

Parental perceptions of dental health and need for treatment in children with epilepsy: a multicenter cross-sectional study

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Background: Epilepsy is a common neurological disorder in childhood. However, there have been limited studies on its impact on the oral health of affected children. Our study aimed to assess the oral health of children with epilepsy in the city of Jeddah, Saudi Arabia, as perceived by their mothers.

Methods: We conducted a cross-sectional study in three hospitals. We included children 2–18 years old with physician-confirmed epilepsy diagnosis. We assessed parental perception of dental status and need for dental care using a standardized questionnaire that was completed by the mothers. To adjust for potential confounding variables, we used univariate and multivariate logistic regression.

Results: We included 96 children with epilepsy in our study. Their mean age was 6.4±3.4 years. In 55.2% (n=53), dental status was rated as bad, and in 84.4% (n=81) a need for dental care was expressed. Cerebral palsy (OR 5.06, 95% CI 1.28–19.99; *P*=0.021), motor disability (OR 6.41, 95% CI 1.12–36.73; *P*=0.037), referral from a pediatric neurology clinic to a dentist (OR 10.755, 95% CI 3.290–35.151; *P*<0.001), and irregular brushing of teeth (OR 5.397, 95% CI 1.536–18.961; *P*=0.009) were significantly associated with increased risk of perceived bad dental status. Perception of the child as being overweight (OR 0.117, 95% CI 0.034–0.400; *P*=0.001) was significantly associated with decreased risk of perceived bad dental status. Motor disability (OR 5.73, 95% CI 1.64–20.04; *P*=0.006) was significantly associated with increased parental expression of need for dental care.

Conclusion: In most children with epilepsy, perceived dental status was bad and there was a high expressed need for dental care. Interventions to improve the dental health of children with epilepsy should focus on those with cerebral palsy and motor disability.

Keywords: oral, dental, teeth, hygiene, health, epilepsy, child

Introduction

Epilepsy is a neurological disorder characterized by recurrent unprovoked seizures commonly seen in childhood.¹ It is associated with numerous neurocognitive comorbidities, such as learning disabilities, developmental delay, and mental retardation.^{2–4} Good oral health is important for the general health of children, especially in children with epilepsy. Nevertheless, there have not been many studies to assess the oral health or the need for dental care in children with epilepsy. Children with epilepsy experience higher rates of caries.⁵ Furthermore, individuals with epilepsy are less likely to use dental services, despite having higher rates of hospitalization and consultation with physicians compared to the general population.⁶ Interestingly, Percival et al⁷ found that children with epilepsy had more plaque on permanent teeth, more gingivitis, and

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more anterior-tooth trauma, yet fewer dental caries compared to controls. Another study reported that children with epilepsy were at increased risk of developing dental caries and gingival diseases compared to a control group.⁸ It has been documented that gingival overgrowth is a common side effect of antiepileptic drugs in childhood.^{9,10} In Saudi Arabia, to our knowledge, there have been no studies assessing dental health in children with epilepsy.

Some children with epilepsy have associated motor, coordination, or cognitive difficulties resulting from the underlying cause of their seizures, such as cerebral palsy (CP).¹¹ In others, such difficulties may be the result of their seizure type, frequency, or medication. These difficulties could contribute to the development of dental problems, such as trauma, or poor oral hygiene.¹² Poor oral hygiene can create significant morbidity, and affects the well-being of these children and negatively impacts their quality of life.⁹ Screening for these conditions should be part of the initial assessment. The objective of this article is to present an overview of parents' perceptions of dental health issues in children with epilepsy in Saudi Arabia and outline important preventive and practical strategies for the management of this common comorbidity.

Methods

A hospital-based cross-sectional study was conducted between September 2016 and March 2017. Subjects were recruited from three main hospitals in Jeddah city, located in the western region of Saudi Arabia: King Abdulaziz University Hospital, Al-Aziziyah Maternity and Children's Hospital (AMCH), and Jeddah Maternity and Children's Hospital (JMCH). King Abdulaziz is the biggest university hospital in the western region of Saudi Arabia, while Aziziyah and Jeddah are the only maternity hospitals in Jeddah, run by the Saudi Ministry of Health. Eligibility criteria were children 2–18 years old with physician-confirmed epilepsy diagnosed more than 6 months prior to participating in our study. The mother must have been taking care of the child for at least the past 6 months.

