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Evaluation of oral and dental health parameters in children with special care needs

Büşra Tekin, İsmet Rezani Toptancı ✉
Dicle University, Sur Diyarbakir, Turkey
✉ ismettoptanci@gmail.com

Abstract
AIM. The aim of this study is to evaluate and raise awareness of the oral and dental health parameters in children aged 6 to 16 years with special care needs who are enrolled in special education institutions located in the central districts of Diyarbakir in Turkey. Specifically, the study examines the presence of caries, plaque, malocclusions, and molar-incisor hypomineralization.
METHODS. A total of 368 children with special care needs participated in the study, with ages ranging from 6 to 16 years and an average age of 9.61 years. Of the participants, 196 have intellectual disabilities, 51 have Down syndrome, and 121 have autism spectrum disorder. The clinical findings of our study include the DMFT / dmft index, plaque index, occlusal relationships, and the presence of molar-incisor hypomineralization (MIH). The data obtained were analyzed using the SPSS v21 software package.
RESULTS. The mean DMFT/dmft value was found to be 5.64, and the mean plaque index value was 1.37. The occlusal relationships of the participants were as followed: 78.26% had Class I, 11.14% had Class II, and 10.6% had Class III. Additionally, 98.64% of the participants did not have molar-incisor hypomineralization (MIH), while 1.36% did have MIH.
CONCLUSION. In our study, it was found that children with special care needs generally have poor oral hygiene, their parents/caregivers lack sufficient awareness, and the prevalence of caries and plaque index is high in the examined population.

Keywords: DMFT index, plaque index, molar-incisor hypomineralization, Down syndrome, autism spectrum disorder

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Оценка параметров здоровья полости рта и зубов у детей с особыми потребностями

Бюшра Теки, Исмет Резани Топтанчи ✉
Университет Диджле, Сур Диярбакыр, Турция
✉ ismettoptanci@gmail.com

Резюме
ЦЕЛЬ. Оценить и повысить осведомленность о параметрах здоровья полости рта и зубов у детей в возрасте от 6 до 16 лет с особыми потребностями, которые обучаются в специальных учебных заведениях, расположенных в центральных районах Диярбакыра в Турции. В частности, исследование рассматривает наличие кариеса, налета, аномалий прикуса и гипоминерализации моляров и резцов.
МЕТОДЫ. В исследовании приняли участие 368 детей с особыми потребностями в возрасте от 6 до 16 лет, средний возраст которых составил 9,61 года. Из участников 196 имеют интеллектуальные нарушения, 51 ребенок имеет синдром Дауна, и 121 ребенок имеет расстройство аутистического спектра. Клинические результаты нашего исследования включают индекс КПУ / кпу, индекс налета, окклюзионные отношения и наличие гипоминерализации моляров и резцов (MIH). Полученные данные были проанализированы с использованием программного пакета SPSS v21.
РЕЗУЛЬТАТЫ. Среднее значение индекса КПУ/кпу составило 5,64, среднее значение индекса налета – 1,37. Окклюзионные отношения участников распределились следующим образом: 78,26 % имели класс I, 11,14 % имели класс II, и 10,6 % имели класс III. Кроме того, 98,64 % участников не имели гипоминерализации моляров и резцов (MIH), тогда как 1,36 % имели MIH.
ЗАКЛЮЧЕНИЕ. В нашем исследовании было установлено, что дети с особыми потребностями в целом имеют плохую гигиену полости рта, их родители/опекуны недостаточно осведомлены, и в изученной популяции высока распространенность кариеса и индекс налета.

