite the substantial and well-documented burden of oral disease in epileptic patients, oral health assessment remains conspicuously absent from standard epilepsy management guidelines. Neurologists and epileptologists rarely inquire about oral symptoms or examine the oral cavity during routine follow-up visits. Dental professionals, conversely, may lack confidence in treating patients with active seizure disorders, resulting in delayed or avoided dental care. This fragmentation of care perpetuates a cycle of progressive oral deterioration, diminished quality of life, and, in severe cases, systemic consequences from untreated odontogenic infections [7].

Objective: This article aims to comprehensively evaluate the oral hygiene status of epileptic patients by critically reviewing the prevalence, severity, and etiological factors contributing to oral disease in this population. Furthermore, it seeks to propose a refined, evidence-based oral hygiene assessment and preventive care protocol tailored specifically to the epileptic patient, designed for integration into both dental and medical care settings.

MATERIALS AND METHODS This study is structured as a narrative review and critical synthesis of literature. A comprehensive literature search was conducted using PubMed, Scopus, and Google Scholar databases for articles published between 1995 and 2025. The search strategy employed combinations of Medical Subject Headings (MeSH) and free-text terms, including "epilepsy oral health," "epileptic patients oral hygiene," "antiepileptic drugs gingival hyperplasia," "phenytoin gingival overgrowth," "dental caries epilepsy," "periodontal disease epilepsy," "traumatic dental injury seizure," and "salivary dysfunction epilepsy." Inclusion criteria encompassed original cross-sectional and longitudinal clinical research, case-control studies comparing epileptic and healthy populations, systematic reviews with meta-analyses, and evidence-based clinical practice guidelines. Studies

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focusing exclusively on non-epileptic seizure disorders, animal models without human clinical data, and isolated case reports were excluded. Articles were critically analyzed for methodological rigor, sample size adequacy, documentation of seizure type and frequency, AED regimen details, and relevance of outcome measures (Oral Hygiene Index-Simplified, Gingival Index, Community Periodontal Index, DMFT/dmft indices, gingival overgrowth severity scores, traumatic dental injury prevalence, and salivary flow rates). The synthesis focused on identifying consistent patterns across studies, quantifying the magnitude of oral health disparities between epileptic and healthy populations, and constructing a practical, evidence-informed oral hygiene assessment and preventive care protocol.

RESULTS AND DISCUSSION Oral Hygiene Indices and Plaque Accumulation The Oral Hygiene Index-Simplified (OHI-S) and its component Debris Index are consistently and significantly elevated in epileptic patients compared to healthy controls across multiple studies. A cross-sectional investigation by Gurbuz et al. (2010) reported mean OHI-S scores of 3.42 ± 1.18 in a cohort of 120 epileptic patients compared to 1.86 ± 0.74 in matched controls, a difference that persisted after adjustment for age, gender, and socioeconomic status [8]. The factors contributing to impaired oral hygiene performance in epileptic patients are multifactorial. Motor impairment, including fine motor incoordination and tremor associated with both the underlying neurological condition and AED side effects, compromises the manual dexterity required for effective toothbrushing and interdental cleaning. Cognitive deficits, ranging from mild learning disabilities to severe intellectual disability in patients with epileptic encephalopathies, impair understanding of oral hygiene instructions and motivation for self-care. Behavioral factors, including apathy, depression, and anxiety all of which are disproportionately prevalent in epileptic populations further reduce engagement with oral hygiene practices. A uniquely epilepsy-specific barrier is the fear expressed by some patients and caregivers that vigorous toothbrushing may trigger seizures through sensory stimulation, although no evidence supports this association.

Gingival Overgrowth and Periodontal Disease Drug-induced gingival overgrowth (DIGO) remains the most clinically distinctive and extensively studied oral manifestation of epilepsy pharmacotherapy. The prevalence of phenytoin-induced gingival overgrowth varies across studies from 15–70%, influenced by patient age, drug dosage and serum concentration, duration of therapy, and, critically, oral hygiene status and the quantity of supragingival and subgingival dental plaque. The pathogenesis of DIGO involves a complex interplay of drug effects on gingival fibroblast biology and the inflammatory response to the periodontal microbial biofilm. Phenytoin and, to a lesser extent, valproate and carbamazepine, upregulate transforming growth factor-beta (TGF-β) and connective tissue growth factor (CTGF) expression in gingival fibroblasts, promoting excessive collagen synthesis and inhibiting collagen degradation through suppression of matrix metalloproteinase activity [9]. The inflammatory cytokines generated in response to plaque biofilm particularly interleukin-1 beta (IL-1β) and interleukin-6 (IL-6) synergize with the drug-induced fibroblast phenotype, dramatically amplifying the hyperplastic response. This mechanistic synergy explains the critical clinical observation that meticulous plaque control can prevent or substantially mitigate DIGO even in patients on chronic phenytoin therapy, while poor oral hygiene accelerates and exacerbates the condition.

