



Original Article

Oral health status of children with special health care needs receiving dental treatment under general anesthesia at the dental clinic of Taipei Veterans General Hospital in Taiwan

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Abstract

Background: Oral health is crucial to individual growth and development. However, oral health care is often overlooked in children with special health care needs (CSHCN). We investigated current oral health status and unmet dental needs of CSHCN in Taiwan.

Methods: We performed a retrospective study of consecutive CSHCN cases receiving first-time comprehensive dental treatment under general anesthesia at Taipei Veterans General hospital from 2001 to 2010. We retrieved clinical data including age, sex, types, and severity of disability, caries experience index [decayed, extracted, and filled teeth (deft) index for primary dentition/decayed, missing, and filled teeth (DMFT) index for permanent dentition], malocclusion, and treatment modalities from medical charts for analysis. The correlation between different groups of CSHCN regarding the deft/DMFT indices and treatment modalities was analyzed statistically.

Results: Our study included 96 children, ranging in age from 2.4 years to 14.3 years (mean age 6.8 ± 3.3 years). The deft/DMFT index was significantly higher in the younger age group (2–6 years; 13.8 ± 4.3) compared with the older group (> 6 years; 10.5 ± 5.3 ; $p < 0.001$). The mean number of total treated teeth was 14.2 ± 3.8 , and no differences existed among disability groups ($p = 0.528$) and age groups ($p = 0.992$). For the treatment modality, the number of pulp therapies with crown restoration was higher in the younger age group than in the older group. At the time of the study, 53 CSHCN had reached their full permanent dentition. We observed significantly more malocclusion of full permanent dentition in the older age group (91%) than in the younger group (35%; $p < 0.001$).

Conclusion: Unmet dental needs and caries experience indices remain high in CSHCN, regardless of the types and severity of disability. However, the younger the age at which CSHCN received their first dental treatment, the more effective the dental rehabilitation was. Parental education regarding early dental intervention and a preventive approach for enhanced oral care is mandatory. Copyright © 2014 Elsevier Taiwan LLC and the Chinese Medical Association. All rights reserved.

Keywords: comprehensive dental care; deft/DMFT index; dental care for children; disabled children

1. Introduction

Children with special health care needs (CSHCN) are a special group of patients suffering from various systemic disorders such as physical, developmental, mental, sensory, behavioral, cognitive, or emotional impairment or a limiting condition that requires medical management, health care intervention, and specialized services or programs.¹ Because of their limited motor and sensory coordination, most children

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with disabilities do not have the ability and awareness to care for themselves and must rely on their parents or caregivers for general care. Oral health care is often overlooked in these children. Studies of several populations have shown high unmet dental needs among CSHCN, such as those with cerebral palsy, autism, developmental delay, and Down syndrome.^{2–4} Because their complex situations often exhaust their care providers and certain caregivers do not possess essential knowledge to detect potential dental problems, dental needs have become the leading unmet medical health concern for CSHCN.^{3,5–8}

Dental caries are the most dominant unmet oral health problem in children.⁹ Numerous studies conducted in day care centers or school institutions have shown that dental caries experiences were significantly higher in CSHCN than in normal children in previous decades.^{10,11} The prevalence of a poor oral hygiene index, gingival and periodontal disease,^{10,12–14} and malocclusion^{10,15} were also high in CSHCN.

Oral health status and comprehensive dental care in CSHCN has been widely discussed in other countries throughout recent decades. However, only a few studies have investigated the oral health care status and dental needs of CSHCN in Taiwan. We conducted a retrospective study of the oral health status of CSHCN who received their first comprehensive dental treatment at Taipei Veterans General Hospital (Taipei, Taiwan) to analyze whether different patterns of dental treatment exist across disability and age groups.

2. Methods

CSHCN receiving comprehensive dental rehabilitation under general anesthesia from 2001 to 2010 at Taipei Veterans General Hospital were enrolled in our survey. The Institutional Review Board, Taipei Veterans General Hospital approved this study (VGHIRB No. 2013-03-027B). All participants who attended our hospital setting were first examined to evaluate their behavioral capabilities and their psychological and physical disabilities. Qualified pediatric dentists performed charting and oral examination. The inclusion criteria included children aged younger than 14 years at the time of dental intervention, and children with national disability certificates and no prior dental experience or treatments. Children with cancer or chronic progressive diseases such as congenital heart disease, insulin-dependent diabetes mellitus, and metabolic disorders were excluded from the survey. Prior to dental treatment procedures, we consulted with the corresponding pediatric physicians and anesthesiologists on the systemic conditions for each participant to ensure no absolute contraindications for general anesthesia during the procedure.