Ключевые слова: индекс КПУ, индекс налета, гипоминерализация моляров и резцов, синдром Дауна, расстройство аутистического спектра

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INTRODUCTION

In children with disabilities, physical and intellectual impairments, biting disorders, inadequate chewing, and swallowing difficulties lead to oral and dental health problems. When inadequate oral care, excessive consumption of soft, cariogenic foods, and poor oral hygiene are added to this situation, the problem is observed to become even more severe. Dental treatments for children with disabilities are challenging due to the cooperation issues of the children [1]. Therefore, studies have reported that the rate of untreated caries in children with disabilities is higher compared to healthy children. There are numerous reasons explaining the differences in caries incidence between children with disabilities and healthy children. These include differences in the frequency of carbohydrate intake and salivary flow rate, impaired cooperation, inadequate oral hygiene due to muscle and joint problems, and chewing difficulties [2].

It is expected that individuals with special care needs may experience fear during treatment [3]. Creating a positive communication environment with these individuals will facilitate the management of the process and help identify the needs of disabled individuals. Furthermore, it should not be forgotten that a good communication environment can enhance the ability of disabled individuals to understand the instructions of healthcare personnel during the treatment process [4; 5].

Individuals with disabilities who have difficulty cooperating and therefore require special oral and dental care practices experience much greater challenges in accessing services. In addition to these challenges, the low awareness of oral health among disabled parents/caregivers leads to the lack of preventive measures and the neglect of oral health in individuals with special care needs due to various chronic illnesses, further adversely affecting their oral health. In this regard, the health issues of individuals with special care needs are an important consideration for the management of dental services. [5].

In our study, we aim to evaluate the oral and dental health parameters of children aged 6–16 with special care needs who are attending Special Education Institutions located in the central districts of Diyarbakır province, Turkey, and to raise awareness about oral hygiene.

METHODS

Our study included individuals aged 6–16 who are enrolled in special education institutions and have any of the following conditions: mental retardation, autism, or Down syndrome. The individuals' examinations were conducted using a mirror-sonde in daylight, and oral and dental health parameters (DMFT, plaque index, MIH, malocclusion) were assessed. Our study is a descriptive cross-sectional field study. Our study obtained ethical approval with protocol number 2022-41 at the meeting of the Local Ethics Committee of the Faculty of Dentistry, Dicle University, held on November 30, 2022. Before visiting special education institutions for screening, the necessary permissions were obtained from the Diyarbakir Provincial Directorate of National Education After obtaining the permissions, contact was made with the responsible individuals in randomly selected institutions to make appropriate planning, and our study began. Our study was conducted between March 2023 and June 2023.

STATISTICAL ANALYSIS

During the period of the study, there were approximately 9,000 children aged 6–16 who met the study criteria. The study sample was calculated using the formula commonly employed when the population parameters are known. According to the sample calculation, considering a 5% significance level, 95% confidence level, and a 5% margin of error, the required minimum sample size calculated from the 9,000 individuals aged 6–16 with special care needs in the central districts of Diyarbakır province was targeted as 368 observations for the study. In this study, the obtained data were analyzed using the licensed IBM SPSS v21 software package. Due to the large number of observations, Shapiro-Wilk's and/or Kolmogorov-Smirnov tests were used to investigate whether the variables came from a normal distribution. A significance level of 0.05 was used when interpreting the results. When examining the differences between the groups, Mann Whitney U and Kruskal Wallis-H Tests were used in intergroup comparisons because the variables were not normally distributed. If significant differences were observed in the Kruskal-Wallis H test, the groups with differences were determined using Post-Hoc Multiple Comparison Test. When examining the relationships between the groups of nominal variables, Chi-Square analysis was applied. Pearson Chi-Square analysis was applied to RxC tables using Monte Carlo Simulation. Since more than 20% of the expected values in cells were less than 5, Chi-Square analysis was conducted using Monte Carlo Simulation. Results were interpreted using a significance level of 0.05; if $p < 0.05$, it indicates a significant relationship, whereas if $p > 0.05$, it indicates no significant relationship.

