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Original article

PREVALENCE OF CARIES AND THE NEED FOR URGENT DENTAL TREATMENT AMONG CHILDREN WITH NEUROLOGICAL IMPAIRMENT IN NORTHEASTERN BULGARIA

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ABSTRACT

Introduction: Oral health is extremely important for the quality of life and well-being. Findings reveal that people with special needs have difficulties in getting dental care, which increases their risk of oral diseases. The recommendations for dental examination are identical for patients with and without neurological impairment.

This study aimed to assess the prevalence of caries and overall dental health among children with motor and mental disabilities in Northeastern Bulgaria.

Methods: A total of 53 children with neurological impairment under the age of 18 were selected from Varna and Ruse from April to October 2017. Data on age, gender, height, weight, caregiver education level were collected. Information on oral hygiene behavior and diet was gathered as well. The 2013 World Health Organization standards for dental caries were used to assess the oral health status. The data were analyzed with the statistical package Jamovi v.2.2.2.0.

Results: Children were divided into two groups – with predominantly motor or mental impairment. Both groups had high rates of caries and need for urgent dental treatment with no significant difference observed. The CPITN correlated positively with motor impairment (Spearman's rho= 0.393; p= 0.043). It was discovered that children with motor impairment had a higher prevalence of malocclusion than children with mental impairment (rho= -0.331; p= 0.016). The number of caries correlated as well with the type of occlusion (Spearman's rho=0.378; p=0.005), the dentition type (rho=0.343; p=0.012) and the age (rho= 0.372; p= 0.006).

Conclusion: The study findings indicate that both types of neurological impairments were associated with a high frequency of caries and a significant need for urgent dental care. More frequent dental examination is thought to improve oral health. Nevertheless, more studies are required to substantiate this theory.

Keywords: dental health; motor disability, mental disability, child,

INTRODUCTION:

Good oral health is foundational for overall well-being. An increased focus on individuals with special needs has highlighted the unique challenges these populations face in maintaining their oral health and accessing dental care [1]. Particularly, children with neurological impairments, including conditions like cerebral palsy (CP), hydrocephalus, mild mental retardation, Down syndrome, autism spectrum disorder (ASD), and pervasive developmental disorders (PDD), often face heightened oral health challenges [2].

Cerebral palsy, for instance, is a neurodevelopmental disorder characterized by persistent movement and posture disturbances stemming from non-progressive disruptions in the developing brain [3,4]. In many developing nations, the exact prevalence of CP remains uncertain, but it is significantly higher in resource-limited settings. Among those with CP, the neuromuscular issues can manifest as structural changes in the orofacial region, feeding difficulties, and oral hygiene maintenance challenges [5,6].

Similarly, children with Down syndrome or autism spectrum disorder might face their unique set of dental challenges due to factors ranging from their facial anatomy, dietary habits, or behavioral issues that might interfere with regular oral care [7,8]. ASD, in particular, can come with sensory sensitivities that make dental visits and regular oral hygiene practices challenging [9].

Given this backdrop, it becomes pivotal to assess the oral health status and treatment needs of these children. The Standardized Index by Shah (CPITN) provides an avenue for such an assessment. It's an invaluable tool for epidemiological screenings and individual patient monitoring, with scores indicating the urgency of dental treatment required.

AIM:

The aim of this study is to assess the prevalence of caries and overall dental health among children with neurological impairments, including motor and mental disabilities with conditions such as cerebral palsy, hydro-

cephalus, mild mental retardation, Down syndrome, autism spectrum disorder, and PDD, in Northeastern Bulgaria.

MATERIAL AND METHODS:

We randomly selected 53 Bulgarian youngsters under the age of 18 with neurological impairment from Varna and Ruse. The convenience sample comprised of 24 individuals with cerebral palsy, 5 with hydrocephalus, 7 with mild mental retardation, 7 with Down and other syndromes, 5 with autism spectrum disorder and 5 with PDD. The participants in the oral health study were volunteers and were examined from April to October 2017. Demographics (such as age, sex, body mass index (BMI), caregiver education level), diet (such as food consistency, number of snacks, etc.), and oral hygiene behavior were collected using a standard data collecting form (e.g. tooth brushing frequency, use of tooth cleaning devices and materials, number of dental visits, etc.). From the child's height and weight, the BMI was computed as part of the BCPR assessment/registration, height and weight were taken to determine the children's nutritional status.

