ARTICLE

Oral Health Condition and Treatment Needs of a Group of UAE Children with Down Syndrome

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Abstract

Objectives: Several studies have described the oral health condition and treatment needs of individuals with Down syndrome (DS), but there are no reports about DS patients in UAE. This study was conducted to determine the oral health condition and treatment needs in these patients.

Methods: Sixty children with DS attending Sharjah School for Humanitarian Service (SSHS) were selected for the study. In the evaluation, the children were compared with a normal non-DS control group selected from children attending college of dentistry Ajman University dental clinics and matched for age and sex. Clinical assessment included extraoral and intraoral examination, measurement of decayed (D), missing (M) and filled (F) teeth (DMFT) for permanent dentition and (dmft) for primary dentition, while periodontal evaluation included recording of oral hygiene status, plaque index (P1), gingival index (GI), probing depth (PD), and clinical attachment level (CAL). Periodontal and gingival health status was recorded according to the Community Periodontal Index of Treatment Needs (CPITN). DS children were also examined for malocclusion, dental hypoplasia, crowding, and missing teeth.

Results: Compared with normal controls, children with DS had mean number of DMFT almost twice as high as that in the parallel healthy controls (13.2 ± 0.84 vs. 7.4 ± 3.94). More of the DS children showed poor oral hygiene. The assessment of the periodontal treatment needs of the DS children revealed that only 10% of the children had healthy gingiva compared with 38.3% of healthy controls. Significantly high proportion of DS patients ($p < 0.05$) require complex periodontal treatment. DS patients have shown a significantly higher proportion of malocclusion ($p < 0.01$), compared with non-DS subjects. Conclusion: Individuals with DS in UAE have poor oral health and an increased occurrence of periodontal disease and dental caries compared with otherwise normal, age-matched control groups. Preventive, restorative and periodontal treatment needs are unmet in DS children. These findings reinforce the importance of promoting the integration of the

dental specialists to the interdisciplinary team that provides healthcare for this group of children.

Keywords: Down syndrome, Dental caries, Dental treatment, Oral health, UAE

Introduction

Down syndrome (DS) is a genetic condition caused by a chromosomal abnormality and results in a characteristic appearance, learning disability, and a variety of physical and medical features affecting between 1 in 600 to 1 in 1000 live births (1). Although there are some patients with DS with an IQ above 69, nearly all patients with this condition have intellectual impairmentof variable degrees. Periodontal disease is the most significant oral health problem in these patients. Studies have shown mentally handicapped children to have poor periodontal health (2-5). These children experience rapid, destructive periodontal disease. Consequently, large numbers of them lose their permanent anterior teeth by their early teens. Contributing factors include poor oral hygiene, malocclusion, bruxism, conical-shaped tooth roots, and abnormal host response because of a compromised immune system. Evidence exists that DS patients have a greater unmet oral health need and less access to screening services than the general public (6). As the association between oral health and quality of life is well established, this situation may have wider implications (7, 8). Studies indicate numerous user/care-giver barriers, professional service provider barriers, and ethnic barriers to the oral health of people with learning disabilities (6,9-12). In particular, oral health may be a low priority in the context of other social and medical challenges (6). Studies investigating the oral health needs of people with DS indicate that they consistently have worse oral hygiene levels and a greater incidence of gingival inflammation and periodontal disease than that of the general population; yet they experience more untreated disease and more extractions (13-16). Other studies have examined access issues, indicating that people with disabilities have problems in accessing oral health services and finding a dentist (18-20). However other studies (20, 21) have demonstrated that once children with DS have found a suitable dentist they are more likely to attend regularly than their non-DS peers. Despite this, the evidence showed that they are less likely to receive treatment than their non-DS peers (20).

