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Original Article

Evaluation of Health Habits and Level of Oral and Dental Health of Children with Hearing Impairment

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ABSTRACT

Mental and physical disabilities in children, including hearing impairment, are important factors affecting oral health. This study aimed to investigate the health habits and oral health status of children with hearing impairment. In this cross-sectional-analytic study, information related to health habits and clinical examinations, including caries status, gingival health index, oral health index, and trauma, were recorded in the data collection form. ANOVA, t-test, chi-square test, Mann-Whitney, and linear regression models were used for statistical analysis. In this study, 137 children with hearing impairment in the age range of 4-6 and 6-12 years were examined. The mean DMFT was 3.4 ± 4.1 and the total DMFT was 3.8 ± 4.4. Comparison of DMFT in the two age groups showed a significant difference ($P < 0.01$). Oral health according to the OHI-S index was good in 57.7% of cases. Based on the gum health index, only 10.9% of all children had healthy gums and there was a significant difference between the two age groups ($P < 0.01$). Only 53.3% of children repeated brushing their teeth every day. Linear regression analysis showed that the age of the children ($P = 0.04$, B-coefficient= -0.5), type of disability ($P < 0.001$, B-coefficient = 3.4), and health index ($P = 0.03$, B-coefficient = 1.2) had a significant effect on the mean total DMFT. According to the results of this study, the caries status in children with hearing impairment was higher than average. In addition, a low percentage of children had complete gum health and their health habits were also at a low level. This segment of society requires more attention from dentists and relevant authorities in implementing preventive and therapeutic programs due to their inability to learn normal health instructions.

Keywords: Children, Health habits, Oral and dental health, Hearing impairment

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Introduction

Oral health and the level of caries are factors that commonly affect children's quality of life [1-3]. Children in every society are at risk of developing a variety of oral and dental diseases, including caries, malocclusion, jaw and facial deformities, and periodontal and gum diseases. If primary prevention services are not provided promptly, the spread of these diseases will cause physical, social, and psychological consequences for the child and other people related to him, including family members. Naturally, the consequences of children's oral and dental diseases affect the work and activity time, rest, economic status, and psychological conditions of the parents and it can be stated that the quality of life related to the child's oral and dental health is closely related to his family [4, 5].

Tooth decay and periodontal problems are common and cause complications and limitations in children's daily functioning [6-8]. Low socioeconomic status, low

parental awareness, and poor oral and dental hygiene are among the factors that contribute to the development of caries [9]. One of the important factors affecting oral health is the mental and physical disabilities of children. Studies related to the oral and dental health status of people with disabilities in the past few decades have shown that although children with disabilities start their lives with strong and healthy teeth and gums that are similar to normal children, diet, eating patterns, medications, and physical limitations and the inability to clean, as well as the attitude of parents and health care providers, lead the child to poor oral and dental health [10-12].

A group of children needing special care are children with hearing impairment; Hearing impairment can affect the overall behavior of people with disabilities. In society, people who have difficulty understanding normal speech are generally referred to as deaf, and hearing loss is defined as a condition in which a person's hearing is not sensitive to sounds that are audible to normal people. The severity of hearing loss is defined as how much louder a sound must be to be heard by the person [13, 14]. There are currently 278 million people with hearing impairment in the world, 80% of whom live in developing countries [15]. Relatively limited research and clinical studies have been conducted on the prevention, treatment, and prevention of oral diseases in the deaf. Conservative dental treatments are an important part of health programs for all people, including the deaf, and planning for this requires awareness of their DMFT [16-18].

Deaf people are at higher risk of tooth loss than normal people due to hearing deprivation and the limitations it causes, which in turn results from poor hygiene practices and improper functioning of the tongue and mouth muscles. In addition, the difficulty of communicating and explaining information to deaf students in the mass media by the dental community has resulted in their inability to receive health messages [19, 20].