RESULTS

53.26% of the children participating in the study have intellectual disabilities, 32.88% have autism, and 13.86% have Down syndrome. 55.43% of the children participating in the study are male, and 44,57% are female. The 78.26% of the children participating in the study are in Class I, 11.14% are in Class II, and 10.6% are in Class III (Table 1). The average age of the children participating in the study was found to be 9.61. As a result of the examination, the average DMFT/dmft value is 5.64, and the average plaque index value is 1.37. There is a statistically significant difference between the DMFT/dmft value and the types of diseases. The DMFT/dmft values of individuals with autism and intellectual disabilities are significantly lower compared to those with Down syndrome (Table 3). There is also a statistically significant difference between the plaque index (Silness-Löe) value and the types of diseases. Individuals with autism and intellectual disabilities have significantly lower plaque index values compared to those with Down syndrome (Table 4). In the conducted study, there is a statistically significant relationship between the type of disease and occlusion. 56.86% of individuals with Down syndrome, 80.61% of those with intellectual disabilities, and 83.47% of those with autism have Class I occlusion, while 33.33% of individuals with Down syndrome, 7.14% of those with intellectual disabilities, and 6.61% of those with autism have Class III occlusion (Table 5). In the conducted study, there is no

Table 1. Frequency Distribution Table

Indicator		*n*	%
Type of Disease	Down Syndrome	51	13.86
	Mental retardation	196	53.26
	Autism	121	32.88
	Total	368	100.00
Sex	Male	204	55.43
	Female	164	44.57
	Total	368	100.00
Occlusion	Class I	288	78.26
	Class II	41	11.14
	Class III	39	10.60
	Total	368	100.00

Table 2. Distribution table for values

Indicator	*n*	Mean	Median	Min	Max	Sd
Age	368	9.61	9	6	16	2.97
DMFT / dmft	368	5.64	5	0	16	3.91
Plaque Index	368	1.37	1	0	3	0.81

statistically significant relationship between the type of disease and molar-incisor hypomineralization (MIH). In the children participating in the study, 98.64% do not have MIH, while 1.36% have MIH (Table 6).

DISCUSSION

Studies on the oral and dental health of children with special care needs have observed that these children have poor oral hygiene and frequently encounter gum diseases such as gingivitis and periodontitis, which are associated with oral hygiene, compared to healthy children [6].

In literature studies, some indicate that the prevalence of dental caries in children with Down syndrome is less common compared to healthy individuals [7], while other studies show that caries lesions occur with similar or even greater frequency in individuals with Down syndrome compared to healthy individuals [8; 9]. The reasons for the lower frequency of dental caries in individuals with Down syndrome include the presence of diastema in the teeth, delayed tooth eruption, different salivary chemistry, microdontia, oligodontia, hypodontia, and the flattening of tooth surfaces due to bruxism [10]. In this study, the average DMFT value for individuals with Down syndrome was found to be 7.76 (Table 3).

Table 3. Differences between types of diseases in terms of DMFT/dmft values

Indicator		Type of Disease						Kruskal Wallis H Test		
		n	Mean	Median	Min	Max	Sd	Mean Rank	*H*	*p*
DMFT / dmft	Down Syndrome	51	7.76	9	0	14	4.03	241.09	19.368	0.001
	Mental retardation	196	5.55	5	0	15	3.83	182.77		
	Autism	121	4.89	4	0	16	3.69	163.45		
	Total	368	5.64	5	0	16	3.91			

Table 4. Differences between types of diseases in terms of plaque index (Sillnes-Löe) values

Indicator		Type of Disease						Kruskal Wallis H Test		
		n	Mean	Median	Min	Max	Sd	Mean Rank	*H*	*p*
Plaque index	Down Syndrome	51	1.73	2	0	3	0.80	231.14	17.085	0.001
	Mental retardation	196	1.39	1	0	3	0.79	185.80		
	Autism	121	1.20	1	0	3	0.80	162.74		
	Total	368	1.37	1	0	3	0.81			