All of the patients received the treatment modality of full-mouth dental restoration in compliance with the standard principles. Fissure sealants were applied to posterior teeth affected with deep pits and fissures. For tooth restorations, composite resin filling (CRF) was applied according to the preparation of each cavity. Pulp therapy was indicated for

teeth with deep and multiple-surface caries, followed by stainless steel crowns for posterior teeth and strip crowns for anterior teeth. Extraction was considered for teeth with severe decay that resulted in poor restorability or those with peri-apical lesions or mobility that could potentially harm the corresponding succedaneous teeth. Every patient was scheduled for a periodic recall every 3–6 months for basic oral health maintenance. Malocclusion was evaluated when the patient reached full permanent dentition at approximately 12 years of age. Malalignment of dentition, deep bite, anterior open bite, cross-bite, ectopic eruption of permanent canines, or impacted permanent premolars and canines were viewed as malocclusion.

We collected data from each participant, including age, sex, medical diagnosis and severity of disability, oral health status, and types and numbers of treatments. Types and severity of disability were recorded according to the patient's National Disability Certificate and medical history records. Diagnoses included autism, mental retardation, limb disability, infrequent disease caused by DNA impairment, vision disability, voice or speech mechanism disability, loss of function of primary organs, and balance mechanism disability. Children with two or more medical diagnoses were considered to constitute multi-disabilities.

Dental caries were recorded based on the World Health Organization (WHO) oral health survey criteria and methods using the decayed, extracted, and filled teeth (deft) index for primary dentition and the decayed, missing, and filled teeth (DMFT) index for permanent dentition. In cases of early and late-mixed dentition, we combined the two indices to assess the degree of total caries. We also recorded the numbers and types of treated teeth and the malocclusion condition at the approximate patient age of 12 years for further statistical analysis.

We compiled and calculated the frequency and distribution of patients' general characteristics and dichotomized the patients into two groups according to age (young: 2–6 years vs. older: > 6 years). We assessed the correlation between the age groups and oral health status by using the independent *t* test and the Chi-square test, and demonstrated the relationship between the type and severity of disabilities and oral health status by using a one-way analysis of variance (ANOVA) and a Chi-square test. We performed statistical analysis using SPSS version 17 (SPSS Inc., Chicago, IL, USA).

3. Results

Among the 96 participants, 62 boys and 34 girls were enrolled in our survey. Patient ages ranged from 2.4 years to 14.3 years (mean: 6.8 ± 3.3 years). For age, 39 patients were between 2 years and 6 years (young age group) and 56 were older than 6 years (older age group). According to the disease entity, most of the disabilities in patients attending our hospital were autism (31%), multi-disabilities (MD; 30%), mental retardation (MR; 19%), and others (20%), including seven cerebral palsy, two voice or speech mechanism disability, two vision disability, and one balance mechanism

Table 1
Demographic characteristics of the study population.

Characteristics	n	%
Sex		
Boy	62	64.6
Girl	34	35.4
Age group		
2–6 years	56	58.3
>6 years	40	41.7
Medical diagnosis		
Autism	30	31.3
Multiple disability	29	30.2
Mental retardation	18	18.8
Others	19	19.7
Disability grading		
Mild	24	25
Moderate	30	31.3
Severe	29	30.2
Profound	13	13.5

disability. We also recorded the severity of disability: mild ($n = 24$), moderate ($n = 30$), severe ($n = 29$), and profound ($n = 13$; Table 1).

The overall mean deft/DMFT index was 12.5 ± 5.0 . The deft/DMFT index was significantly higher in the young age group (13.8 ± 4.3) than in the older age group (10.5 ± 5.3 ; $p < 0.001$), and higher for girls (13.82 ± 5.05) than for boys (11.76 ± 4.86 ; $p = 0.055$). The deft/DMFT index did not vary significantly across disability groups ($p = 0.752$), the index value from lowest to highest being 11.9 ± 4.6 in the MR group, 12.1 ± 5.9 in the MD group, 12.4 ± 4.0 in the autism group, and 13.4 ± 5.4 in the others group. The deft/DMFT index also did not show any significant differences regarding disability severity ($p = 0.352$, 13.9 ± 4.4 in mild disability, 11.7 ± 4.4 in moderate disability, 12.2 ± 5.0 in severe disability, and 11.1 ± 7.5 in profound disability (Table 2).