Despite the importance of knowing the oral health status and treatment needs of these special groups, no specific study has been conducted on these children. Therefore, this study aimed to investigate the health habits and treatment and hygiene needs related to the oral health of deaf children and to develop educational and treatment plans based on it.

Materials and Methods

This study was a cross-sectional study and the sample size was 43 children aged 4-6 years and 94 children aged 6-12 years.

The inclusion criteria for the study included deaf children aged 4-12 years (deaf and hard of hearing) who did not have any other concurrent disabilities, and the exclusion criteria were parental dissatisfaction or lack of cooperation of the child in the intraoral assessment and examinations.

All children underwent a complete oral and dental examination by an examiner who was trained in dealing with these children, diagnosing caries, detecting debris and tartar, and diagnosing inflammation and gum health. To assess caries in children, the DMFT, DMFT index (number of decayed, filled, or extracted teeth due to caries) was used with the help of a light bulb attached to the head and probe of the WHO. The information was recorded in the form recommended by the WHO [21]. Based on the common classification for caries status [22], the DMFT range between 0-4 was considered as low caries, 5-9 as moderate caries, and values above 9 as high caries.

To assess the oral health status of children, the “Simplified Oral Health” index was used and the amount of debris and plaque on permanent (11, 16, 26, 31, 36, 46) and deciduous (51, 55, 65, 71, 75, and 85) primary teeth was simultaneously assessed. Finally, based on the average score of the individuals, the health level was reported as good (0-1.2), moderate (1.3-3), and poor (3.1-6) [23]. Gum health was assessed as a gingival index using a mirror and probe. The same base teeth used for the OHI-S index were selected for the work and the degree of gingivitis and bleeding was calculated for 4 levels of each tooth, and finally, the gingival index was calculated for each individual (number between 0-3). The clinical interpretation of the results was as mild, moderate, and severe gingivitis based on the average scores obtained for each individual (mild 0-1, moderate 1.1 to 2, and severe 2.1 to 3) [24].

To ensure the accuracy of the diagnoses, the examiner (student collaborator of the project) was trained by one of the professors of the community care group and a periodontist, and the necessary calibration was performed on 20 patients of the pilot study and the agreement coefficient was calculated.

The Reliability Coefficient for caries diagnosis and DMFT registration was 0.93, for gingivitis registration or GI it was 0.94 and for simplified health index registration or OHI-s, it was 0.92. Dental trauma status, tooth wear, and fluorosis were also recorded as secondary variables based on the examination form.

Information on hygiene habits and children's familiarity with oral hygiene tools was recorded based on the prepared data collection form; hygiene habits questions were about how children clean their teeth and

the materials and tools they use, the frequency of brushing their teeth, and its repetition during the week. Other recorded information was the frequency of sugary foods consumption, the status of parafunctional habits including thumb sucking or nail biting, history and pattern of visiting the dentist, history of trauma to the cervicofacial area, and their demographic information including age and gender. The child's brushing method (method and completeness) was recorded by the examiner by providing each child with a toothbrush and asking them to demonstrate the brushing method (rolling or rotating the toothbrush on the teeth, scrubbing or horizontal movement of the toothbrush on the teeth, or a combination) on themselves in the form.

This form was designed based on previous studies for children aged 4-12 years. To ensure face and content validity, the checklist was provided to a group of experts (3 professors from the community-oriented group), and their approval was obtained. In addition, the ability to understand the checklist questions prepared by deaf children aged 4-12 was confirmed during a consultation with one of the audiometry professors.

For children aged 6-12, questions were asked of the child with the help of a trainer based in the center and recorded by the examiner. For children aged 4-6, the checklist was completed by the parents. Before conducting the study, in coordination with the educational centers for deaf children, they were asked to obtain consent from the children's parents while explaining the goals of the project.