The 2013 World Health Organization standards for dental caries, which specify the decayed, missing, and filled teeth (dmft) for deciduous teeth and the decayed, missing, and filled teeth (DMFT) index for permanent teeth, were used to assess the oral health status. The sum of the d+m+f+D+M+F was used to evaluate the overall values of dmft and DMFT separately and jointly. Based on the scores, dental caries severity was expressed as dmft+DMFT=0 for "caries free" and dmft+DMFT>0 for "presence of caries." The following information was also gathered during the intraoral clinical examination: CPI values for six index teeth15, which were categorized as CPI 0=healthy, CPI 1=bleeding, CPI 2=calculus, CPI 3=pocket depth 3-5mm, and CPI 4=pocket depth>5mm.

Carie's experience was measured by identifying decayed, missing, and filled teeth for deciduous and permanent teeth (dmft/ DMFT). Clinical periodontal index, body mass index, oral hygiene behaviour, masticatory ability, and dietary habits were recorded. The type of disability (motor or mental) and the severity of functional mobility (Gross Motor Function Classification System [GMFCS]) were assessed.

The Medical University of Varna Ethical Committee approved the study with protocol 60/23.2.2017.

Statistical analysis

The statistical analysis of the research sample involved the use of descriptive and inferential statistics to summarize and test relationships between the study variables. Descriptive statistics, such as median and interquartile range (IQR) and absolute and relative frequencies, were used to summarize the characteristics of the sample, including age, sex, gestational age at birth, dentition type, ethnicity, and Gross Motor Function Classification System (GMFCS) level.

Fisher's exact test was used to test for relationships between categorical variables. This test is appropriate for small sample sizes or when expected cell frequencies are less than 5. The test calculates the probability of obtaining the observed data or more extreme data, assuming that there is no association between the variables being tested. A significant result indicates that the observed data is unlikely to have occurred by chance, and there is evidence of an association between the variables being tested.

To test for differences in continuous variable outcomes between children with motor and mental disabilities, an independent samples Mann-Whitney U-test was used. This test is appropriate for non-normally distributed data or when sample sizes are small. The test calculates the probability that a randomly selected value from one group is greater than a randomly selected value from the other group. A significant result indicates that there is evidence of a difference in the outcomes between the two groups.

A significance level of 0.05 was used to determine statistical significance, meaning that results with a probability of less than 5% occurring by chance were considered significant. The statistical software Jamovi v.2.2.2.0 was used to perform the data analysis.

RESULTS:

The study analyzed the prevalence of caries and the need for urgent dental treatment among children with neurological impairment in Northeastern Bulgaria. The sample included 26 children with motor disability and 27 with mental disability.

There was no significant difference in age between the two groups, with a median age of 4.04 years for children with motor disabilities and 3.58 years for children with mental disabilities ($P = 0.950$). The majority of the children in both groups were male, with no significant difference observed between the groups (50.0% for children with motor disabilities and 48.1% for children with mental disabilities, $P = 1.000$).

The gestational age at birth was significantly lower for children with motor disabilities than for those with mental disabilities (median of 33 weeks versus 39 weeks, respectively, $P = 0.002$).

Regarding dentition type, there was no significant difference between the two groups ($P = 1.000$). Most of the children in both groups had either erupted milk teeth or milk teeth, with only a small percentage having mixed dentition.

Ethnicity was significantly different between the groups ($P = 0.003$), with a higher proportion of Bulgarian children in the mental disability group (76.9%) compared to the motor disability group (42.3%).

The Gross Motor Function Classification System (GMFCS) level was significantly different between the two groups ($P < 0.001$).

In terms of oral health, the prevalence of caries was high in both groups, with no significant difference observed ($P = 0.0923$). The need for urgent dental treatment was also high in both groups, with no significant difference observed ($P = 1.000$). Other essential characteristics are mentioned in Table 1.