We also analyzed the number and types of dental treatment for each participant. The mean of total treated teeth was

Table 2
Distribution of deft/DMFT indices by age, sex, disability type, and grading.

Characteristics	deft/DMFT	p
Sex		
Boy	11.76 ± 4.86	0.055
Girl	13.82 ± 5.05	
Age group		
2–6 years	13.82 ± 4.31	<0.001
>6 years	10.54 ± 5.33	
Disability type		
Autism	12.37 ± 3.96	0.752
Multiple disability	12.11 ± 5.91	
Mental retardation	11.87 ± 4.62	
Others	13.43 ± 5.44	
Disability grading		
Mild	13.91 ± 4.44	0.352
Moderate	11.68 ± 4.40	
Severe	12.19 ± 4.97	
Profound	11.09 ± 7.46	

deft = decayed, extracted, and filled teeth for primary dentition; DMFT = decayed, missing, and filled teeth for permanent dentition.

Table 3
Distribution of dental treatment and numbers of treated teeth by age group.

	2–6 years	> 6 years	p
Pulp therapy	7.23 ± 3.89	3.36 ± 3.31	<0.001
CRF	6.84 ± 4.01	7.15 ± 4.79	0.730
Crown	5.75 ± 3.18	2.69 ± 2.81	<0.001
Extraction	1.23 ± 2.20	1.69 ± 2.47	0.344
Total	14.23 ± 3.97	14.15 ± 3.62	0.922

CRF = composite resin filling.

14.2 ± 3.8 , and no differences existed among age groups and sex in the total number of treated teeth ($p = 0.297$ and $p = 0.735$, respectively). The mean numbers of pulp therapies and crown restorations in the young age group (7.2 ± 3.9 and 5.8 ± 3.2 , respectively) were significantly higher compared with those in the older age group (3.4 ± 3.3 and 2.7 ± 2.8 , respectively; $p < 0.001$ in both parameters; Table 3). Among the participants, 53 CSHCN had reached 12 years of age at the time of our study. We observed significantly more malocclusion in the older age group (30 of 33, 91%) than in the young age group (7 of 20, 35%; $p < 0.001$; Table 4). No differences existed among the different disability groups in types and number of treated teeth. However, the number of crown restorations was significantly higher in the autism group (Table 5).

4. Discussion

The mean deft/DMFT index for 3–14 year old CSHCN in this study was 12.47, which is higher than that of the national survey for disabled school children. In a previous National Health Insurance (NHI) survey in 2004, the mean deft/DMFT index for 3–12 year old CSHCN was 3.25¹⁶; a similar study of school children with disabilities in Kaohsiung County conducted by Hsiao¹⁷ (2007) showed a mean value of 4.0. Oral diseases remain a primary health problem among CSHCN because of low self-care physical capabilities, caregiver dependency, and poor compliance when seeing dentists.⁵ CSHCN who are taken to the hospital for dental care tend to have more complex dental problems and worse oral health status than those who receive preventive dental care periodically at local clinics or day care institutions. Our finding was similar to the Stankova study,¹⁸ which examined 212 5-year-old disabled children treated under general anesthesia from 2006 to 2008. The mean DMFT index of the patients in that research was 11.05 ± 4.82 . These results may be substantive evidence to suggest that those who receive hospital care suffer

Table 4
Percentage of malocclusion of participants reaching 12 years of age during follow-up.*

	2–6 years	> 6 years	Total no. of participants
Malocclusion	7	30	37
No malocclusion	13	3	16
Total (n)	20	33	53

* $p < 0.001$, Chi-square test.

Table 5
Distribution of dental treatment and numbers of treated teeth by disability type.

	Autism	MD	MR	Others	<i>p</i>
Pulp therapy	6.07 ± 3.58	5.33 ± 4.32	4.73 ± 4.38	6.04 ± 4.50	0.707
CRF	5.70 ± 3.31	7.48 ± 5.13	7.20 ± 4.69	7.87 ± 4.14	0.265
Crown	6.00 ± 3.57	4.33 ± 3.10	2.60 ± 2.69	3.96 ± 3.17	0.008
Extraction	0.93 ± 1.60	1.07 ± 1.80	2.13 ± 3.52	2.00 ± 2.59	0.189
Total	13.87 ± 3.31	14.52 ± 3.66	13.20 ± 4.87	14.91 ± 3.91	0.528

CRF = composite resin filling; MD = multiple disability; MR = mental retardation.

from poor oral health conditions. Pharmacologic behavior management such as general anesthesia or sedation is essential for full mouth rehabilitation.