Data was entered into SPSS23 software; to describe and distribute the study variables, descriptive statistics were calculated, including the prevalence of caries by its components (average number of decayed, extracted, and filled teeth), the average gingival index, the average oral hygiene index, and the percentage of frequency of responses to each of the checklist questions. ANOVA was used to compare the means in age groups, t-test for both genders, chi-square test to compare the percentage of questions in different gender and age groups (4-6 years and 6-12 years) and Mann-Whitney test was used to compare categorical indicators such as health level. The α error coefficient was considered to be 0.05 for all calculations.

Results and Discussion

137 children with hearing impairment in the age range of 4-6 and 6-12 years, including 55.5% boys and 44.5% girls, were examined, of which 43 were in the age group of 4-6 years (31.4%) and 94 (68.6%) in the age group of 6-12 years.

The results showed that the minimum DMFT (milky) among the examined children was 0, the maximum was 20, and its mean was 3.4 ± 4.1. In the case of total DMFT, the mean was reported to be 3.8 ± 4.4. Comparison of DMFT (milky) in the two age groups showed a significant difference (P = 0.001). The mean of milky and total DMFT components for all examined children, groups of 4-6 and 6-12 years are shown separately in **Table 1**. On the other hand, examinations showed that in the case of primary teeth in the groups of children aged 4-6 and 6-12 years, 30.2% and 37.2% had DMFT=0, respectively, while these figures were reported in the total DMFT as 25.6% and 11.7%, respectively.

Oral and dental health based on the OHI-S index showed that in the entire statistical population, 57.7% had good oral health, 41.6% had average and 0.7% had poor oral health. These figures were 62.8%, 37.2%, and 0 in the age group of 4-6 years and 55.3%, 43.6% and 1.1% in the age group of 6-12 years, respectively. No significant difference was seen between the two age groups. Examination of gum health using the GI index showed that only 10.9% of all children had healthy, non-inflammatory gums (23% in the 4-6-year-old group and 5.3% in the 6-12-year-old group). The gum condition based on the GI index was significantly different in the two age groups (P = 0.012).

Table 1. Comparison of the condition of decayed, extracted, and filled teeth in the two age groups of 4-6 and 6-12 years old

Result	4-6 years old					6-12 years old					
	Milky DMFT*	Total DMFT	DT	MT	FT	Milky DMFT*	Permanent DMFT	Total DMFT	DT	MT	FT
Mean	5.2	5.2	4.2	0.5	0.5	2.7	1.53	4.2	2.6	0.6	0.9
SD	5.4	5.4	5.02	1.6	1.2	3.1	1.93	3.1	2.7	1.1	1.5

*The comparison indicates a significant difference between the two age groups (P = 0.001).

In the examination to detect traumatic lesions, it was observed that 96.4% had no dental trauma, and of the total number of people with this condition, 2.9% of cases were at the level of enamel and dentin fractures,

and in 0.7% of them, trauma caused tooth loosening. The disaggregated statistics in the age groups of 4-6 and 6-12 years are shown in **Table 2**. In the case of dental abrasion, 81% of all children examined had no dental abrasion. The status of trauma and abrasion did not show a significant difference in the two groups **(Table 2)**. In the examination and investigation of fluorosis, 8.8% of all children examined (18.6% of children aged 4-6 and 4.3% of children aged 6-12) had fluorosis.

Based on the results obtained from the data collection form, it was determined that in general all children used a toothbrush to clean their teeth. Most children (70.8%) stated that they brushed their teeth only once a day, and only 53.3% of children repeated brushing their teeth every day. No significant difference was observed in terms of hygiene habits between the two groups. 26.3% of children used sweet foods once a day and 65% used sweet foods more than once a day.