Table 5. Relationships between occlusion and types of diseases

Indicator		Type of Disease								Chi-Square Test	
		Down Syndrome		Mental retardation		Autism		Total			
		n	%	*n*	%	*n*	%	*n*	%	Chi-Square	*p*
Occlusion	Class I	29	56.86	158	80.61	101	83.47	288	78.26	32.898	0.001
	Class II	5	9.8	24	12.24	12	9.92	41	11.14		
	Class III	17	33.33	14	7.14	8	6.61	39	10.60		
	Total	51	100.00	196	100.00	121	100.00	368	100.00		

Table 6. Relationships between MIH and types of diseases

Indicator		Type of Disease								Chi-Square Test	
		Down Syndrome		Mental retardation		Autism		Total			
		n	%	n	%	n	%	n	%	Chi-Square	p
MIH	Absent	51	100	191	97.45	121	100	363	98.64	*	0.111
	Present	0	0	5	2.55	0	0	5	1.36		
	Total	51	100	196	100	121	100	368	100		

The value obtained is significantly higher than the values reported by Ghaith et al. [11] (2.73 ± 0.22) and significantly lower than the values reported by Jaber et al. [9] (13.2 ± 0.84). Contrary to the results of the study conducted by Robertson et al. [12] in 2019 on individuals with Down syndrome, intellectual disabilities, and autism, in this study, the DMFT/dmft value of individuals with Down syndrome was found to be significantly higher than those of other groups with learning difficulties. In this study, it was concluded that the oral hygiene of patients with Down syndrome is lower than that of patients with intellectual disabilities and autism. Additionally, based on these results, it was determined that children with Down syndrome in our study group have treatment needs that need to be addressed.

It has been shown that children with intellectual disabilities have poorer oral hygiene compared to the general population and have a large number of untreated dental caries [13]. The reason for this is reported to be their inability to adequately perform oral hygiene habits due to lack of muscle coordination, low grasping capacity, and difficulty in following instructions [14]. In our study, the DMFT/dmft score of children with intellectual disabilities (5.5) was found to be higher compared to the study conducted by Makkar et al. in 152 children with intellectual disabilities (1.51 ± 1.161) [15]. In the case-control study conducted by Aşıcı et al., comparing the oral and dental health of 30 individuals with intellectual disabilities and 30 healthy individuals aged between 4 and 18 years, the average DMFT value of individuals with intellectual disabilities in the 12–18 age group was found to be 6.4, which is 3.7 higher than the DMFT value of the control group [16]. Although the DMFT/dmft value in individuals with intellectual disabilities found in our study is similar to some literature, there are differences found in other studies. In our study, there is a statistically significant difference between the types of diseases in terms of DMFT/dmft values ($p < 0.05$). The DMFT/dmft value of individuals with autism and intellectual disabilities is significantly lower than those with Down syndrome. Although there are differences in DMFT/dmft values among the groups, the highest score was found in children with Down syndrome, while the lowest was found in children with autism. Looking at these results, we believe that prioritizing preventive treatments, especially in disabled children, and educating parents and educators about oral and dental health habits are essential.

Children with autism spectrum disorder are at high risk of dental caries because they tend to be selective in their food choices, exhibit food retention behaviors in the mouth, resist tooth brushing, and have difficulty cooperating during dental examinations and treatments. However, it is noted that the evidence regarding the increased risk of dental caries in individuals with autism spectrum disorder has conflicting results [17]. Some studies have shown that the levels of dental caries in children with autism are similar to or lower than those in healthy children [18; 19]. In our study, the DMFT/dmft value found in children with autism, which is 4.89, was higher compared to the examined cross-sectional studies [20–23]. These differences are thought to arise from methodological variations in the studies, socioeconomic status, differences in the amount of support provided to disabled individuals in different developed countries, the knowledge and approach of dentists, and the control of the diet of children with autism by the family.