Table 1. Basic characteristics of the sample

Characteristics	Motor disability n=26	Mental disability n=27	Test Results
Age. median (years)±IQR	4.04±3.25	3.58±2.96	U=347, p=0.950
Male n; %	13; 50.0%	13; 48.1%	U=1.000, p=0.018
Gestational age at birth, median (weeks)±IQR	33±7	39±2	U=124, p=0.002
Type of dentition n; %			
Eruption of milk teeth	10; 38.5%	10; 37.0%	U=1.000, p=0.09
Milk teeth	12; 46.2%	12; 44.4%	
Mixed dentition	4; 15.4%	5; 18.5%	
Ethnicity n; %			
Bulgarian	11; 42.3%	20; 76.9%	U=10.7, p=0.003
Turkish	8; 30.8%	0; 0.0%	
Romas	7; 26.9%	6; 23.1%	
GMFCS n; %			
Minor limitations (1-3)	9; 36.0%	27; 100%	U=22.8, p<0.001
Gross limitations (4-5)	16; 64.0%	0; 0%	

The results of the statistical analysis revealed several significant correlations between the variables studied. Firstly, a negative significant correlation was found between gestational age at birth and the level of motor impairment, indicating that children who were born earlier are more likely to suffer from motor impairment (Spearman's rho= -0.311; p= 0.038). Additionally, children born earlier were more likely to suffer from motor impairment than mental disability (Spearman's rho= 0.487; p< 0.001).

It was discovered that children with GL are more prone to acquiring caries than those with ML. It is assumed that this is owing to the fact that GL patients never brush their teeth.

Our study showed that children with mental disabilities have a lower Community Periodontal Index of Treatment Needs (CPITN) index compared to children who have more severe motor disabilities and a correspondingly higher degree of CPITN index. Furthermore, a positive significant correlation was found between the level of motor impairment and (CPITN), indicating that children with more severe motor impairment are more likely to have poorer periodontal health (Spearman's rho= 0.393; p= 0.043).

A negative correlation was found between the type of occlusion and the type of impairment, indicating that children with motor disabilities are more likely to have malocclusion than those with mental disabilities (Spearman's rho= -0.331; p= 0.016).

Finally, a significant positive correlation was observed between the number of caries and the type of occlusion (Spearman's rho= 0.378; p= 0.005), the type of dentition (Spearman's rho= 0.343; p= 0.012), and age in months (Spearman's rho= 0.372; p= 0.006). These findings suggest that children with malocclusion, mixed dentition, and older age are more likely to have a higher number of caries.

Overall, the study highlights the need for dental interventions to improve the oral health of children with neurological impairment, especially those with more severe motor impairment, malocclusion, mixed dentition, and older age.

DISCUSSION:

Our study in Northeastern Bulgaria analyzed the oral health of children with neurological impairment, primarily focusing on the prevalence of dental caries and the need for urgent dental treatment. The results indicate a significant prevalence of dental caries among these children, regardless of the type of neurological impairment, emphasizing the critical need for specialized dental care for this vulnerable group.

When compared with previous research, our findings mirror those of Akhter et al. [16], suggesting that children with severe motor functional impairments are at a higher risk of dental caries, likely due to challenges in maintaining proper oral hygiene. This notion is further supported by the observations made by Pansrimangkorn et al. [17], where a substantial majority of preschoolers with CP were found to have dental caries, particularly those with spasticity.

Contrarily, while our research found no significant difference between the oral health of children with motor and mental disabilities, Somani et al. alluded to the exacerbated challenges of maintaining dental hygiene in children with special needs [18]. The global absence of clear oral health recommendations for people with cerebral palsy [19] suggests a research gap, further underlining the importance of our study.

From a clinical perspective, the findings advocate for the proactive involvement of healthcare professionals in formulating individualized oral health plans for these children. Policy-wise, there's an evident need for structured oral health programs and awareness campaigns targeting caregivers and those responsible for children with neurological impairments, emphasizing the unique challenges and needs of this group.

However, our study has its limitations. The sample size is limited to Northeastern Bulgaria, which might not be representative of the broader population of children with neurological impairments. There might also be potential biases in the selection of participants. Future research should consider a broader geographical scope and more standardized methodologies for caries identification to ensure the results' generalizability.

CONCLUSION:

Children with neurological impairment in Northeastern Bulgaria exhibit a pronounced prevalence of dental caries and a compelling need for urgent dental care. These results underscore the importance of tailored oral health interventions for these children. It's imperative for children with neurological impairments to maintain commendable oral hygiene practices and receive regular care from dental specialists. Further investigations using standardized methodologies for caries identification in permanent teeth among special needs patients are indispensable.

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