Table 2. Frequency distribution of oral health indicators, hygiene habits, and parafunctional habits of children with hearing impairment

Variable		4-6 years old	6-12 years old	P-value
Visit to the dentist*	Yes	9 (20.9%)	70 (74.5%)	P = 0.001
	No	34 (79.1%)	24 (25.5%)	$\chi2$ = 35.4
Parafunctional habits*	Yes	20 (48.0%)	21 (22.3%)	P < 0.001
	No	22 (52.0%)	73 (77.7%)	$\chi2$ = 71.4
Dental trauma	Yes	1 (2.3%)	4 (4.3%)	P = 0.22
	No	42 (97.7%)	90 (95.7%)	$\chi2$ = 1.8
Abrasion	Yes	12 (27.9%)	14 (14.9%)	P = 0.06
	No	31 (72.1%)	80 (85.1%)	$\chi2$ = 3.2
Number of times you brush your teeth per day	Does not brush	0 (0.0%)	0 (0.0%)	P = 0.07 $\chi2$ = 5.4
	Once	36 (83.7%)	61 (64.9%)	
	Twice	6 (14.0%)	24 (25.5%)	
	More than twice	1 (2.3%)	9 (9.6%)	
OHI-S	Average rating	65.3	70.6	P = 0.07*
GI*	Average rating	57.6	74.2	P = 0.012*

*Mann–Whitney test

The results obtained from the data collection form regarding parafunctional habits showed that 46.7% of the children had habits, the most common of which were thumb sucking (25.5%) and teeth grinding (8.8%).

Separately, in the age group of 4-6 years, all the examined children had habits, 79.1% had thumb-sucking habits and 20.9% had teeth-grinding habits. In the age group of 6-12 years, only 22.3% had habits, and the most common habits in this group were nail biting (9.6%) and teeth grinding and lip biting (3.2%). A review of the history of head and facial trauma in children showed that 29.2% of all examined children had a history of head and facial trauma (51.2% of children in the 4-6 year group and 19.1% of children in the 6-12 year group).

In the study of the history of dental visits, 58.4% of the total statistical population responded positively, and separately in the 4-6-year-old group, 23.3% had a history of visits, and most of the services provided included restoration (27.9%) and examination (14%), while in the 6-12-year-old group, 74.5% had visits, and the most visits were for extraction (25.5%) and restoration of teeth (23.4%). In terms of regular visits, the difference between the two age groups was significant (P < 0.001).

To determine the factors affecting the total tooth decay status, linear regression analysis was used. Considering total DMFT as the dependent variable and the variables of disability type (hearing impaired/deaf), gender, age, history of regular dental check-ups, oral health index, and number of times of brushing teeth, it was determined (P < 0.001, R_2 = 0.24) that only the age of the children (P < 0.04, B-coefficient = -0.5), type of disability (P < 0.001, B-coefficient = 3.4), and health index (P = 0.03, B-coefficient = 1.2) had a significant effect on the mean total DMFT **(Table 3)**. Thus, patients with younger age, patients with hearing impairment, and patients with lower health levels had higher mean DMFT.

Table 3. Regression model of factors affecting total DMFT

Remaining variables in the final model	Beta Coefficients	Standard deviation	*P*-value
Constant	-5.062	3.583	0.161
Age	-0.309	0.154	0.048
Disability	3.404	0.902	0.000
OHI-s	1.173	0.555	0.037

Among the children who used a toothbrush, 82.8% used the scrub method, 4.5% used the roll method, and the rest used both methods for brushing. Only 56% of the children completed all the brushing steps in front of the examiner.

Nowadays, improving the quality of life of physically disabled people is considered a rehabilitation goal. Oral health is one of the factors that usually affects the quality of life of people [25]. Physically disabled children usually receive a lot of care about their disability, but little attention is paid to their oral and dental health, and it is often ignored due to fear and lack of awareness.

In this study, the average DMFT and total DMFT (primary and permanent) were 3.4 ± 4.1 and 4.4 ± 3.8, respectively. The average total DMFT in 12-year-old children was also reported to be 3.6 ± 2.5. 16.1% of the children had no dental caries and were so-called caries-free. The caries-free rate in 6- and 9-year-old children in this study was 5.9% and 28.6%, respectively. In a study in Kuwait [26], this percentage was reported to be 17%. While in a study in India, the rate of children without caries was reported to be 65%. This difference is due to the location of the assessment in the latter study (a private school with high welfare and high access to dental services) [25].