In our study, the plaque index (Silness-Löe) was used for the assessment of oral hygiene. The reason for using the plaque index is that it allows for the recording of plaque scores by inspecting the teeth visually without the need for any staining agent. Among the disadvantages of plaque staining agents are the potential to leave a bad taste in the mouth and to cause allergic reactions [24]. In a cross-sectional study conducted by Al-Sufyani et al., 101 children with Down syndrome aged 6–16 years were examined, and the plaque index value was found to be 1.45 ± 0.57. This finding indicates that children with Down syndrome have poor oral hygiene [25]. The study conducted by Goud et al. found a plaque index of 1.76 ± 0.78 in 100 children with Down syndrome aged 6–16 years [26]. In a study conducted by Shyama et al. in Kuwait, the plaque index value was found to be 1.93 in 112 children with Down syndrome. These findings suggest that children with Down syndrome have poor oral hygiene [27]. There may not be a large number of studies on this topic, but in our study, we found a plaque index value of 1,73, which is similar to the studies conducted by Al-Sufyani et al., Goud et al., and Shyama et al. In our study, it was observed that children with Down syndrome also had poor oral hygiene. Furthermore, these results indicate the need for additional treatment requirements for oral hygiene in children with Down syndrome in our study group.

In a cross-sectional study conducted by Özkul et al. on 105 mentally retarded patients, the oral health and periodontal status of the patients were evaluated, and the plaque index score was found to be 1.71 ± 0.9 [28]. In a study conducted by Al-Maweri et al., where they evaluated the oral health of a total of 401 disabled individuals, including 150 mentally retarded individuals aged 6–14 years, the plaque index value for mentally retarded individuals was found to be 1.41 ± 0.6 [25]. In our study, the plaque index value was found to be 1.39 to determine the oral hygiene of mentally retarded individuals. This result, in line with other literature studies, indicates that individuals diagnosed with mental retardation generally have poor oral hygiene. Our findings show that the plaque index value is lower than the plaque index value of patients with Down syndrome but higher than the plaque index value of patients with autism. Furthermore, the presence of mental retardation in individuals with Down syndrome may suggest that oral hygiene deficiency in these patients may be more severe than in patients with autism.

In our study, the plaque index value of autistic children was found to be 1.2. While this value is quite close to some literature [29–31], it is considerably different from others [31; 32]. We believe that the reason for this difference could be attributed to the cross-sectional nature of our study, the random selection of the samples, and the possible reflection of inadequate dental awareness and access to dental health services among families of autistic children in the region.

Dentofacial anomalies are commonly encountered in individuals with Down syndrome. Class III malocclusions, developmental delays in the midface, mandibular prognathism, and a large, protruding tongue are

among the more common conditions seen in children with Down syndrome [10]. Although the number of individuals with Down syndrome included in the study by Kasımoğlu et al. was small, Class III malocclusion was the most common among them [33]. In a cross-sectional study conducted by Alkawari with 23 children with Down syndrome aged 10–14 years, Class I malocclusion was observed in 36.4%, while Class III malocclusion was observed in 59.1% according to the Angle classification [34]. In our study, however, Class I malocclusion was more frequently observed among individuals with Down syndrome (56.86%). We believe this is due to the small number of individuals with Down syndrome included in our study and the cross-sectional nature of the study. However, despite the small number of individuals with Down syndrome, the rate of Class III malocclusion was found to be higher in individuals with Down syndrome (33.33%) compared to those with MR (7.14%) and Autism (6.61%) in our study. The result we found is consistent with the existing literature findings.

Malocclusion in individuals with mental retardation impedes their social acceptance in terms of aesthetics and also disrupts oral functions such as chewing and swallowing for these individuals. Studies that thoroughly evaluate the orthodontic treatment needs of individuals with mental retardation are needed [35]. In the study conducted by Kasımoğlu et al., it was found that individuals with mental retardation exhibit Class I, Class II, and Class III occlusion relationships, respectively [33]. Similarly, in our study, the most common occlusal relationship observed in individuals with mental retardation was Class I, while the least common was Class III. Literature studies on occlusal relationships in individuals with mental retardation are quite limited, and more research is needed on this topic.