We created a 20-item focused questionnaire to assess dental status and need for dental care as perceived by the mother. The questionnaire included questions relating to the following: history of drop attacks; considered as overweight by parents; history of vomiting or gastroesophageal reflux disease, motor disability, or cognitive disability; frequency of brushing teeth; recently been to a dentist; type of antiepileptic drug used; cause of epileptic seizure; and if there had been a referral to a dentist from the pediatric neurology clinic. The focused questionnaire also included demographics questions:

the child's age, sex, and nationality, mother's and father's age, education, and employment, and total family income. To reduce selection bias, we recruited a consecutive sample of eligible children. With the purpose of reducing information bias, we measured our primary outcome, impact of epilepsy on child's and family life, using a validated and pretested questionnaire. This study was approved by the Institutional Review Board of King Abdulaziz University Hospital and the Research Ethics Committee of King Abdulaziz University in Jeddah. Signed informed consent was obtained from all subjects who participated in this study.

To describe our study population, we used frequencies and absolute numbers for categorical variables, and means, SD, medians, and interquartile ranges for continuous variables. For statistical analysis, age (of children and parents) was grouped into categories. Associations between two categorical variables were assessed using the χ^2 test. To adjust for potential confounding variables, univariate and multivariate logistic regression models were conducted. A backward-elimination procedure was used to select variables for the regression model. For all statistical tests, $P < 0.05$ was defined as the level of significance, to adjust for multiple testing. We used SPSS version 20 for data analysis.

Results

We recruited 96 children with epilepsy. The rate of refusal to participate was $<5\%$ in all study hospitals. Table 1 lists demographic characteristics of the children, and Table 2 responses about dental status, perceived need for dental care, and risk factors. The mean age of the children was 6.4 years (SD 3.4, median 5.5). The mean age of mothers was 36 years (SD 6.3, median 36.0) and of the fathers 42 years (SD 6.9, median 40.0). Forty-nine percent of the children were female and 53.1% Saudi. More than half (54.2%) had a monthly family income of $<SR5,000$ and only 8.3% $>SR10,000$ Saudi Riyals.

Most of the parents (92.7%) did not know the type of seizures that their child had, and only 5.2% reported whole-body seizures. About two-thirds of children (65.6%) suffered from CP, and in 13.5% the cause of epilepsy was unknown. The most common single antiepileptic therapy was sodium valproate (26%; $n=27$). The most common combination-antiepileptic therapy was carbamazepine with sodium valproate (42.7%; $n=41$). Cognitive and motor disability were equally reported in 75.0% of the cases. More than half (53.2%) the children did not brush their teeth regularly. Two-thirds of the children had seen a dentist previously, and 64.6% were referred to a dentist from the neuropediatric clinic. Mothers

Table 1 Characteristics of children (n=96)

	% (n)
Age (years)	
<5	35.4 (34)
5–10	44.8 (43)
≥10	19.8 (19)
Sex	
Male	51.0 (49)
Female	49.0 (47)
Nationality	
Saudi	53.1 (51)
Egyptian	7.3 (7)
Syrian	13.5 (13)
Somali	7.3 (7)
Yemeni	7.3 (7)
Other	11.5 (11)
Type of seizures	
Do not know	92.7 (89)
Whole body	5.2 (5)
Partial	2.1 (2)
Cause of epilepsy	
Cerebral palsy	65.6 (63)
Hypoxic ischemic encephalopathy	5.2 (5)
Unknown	13.5 (13)
Other	15.6 (15)
Antiepileptic drugs	
Single therapy	55.2 (53)
Combined therapy	44.8 (43)

reported that their children's teeth were bad in more than half the cases (55.2%), and the majority (84.4%) expressed the need for dental care.

Parental reporting of dental status

There was no statistically significant association between child's age, sex, or nationality and perceived dental status (Table 3). Underlying diagnosis was, however, associated with reported dental status ($P=0.002$).