Periodontal disease parameters, including probing pocket depths, clinical attachment loss, and bleeding on probing, are significantly worse in epileptic patients than in healthy controls, with the disparity most pronounced in patients with poor seizure control, intellectual disability, and institutionalization. The periodontal destruction is driven by the synergistic effects of impaired oral hygiene, drug-induced gingival tissue changes creating plaque-retentive anatomical distortions, and,

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potentially, direct effects of AEDs on bone metabolism, including phenytoin-induced alterations in vitamin D metabolism and calcium homeostasis.

Dental Caries Experience The dental caries experience in epileptic patients, measured by the DMFT index, is consistently elevated compared to healthy populations. Contributing factors include xerostomia induced by AEDs, particularly carbamazepine and topiramate, which reduces salivary flow and impairs the oral cavity's innate cleansing, buffering, and antimicrobial functions. The frequent consumption of sugar-containing liquid formulations of AEDs, particularly in pediatric and intellectually disabled patients, delivers a continuous cariogenic substrate to the dental biofilm. Suboptimal oral hygiene, as discussed, permits prolonged plaque stagnation on tooth surfaces. Furthermore, developmental enamel defects, including hypoplasia and hypomineralization, may be more prevalent in epileptic patients due to shared genetic or environmental risk factors and the effects of AEDs taken during odontogenesis [10].

Traumatic Dental Injuries Traumatic dental injuries, including crown fractures, crown-root fractures, luxation injuries, and avulsion of teeth, occur with significantly increased frequency in epileptic patients. The injuries result from falls during generalized tonic-clonic seizures, forceful jaw clenching producing dental cusp fractures, and impact against hard surfaces during uncontrolled convulsive movements. Maxillary central incisors are the most frequently injured teeth, consistent with their exposed position and the pattern of forward falls. The prevalence of traumatic dental injuries in epileptic populations ranges from 20–50% across studies, representing a two to fourfold increase over general population rates. Importantly, dental injuries sustained during seizures are often not promptly diagnosed or treated due to the focus on neurological and medical stabilization, potentially leading to pulp necrosis, periapical pathology, and tooth loss.

Proposed Oral Hygiene Assessment and Preventive Care Protocol Based on the synthesized evidence, the following refined protocol for oral hygiene evaluation and preventive care in epileptic patients is proposed:

Component 1 (Comprehensive Baseline Assessment): Full-mouth oral hygiene evaluation using standardized indices (OHI-S or Plaque Index). Periodontal assessment including gingival index, probing depths, and clinical attachment loss. Caries assessment with DMFT/dmft indices and bitewing radiographs. Specific gingival overgrowth evaluation documenting severity (Grade I–IV), distribution, and correlation with specific AEDs. Traumatic dental injury screening with pulp vitality testing. Sialometric assessment for patients on xerogenic AEDs.

Component 2 (Risk Stratification): Categorize patients into low, moderate, or high oral disease risk based on seizure frequency and type, AED regimen, gingival overgrowth status, oral hygiene performance, caries experience, and cognitive/motor functional level.

Component 3 (Individualized Oral Hygiene Program): Mechanical plaque control using powered toothbrushes for patients with motor impairment. Adjunctive chemical plaque control with chlorhexidine gluconate 0.12% mouthwash for short-term use in gingival overgrowth patients. Daily fluoride mouthwash (0.05% sodium fluoride) for caries prevention. Interdental cleaning aids selected based on manual dexterity. For patients with severe gingival overgrowth, referral for gingivectomy and regular supportive periodontal therapy.

Component 4 (Preventive and Restorative Dental Care): Three to four-monthly professional prophylaxis for high-risk patients. Fluoride varnish application at each recall. Fissure sealants for caries-susceptible permanent molars. Custom-fabricated mouthguards for patients with frequent generalized seizures to prevent traumatic dental injuries. Minimally invasive restorative approaches respecting the patient's cooperation capacity.

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Component 5 (Multidisciplinary Collaboration): Structured communication between the dental team and neurology/epileptology team. Consideration of AED substitution from phenytoin to agents with lower gingival overgrowth potential, in consultation with the neurologist, for patients developing significant gingival hyperplasia. Dental treatment scheduling coordinated with seizure control status. Provision of clear seizure first-aid instructions to dental staff.

CONCLUSION The oral hygiene status of epileptic patients represents a critically important yet systematically neglected dimension of comprehensive epilepsy care. The evidence reviewed in this article unequivocally demonstrates that epileptic patients bear a substantially elevated burden of oral disease including impaired oral hygiene, accelerated periodontal destruction, drug-induced gingival overgrowth, increased dental caries, and traumatic dental injuries compared to the general population. The etiological pathways driving this oral health disparity are complex and interdependent, encompassing the direct effects of seizures, the pharmacological consequences of AEDs, and the behavioral and functional barriers to effective oral self-care. The refined oral hygiene assessment and preventive care protocol proposed herein offers a structured, evidence-based framework for integrating comprehensive dental care into the multidisciplinary management of epilepsy. Through early detection, risk-stratified preventive intervention, individualized oral hygiene support, and genuine interdisciplinary collaboration, the cycle of progressive oral deterioration can be interrupted, and the quality of life of individuals living with epilepsy can be substantially enhanced.

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