Medical centers in Taiwan conduct numerous pharmacological approaches to manage dental problems for CSHCN. National Taiwan University Hospital (NTUH) conducted an analysis of people with disabilities in which dental treatment was performed under sedation in a day care unit.¹⁹ In 1999, 374 people with disabilities aged from 3 years to 46 years were selected, with a mean age of 14.2 years. The average number of dental treatments at one time per person was 6.1 teeth (pulp therapy: 1.2, filling: 3.6, extraction: 1.3), and the average duration of the treatment was ≤ 1 hour. One CSHCN may have received dental treatment several times during a year, which substantially differed from our treatment modality, in which we performed all required treatments with a longer operation time. Another study conducted at Tri-Service General Hospital (TSGH) from 2001 to 2007 included 25 disabled people mean aged 11.7 years. Dental treatment was performed under general anesthesia, and the mean number of treated teeth was 21.5 (pulp therapy: 7.9, filling: 13.6, SSC: 6.0, extraction: 1.9). The results were similar to that of our research. The mean age of CSHCN receiving dental treatment in these hospitals decreased from that at NTUH in 1999 to that at TSGH in 2007 to that of the present study in 2013 (14.2 years, 11.7 years, and 6.8 years, respectively), indicating that the recent NHI policy has drawn people's attention to early dental intervention and early prevention for CSHCN. More CSHCN younger than 6 years of age were brought to a hospital or dental clinic for their first dental checkup than previously.

The mean deft/DMFT index was higher in the young age group (13.8) compared with the older age group (10.5) in our survey. During the early age of development, younger children might have difficulty accessing adequate dental care or a family dentist because of their physical impairment. After 6 years of age, exfoliation of the primary teeth and eruption of permanent teeth decrease the deft/DMFT index until children reach 12 years of age. The prevalence of caries and the DMFT index rise every year after the age of 12 years. Our finding corresponds strongly with other Taiwanese studies.^{16,20} However, national surveys in the United States have reported an opposite result, demonstrating that children older than 6 years of age are more likely to have more complex unmet dental needs because there is more time for them to develop dental

problems that require medical intervention.^{3,5} Regardless of the discrepant results between various studies, it is imperative to advocate the dental-home concept, particularly for CSHCN, and to provide instruction for disabled children and their guardians on oral hygiene maintenance throughout the critical development stages.

For the association between treatment and age group, we observed significantly more pulp therapies and crown restorations performed for the younger age group. Furthermore, 53 of 96 CSHCN that had reached the age of 12 years at the time of our study showed a significantly higher percentage of malocclusion in full permanent dentition in the older age group compared with the younger age group. The malocclusion conditions we observed in our patients were mostly related to space problems resulting from premature loss of deciduous teeth at an early age, such as ectopic eruption or impacted permanent canines and premolars and dentition crowding. Severely decayed teeth without timely restoration are often treated through extraction, which may lead to malocclusion, further poor esthetics, and compromised mastication ability.^{3,9,16} This indicates that early intervention of oral health care facilitates full mouth rehabilitation in young children.

In contrast to our hypothesis that children who were severely disabled or had certain types of disability such as autism, Down syndrome, and multi-disabilities would have more unmet dental needs, we observed no significant difference in the deft/DMFT index and dental treatment modalities regarding disability type and severity. This might be because of case selection in a hospital setting, and only referring those who suffered from multiple dental problems and lacked cooperative ability for advanced medical intervention. According to Huang's¹⁶ national survey on people with disabilities, people with severe to profound disabilities had significantly more missing teeth and fewer restored teeth compared with people with mild disabilities. This indicated that people severely affected were less likely to acquire timely dental treatment needs. CSHCN younger than 12 years of age with multiple disabilities and mental retardation were observed to have more caries decay with a lower filling rate compared with other disability types.^{16,21} Although no difference existed in dental treatment needs and the deft/DMFT index among various disability types in our study, most diagnoses of CSHCN were autism, multiple-disability, and mental retardation, corresponding to the most frequent caries-affected groups in the national survey.

In conclusion, unmet dental needs and caries experience indices remain high, regardless of disability types and severity in Taiwan. However, CSHCN aged younger than 6 years have more effective dental rehabilitation than older patients do when comparing treatment modalities. We observed a significantly high percentage of malocclusion upon full permanent dentition in the older age group and concluded that early dental intervention and preventive approaches for oral care are mandatory for CSHCN. Parents and caregivers should be educated as to the importance of early and regular dental visits.

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