Studies examining malocclusions in autistic children have not yielded definitive results. Many cross-sectional studies have found a high prevalence of Class I occlusion in autistic children [30; 33; 36–38]. In our study, consistent with the existing literature, Class I occlusion was found to be high in autistic children.

Molar incisor hypomineralization (MIH) is a commonly encountered developmental dental problem in children worldwide [39]. There is insufficient research available on molar incisor hypomineralization (MIH) in children with special care needs. R.N. Mohamed in a study conducted by et al., the frequency of molar incisor hypomineralization (MIH) and associated factors were investigated in 400 children with special care needs, including 123 with mental retardation, 107 with autism and 70 with Down syndrome. In this study, the children were between 6 and 16 years old, and the prevalence of molar incisor hypomineralization (MIH) was found to be slightly higher in children with special care needs aged 6 to 11 compared to those aged 12 to 16. This finding has led to the assumption that the possibility of masking MIH by carious lesions may be higher among older children. The current result has shown that the prevalence of MIH among children with multiple disabilities is significantly higher than in other children. It has not been possible to compare the current result with previous studies due to the lack of similar studies [40]. In our study, the presence of Molar Incisor Hypomineralization (MIH) was found in only 1.36% of patients with special care needs. This result was not found to be statistically significant.

CONCLUSION

Among the participants in the study, different developmental disorders such as mental retardation, autism, and Down syndrome have significant effects on oral and dental health. It was determined that individuals with autism and mental retardation have lower DMFT/dmft values and plaque indices compared to individuals with Down syndrome. There are significant differences in the frequency of different occlusion types among individuals with Down syndrome, mental retardation, and autism. There was no statistically significant relationship between disease type and MIH. These results indicate that the impact of MIH on the oral and dental health plans for individuals with special care needs is uncertain. However, it is important to consider specific conditions like MIH when evaluating the overall oral and dental health status of an individual. This way, individualized care plans can be developed more effectively.

This study needs to be supported by larger samples and long-term follow-up studies.

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INFORMATION ABOUT THE AUTHORS

İsmet Rezani Toptancı – Assistant Professor, Dr. Sci. (Med.), Faculty of Dentistry, Department of Pediatric Dentistry, Dicle University, Sur Diyarbakir, 21280, Turkey, https://orcid.org/0000-0003-2298-9617

Büşra Tekin – Assistant, Medical Sciences Candidate, Dicle University Faculty of Dentistry, Department of Pediatric Dentistry, Sur Diyarbakir, 21280, Turkey, https://orcid.org/0009-0006-5619-1987

ИНФОРМАЦИЯ ОБ АВТОРАХ

Исмет Резани Топтанчи – д.м.н., ассистент профессор, стоматологический факультет, кафедра детской стоматологии, Университет Дидже, 21280, Турция, г. Диярбакыр; https://orcid.org/0000-0003-2298-9617

Бюшра Текин – к.м.н., ассистент, стоматологический факультет, кафедра детской стоматологии, Университета Дидже, 21280, Турция, г. Диярбакыр, https://orcid.org/0009-0006-5619-1987

AUTHOR'S CONTRIBUTION

İsmet Rezani Toptancı – research concept and design, collection and/or assembly of data, critical revision of the article, final approval of the article.

Büşra Tekin – research concept and design, data analysis and interpretation, collection and/or assembly of data, writing the article, critical revision of the article, final approval of the article.

ВКЛАД АВТОРОВ

Исмет Резани Топтанчи – концепция и дизайн исследования, сбор и/или обработка данных, критическое рецензирование статьи, окончательное утверждение статьи.

Бюшра Текин – концепция и дизайн исследования, анализ и интерпретация данных, сбор и/или обработка данных, написание статьи, критическое рецензирование статьи, окончательное утверждение статьи.