In addition, the mean permanent DMFT was lower than the mean milk DMFT of children aged 4-12 years in the present study, which could be due to the greater attention of parents and children at older ages to the oral health status, as well as the health education and services provided by schools. Regarding dental visits, children aged 6-12 years had more visits, which could confirm this point.

Another noteworthy point is that the highest component of DMFT/DMFT was related to caries, which indicates that many children do not pay attention to treatment. In children with hearing impairments, low access to services is largely due to difficulties in establishing effective communication between health service providers, including dentists, with this group of children. A study in the UK found that children under 5 years of age were 23 times less likely to visit a dentist than older children, and two-thirds of the difficulties in accessing the dentist were due to communication problems [27].

Regarding hygiene habits, the results of the data collection form showed that almost all children used a toothbrush to clean their teeth. In a study in India, the results showed that 100% of the deaf children studied used a toothbrush to clean their teeth once a day [28].

19% of the children had dental abrasion, and 46.7% of the children had parafunctional habits, the most common habits being thumb-sucking and teeth grinding. The reason for the high prevalence of parafunctional habits in these children could be due to higher stress in these children compared to their healthy peers [29, 30]. Considering that both abrasion and habits were higher in children aged 4-6 years, it can be concluded that much of the dental abrasion was the result of teeth grinding in children. In a dental examination to investigate dental trauma, it was found that 3.6% of children had trauma.

Regarding oral hygiene based on the OHI-S index, it was found that 57.7% had good hygiene. The mean obtained in this study for this index was reported to be 1.1 ± 0.5, which was much lower than the study conducted in India (2.52 ± 1.08) [28]. In another study in India by Rawlani *et al*. this index was also calculated to be 1.49 ± 2.76 [25]. These differences, in addition to the difference in the way of cleaning teeth and education, could be due to the difference in examinations. Considering the influential role of brushing frequency in caries status, more emphasis should be placed on oral health care education in these children. Regarding gum condition based on the GI index, it was found that 89.1% of the total examined subjects had gingivitis.

Social skills are a set of learned behaviors that enable an individual to interact effectively with others and avoid socially inappropriate responses. Cooperation, participation with others, helping, initiating relationships, asking for help, praising others, and expressing gratitude are examples of such behaviors. Studies have shown that children with hearing impairments often have lower levels of social skills compared to their healthy peers. Hearing is more important in learning than vision, and the social and personal development of individuals in society is largely dependent on communication. In the hearing population, language is the most common means of transmitting messages between people. Society gives less importance to hearing impairments than to vision impairments, as a result, the psychological effects of hearing impairments are much greater than those of

vision impairments, and deaf children are more susceptible to mental disorders [31-33]. Considering the above, these children need to be supported more by their families and society.

As mentioned, this segment of the community requires more attention from dentists and relevant authorities in implementing preventive and therapeutic programs due to their inability to learn health instructions normally. Due to the multifactorial nature of the caries situation, there is a need for cooperation and assistance between different sectors of society, including children and parents, dentists, and policymakers, to improve health status. According to the results, the importance of creating special dental treatment facilities and increasing awareness is clear. The level of oral and dental health in this special group can be improved by holding oral and dental health training classes for parents and health educators in schools and providing special visual educational programs by the media, as well as conducting periodic examinations of the deaf by dentists and determining preventive and therapeutic needs, establishing dental centers specifically for the deaf, and training sufficient personnel to teach them health programs.

Conclusion

Overall, the comparisons showed that the caries status of the children under study was above average. In addition, a low percentage of children had perfect gum health and their hygiene habits were at a low level. On the other hand, with increasing age, the caries status and compliance with oral health-related behaviors in these children improve, which is either due to the existence of school-based programs (education and more regular examinations) or the increased ability of children and their parents to perform oral health care.

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