There was a statistically significant correlation between dental status reporting and both mother's ($P=0.042$) and father's ($P=0.041$) level of education and father's employment ($P=0.038$). There was no statistical significance with the other variables (Table 4).

There was a statistically significant association between all the other risk factors (drop attacks, cognitive disability, motor disability, vomiting, perceived to be overweight, previous dental review, or referral to a dentist) and perceived dental status (Table 5).

Parental reporting of need for dental care

There was no statistically significant association between any of the child's demographics (age, sex, nationality, or

Table 2 Dental status and other factors

	% (n)
Cognitive disability	
No	25.0 (24)
Yes	75.0 (72)
Motor disability	
No	25.0 (24)
Yes	75.0 (72)
Dental status	
Good	44.8 (43)
Bad	55.2 (53)
Need for dental care	
Needed	84.4 (81)
Not needed	15.6 (15)
History of drop attacks	
No	83.3 (80)
Yes	16.7 (16)
Brushing teeth	
Every day	46.9 (45)
Sometimes	46.9 (45)
Never	6.3 (6)
Vomiting	
No	20.8 (20)
Yes	79.2 (76)
Recently seen a dentist	
No	33.3 (32)
Yes	66.7 (64)
Perceived to be overweight	
No	63.5 (61)
Yes	36.5 (35)
Referral to dentist after being seen in clinic	
No	35.4 (34)
Yes	64.6 (62)

drug therapy) and perceived need for dental care, with the exception of the underlying diagnosis ($P=0.013$; Table 3). The only statistically significant association between perceived need for dental care and family demographics was that of the father's education ($P=0.026$) (Table 4). The correlation between reported need for dental care and all the other risk factors (Table 5) was statistically significant, with the exception of drop attacks ($P=0.059$). Particularly strong was the statistical significance of motor disability ($P=0.006$), vomiting ($P=0.007$), perceived to be overweight ($P<0.001$), having previously seen a dentist ($P<0.001$), and having received a dental referral after attending the clinic ($P<0.001$).

Univariate and multivariate analyses for perceived dental status

The following factors were significantly associated with increased risk of reported bad teeth (univariate analysis): CP (OR 6.18, 95% CI 2.42–15.75; $P<0.001$), motor disability (OR 7.60, 95% CI 2.53–22.84; $P<0.001$), cognitive disability

Table 3 Analysis of demographics with perceived dental status and need for dental care

	Dental status		P-value	Dental care		P-value
	Good, % (n)	Bad, % (n)		Not needed, % (n)	Needed, % (n)	
Age						
<5.5 years	39.6 (19)	60.4 (29)	0.412	20.8 (10)	79.2 (38)	0.16
≥5.5 years	50.0 (24)	50.0 (24)		10.4 (5)	89.6 (43)	
Sex						
Male	44.9 (22)	55.1 (27)	0.983	16.3 (8)	83.7 (41)	
Female	44.7 (21)	55.3 (26)		14.9 (7)	85.1 (40)	
Nationality						
Saudi	41.2 (21)	58.8 (30)	0.448	15.7 (8)	84.3 (43)	0.986
Non-Saudi	48.9 (22)	51.1 (23)		15.6 (7)	84.4 (38)	
Diagnosis						
Cerebral palsy	33.8 (24)	66.2 (47)	0.002	9.9 (7)	90.1 (64)	0.013
Hypoxic ischemic encephalopathy	60.0 (3)	40.0 (2)		20.0 (1)	80.0 (4)	
Unknown	100.0 (5)	0.0 (0)		60.0 (3)	40.0 (2)	
Others	73.3 (11)	26.7 (4)		26.7 (4)	73.3 (11)	
Antiepileptic drugs						
Single therapy	37.7 (20)	62.3 (33)	0.123	15.1 (8)	84.9 (45)	0.874
Combined therapy	53.5 (23)	46.5 (20)		16.3 (7)	83.7 (36)	

Table 4 Analysis of family demographics with perceived dental status and need for dental care

	Dental status		P-value	Dental care		P-value
	Good, % (n)	Bad, % (n)		Not needed, % (n)	Needed, % (n)	
Mother's education						
Below secondary	73.3 (11)	26.7 (4)	0.042	33.3 (5)	66.7 (10)	0.093
Secondary	35.7 (15)	64.3 (27)		9.5 (4)	90.5 (38)	
University	43.6 (17)	56.4 (22)		15.4 (6)	84.6 (33)	
Mother's job						
Housewife	45.5 (40)	54.5 (48)	0.665	17.0 (15)	83.0 (73)	0.204
Employed	37.5 (3)	62.5 (5)		0.0 (0)	100.0 (8)	
Mother's age						
≤35 years	47.8 (22)	52.2 (24)	0.566	19.6 (9)	80.4 (37)	0.308
>35 years	42.0 (21)	58.0 (29)		12.0 (6)	88.0 (44)	
Father's age						
>40 years	47.2 (17)	52.8 (19)	0.711	16.7 (6)	83.3 (30)	0.828
≤40 years	43.3 (26)	56.7 (34)		15.0 (9)	85.0 (51)	
Father's job						
Unemployed	21.7 (5)	78.3 (18)	0.038	17.4 (4)	82.6 (19)	0.962
Blue-collar	52.9 (18)	47.1 (16)		14.7 (5)	85.3 (29)	
White-collar	51.3 (20)	48.7 (19)		15.4 (6)	84.6 (33)	
Father's education						
Below secondary	76.9 (10)	23.1 (3)	0.041	38.5 (5)	61.5 (8)	0.026
Secondary	37.5 (12)	62.5 (20)		6.3 (2)	93.8 (30)	
University	41.2 (21)	58.8 (30)		15.7 (8)	84.3 (43)	
Income (in Saudi Riyal [SR])						
SR<5,000	50.0 (26)	50.0 (26)	0.535	17.3 (9)	82.7 (43)	0.881
SR 5,000–10,000	38.9 (14)	61.1 (22)		13.9 (5)	86.1 (31)	
SR>10,000	37.5 (3)	62.5 (5)		12.5 (1)	87.5 (7)	

(OR 5.64, 95% CI 1.99–16.01; $P=0.001$), previous visit to the dentist (OR 7.477; CI 2.914–19.185; $P<0.001$), and receipt of dental appointment (referral) after coming to neuropsychiatric clinic (OR 11.089, CI 4.050–30.365; $P<0.001$) In contrast, drop attack (OR 0.303, 95% CI 0.096–0.955; $P=0.04$) and

perception of child being overweight by parent (OR 0.134, 95% CI 0.052–0.343; $P<0.001$) were significantly associated with decreased risk of bad teeth.

Multivariate analysis revealed statistically significant association between increased reports of bad teeth and

Table 5 Analysis of other risk factors with perceived dental status and need for dental care

	Dental status		P-value	Dental care		P-value
	Good, % (n)	Bad, % (n)		Not needed, % (n)	Needed, % (n)	
Drop attack						
No	40.0 (32)	60.0 (48)	0.035	12.5 (10)	87.5 (70)	0.059
Yes	68.8 (11)	31.3 (5)		31.3 (5)	68.8 (11)	
Cognitive disability						
No	75.0 (18)	25.0 (6)	0.001	29.2 (7)	70.8 (17)	0.035
Yes	34.7 (25)	65.3 (47)		11.1 (8)	88.9 (64)	
Motor disability						
No	79.2 (19)	20.8 (5)	<0.001	33.3 (8)	66.7 (16)	0.006
Yes	33.3 (24)	66.7 (48)		9.7 (7)	90.3 (65)	
Vomiting						
No	65.0 (13)	35.0 (7)	0.041	35.0 (7)	65.0 (13)	0.007
Yes	39.5 (30)	60.5 (46)		10.5 (8)	89.5 (68)	
Perceived to be overweight						
Yes	74.3 (26)	25.7 (9)	<0.001	3.3 (2)	96.7 (59)	<0.001
No	27.9 (17)	72.1 (44)		37.1 (13)	62.9 (22)	
Recently seen a dentist						
Yes	27.9 (17)	72.1 (44)	<0.001	37.1 (13)	62.9 (22)	<0.001
No	74.3 (26)	25.7 (9)		3.3 (2)	96.7 (59)	
Referral to dentist						
Yes	25.8 (16)	74.2 (46)	<0.001	41.2 (14)	58.8 (20)	<0.001
No	79.4 (27)	20.6 (7)		1.6 (1)	98.4 (61)	
Brushing teeth						
Every day	48.9 (22)	51.1 (23)	0.065	15.6 (7)	84.4 (38)	0.048
Sometimes	35.6 (16)	64.4 (29)		11.1 (5)	88.9 (40)	
Never	83.3 (5)	16.7 (1)		50.0 (3)	50.0 (3)	

family monthly income of >SR10,000 (OR 18.32, 95% CI 2.12–158.44; $P=0.008$), CP (OR 5.06, 95% CI 1.28–19.99; $P=0.021$), motor disability (OR 6.41, 95% CI 1.12–36.73; $P=0.037$), referral for dental review after coming to the neuropediatric clinic (OR 10.755, 95% CI 3.290–35.151; $P<0.001$), and irregular brushing of teeth (OR 5.397, 95% CI 1.536–18.961; $P=0.009$). Perception of the child as being overweight (OR 0.117, 95% CI 0.034–0.400; $P=0.001$) was significantly associated with decreased reporting of bad teeth.

Univariate and multivariate analyses for need of dental care

Univariate analysis revealed that parents were more likely to report a need for dental care in cases of CP (OR 3.56, 95% CI 1.14–11.11; $P=0.029$), cognitive disability (OR 3.29, 95% CI 1.05–10.37; $P=0.042$), motor disability (OR 4.64, 95% CI 1.47–14.70; $P=0.009$), previous visit to the dentist (OR 17.432, 95% CI 3.637–83.550; $P<0.001$), and referral to a dentist after coming to the neuropediatric clinic (OR 42.70, 95% CI 5.278–345.457; $P<0.001$). Perception of child as being overweight by parent (OR 0.057, 95% CI 0.012–0.275; $P<0.001$) was significantly associated with decreased per-

ceived need for dental care. Under multivariate analysis, only motor disability (OR 5.73, 95% CI 1.64–20.04; $P=0.006$) was significantly associated with increased perceived need for dental care.

Discussion

Children and adults with epilepsy are frequently seen in dental practice, and the estimated prevalence of epilepsy is 0.9%.¹³ Dental procedures have an innate risk of causing seizures, and as a result dentists should have sufficient background knowledge about the patient's condition and how to manage it, especially since epilepsy is the commonest medical emergency in dental practices.¹⁴ Our study assessed levels of oral hygiene in children with epilepsy as reported by their mothers.

Our findings suggest that children with CP-related epilepsy had sixfold-higher odds of bad teeth and more than threefold-higher odds of perceived need for dental care than children with noncerebral palsy. This is consistent with other studies reporting a relation between severity of neurological insult in children with CP and risk of having a dental disease.^{15,16} There are multiple possible contributing etiologies

to this relationship. One is having difficulties in coordinating movement, which can make as simple a task as brushing one's teeth considerably difficult.

Another factor is the presence of cognitive impairment, where we found that children with cognitive disability had fivefold-higher odds of bad teeth status and threefold-higher odds of perceived need for dental care than children without cognitive impairment. Cognitive disability is seen more frequently in children with severe CP, and is also accompanied with evidence of cortical abnormalities on imaging.¹⁷ Our finding is supported by evidence presented by Dourado et al,¹⁸ who found that the risk of having dental caries increases with the severity of intellectual impairment. This is proven to affect negatively the quality of life of patients with CP.¹⁹ The main reason seems to be that cognitive disability makes the child's cooperation in brushing and caring for their teeth and oral health more challenging for the parents.²⁰ Dependence of care on a caregiver is an independent factor associated with dental disease, especially in patients with CP.²¹

Children with motor disability had more than sevenfold-higher odds of being reported as having bad teeth and more than fourfold-higher odds of perceived need for dental care than children with no motor disability. The finding is consistent with a study that found malnutrition to be a common finding in patients with CP, which in turn has a negative effect on dental health.²²

Pseudobulbar palsy also plays a major role in the development of dental disease, due to the loss of coordination in functions related to eating, such as chewing food and swallowing it, in addition to not being able to control salivation, resulting in sialorrhea.²³ It is worth noting that periodontal disease tends to occur more in patients with spastic quadriplegic CP.¹ Abnormalities of oral coordination may even be precipitated by antiepileptic drugs like clonazepam, which may cause aspiration.¹³ Phenytoin, another antiepileptic drug, can cause gingival hyperplasia and consequently lead to periodontal disease as well. Dental erosion is associated with swallowing dysfunction¹⁵ and gastroesophageal reflux disease,²⁴ which is quite common in patients with CP. Care should thus be given to diagnosing them properly.

Patients with CP are also more likely to suffer from repeated acts of teeth clenching or grinding (bruxism), especially if their cognitive or motor disability is severe.²⁵ This act leads to considerable damage to dental surfaces, resulting in a flat bite surface. The risk of dental trauma, including facial injury and enamel fractures, is increased in patients with CP-related motor disability and epilepsy. This risk is increased even more in children who have drop attacks, up

to 60%.²⁶ Even though our findings suggest that the presence of drop attacks is associated with reporting of good dental status, this is contradictory to most of the literature. More likely are confounding comorbidities, such as the possibility that children with no drop attacks in our studied population may have had severe cognitive or motor disability, possibly skewing the results in one direction.

Children whose family income was >SR10,000 had 18 times the odds of parental concerns of bad teeth than children whose family income was <SR5,000. In addition, lower parent education was associated with reporting of good teeth. These findings are contradictory to studies that have reported higher socioeconomic status to play an important role in better dental care for children with disabilities and thus a tendency to have better teeth.²⁷⁻²⁹ One explanation for such disparity may be due to poor education about what constitutes good dental health. Another explanation could be that families on low incomes may not have the time to give all their attention to their children, and thus they may not be aware of their dental need or status. The mother's opinion or reference of what good dental health is supposed to be like may differ according to socioeconomic status, which can affect the results.

Perception of the child being overweight by their parents was significantly associated with decreased risk of reported bad teeth. This finding can be explained if we correlate it with nutrition status, as underweight children are more likely to have some form of nutritional deficiency, which can affect their dental health negatively. In contrast, children perceived as overweight by their parents were less likely to have malnutrition of some form. This explanation is supported by other research.²² Particularly, children with CP on liquid diets were more likely to develop dental caries than those on solid diets.¹⁵

Children who had had previous visits to the dentist prior to attending our clinic had seven times the odds of reported bad teeth than children who had not previously had their teeth checked by a dentist. Children who had received a dental appointment (referral) after attending our clinic were at 11 times the odds of bad teeth than children who were not referred to a dentist. Causation cannot be established here, as the children who attended a dentist or needed referral may already have had dental conditions, which explains why they got the referral on their visit. Other studies have reported results opposite to ours, where better overall dental status was associated with routine visits to the dentist.^{27,28}

One limitation of this study is that we utilized convenience sampling, and this can introduce sampling bias. Another limitation is differences in parents' perception of

what the optimal dental status for their child is. A standardized test to assess children accurately by independent dentists should be the focus of future studies; however, that would add considerable cost to the study. Increasing the sample size and demographics by involving all major regions in Saudi Arabia would improve accuracy and give a better picture of the dental status of children with epilepsy in our region. With nearly 85% of children in need of dental care according to their mothers, dental care should start at home and early in life. Dentists should teach parents how to maintain proper dental hygiene²¹ with correct brushing technique and what to do if they are met with any difficulty or resistance from the child.

Conclusion

Dental hygiene is not properly maintained in children with epilepsy as reported by the parents, and more so in children with CP. There is a need for dentists' participation in the health-care teams for children with epilepsy, and this should be supplemented by proper training of parents on how to deal with their child's special needs.

Disclosure

The authors report no conflicts of interest in this work.

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