This population has progressed tremendously over recent years to be able to function in the mainstream of society. Work and community settings are now becoming the norm for patients with DS. This has resulted in a higher level of functioning for most of these individuals with resulting increases in self-esteem and self-image. The demand for dental care in patients with DS is increasing with this inclusive trend. Most dental treatment for patients with DS can take place in a general dental office with relatively minor adaptations. There is a paucity of information about oral health status and treatment needs of patients with DS in the United Arab Emirates (UAE); thus the aims of the present study were: To determine caries experience, periodontal health status and treatment needs of 4-17 year-old DS patients and to assess various dentofacial and occlusal abnormalities in DS patients and to be compared with matched healthy control individuals.

Material and Methods

At the time of the study, there were 60 DS patients aged 4-17 years attending Sharjah School for Humanitarian Services (SSHS). This number represents all number of patients diagnosed with this syndrome and living in the Emirates of Sharjah. The centers offer an intensive rehabilitation program for children diagnosed with DS. All the children had been previously examined and diagnosed as DS patients according to the center's medical records. Prior to the study, SSHS was contacted and agreed to the protocol of the study. Ethical approval was obtained from the Research Ethics Committee at the College of Dentistry, Ajman University, UAE. Consent was obtained from the parents and SSHS headmaster. Inclusion criteria were: a) Diagnosis of DS, b) consent and c) age 4-17 years. Exclusion criteria were: a) Dental prophylaxes in the last 6 months and b) suffering from other diseases known to influence dental caries or the severity of periodontal disease such as diabetes.Sixty patients with DS were referred to our clinics for dental examination and met our inclusion criteria, therefore were included in the study. The healthy controls who met the above mentioned criteria were chosen from relatives or friends of DS patients in an attempt to match age, sex, socioeconomic status, and general dental care background. All controls were medically fit and none was undergoing antibiotic or anti-inflammatory therapy or had undergone such therapy in the previous six months.

Examination

Following complete medical history, all subjects were examined by one examiner following international criteria standardized by the World Health Organization (WHO)

for oral health surveys (22). Patients were examined at the dental clinics of the College of Dentistry, Ajman University, and an oral examination was conducted for both patients and controls. The examination was conducted under natural light and using plain mouth mirrors, gloves, and Community Periodontal Index (CPI) probe. The WHO periodontal probe, previously described by Emslie (23), was used for the assessment of periodontal status. The criteria used for the diagnosis of oral diseases were consistent with those recommended by the WHO (22).

The dmft/DMFT index was used, with codes and criteria established by the WHO. Met Need Index (MNI), an indication of treatment received by an individual, is determined using the ratio of mean missing (M) plus filled (F) teeth to mean decayed, missing, and filled teeth (DMF); that is M+F/DMF. While Restorative Index (RI), which reflects the restorative care of those who have suffered the disease, is measured by the ratio of filled (F) to filled plus decayed teeth (F+D)% that is F/F+D% as described by Jackson (24). This methodology was used systematically for all DS and healthy control children examined.

Periodontal and gingival health status was recorded according to the Community Periodontal Index of Treatment Needs CPITN as recommended by Ainamo et al (25). To avoid the risk of recording false pockets in this age group, codes 3 and 4 were only recorded when there were pathological pockets with bleeding and evident loss of fibrous attachment beyond the cemento-enamel junction. Calibration of the investigator for CPITN was carried out against an experienced clinician and the Kappa value was 0.91. Oral hygiene was evaluated by examining the dental plaque present on the lingual and buccal surfaces of the six index teeth, using the criteria of the plaque index of Silness and Loe (26).

Statistical analysis

The data were analysed using relative frequencies and percentages for categorical variables (such as the presence of decayed teeth) and means for the interval scaled variables (such as the DMFT/dmft score). When the outcome variables were categorical, chi-squared and t-test were used to examine differences by gender and age group for statistical significance. Data were analyzed using SPSS software, version 12.0 (SPSS Inc., Chicago, IL, USA) for Windows. Statistical significance was sat at $P < 0{\cdot}05$.

Results

Total of 60 DS patients with age range between 4-17 years (mean, 9 ± 1.07) were included. There were 35 males (58.3%) and 25 females (41.7%). The control group consisted of 60 healthy non- institutionalized children. The overall occurrence of dental caries among DS children was 90.0% (54/60) where as for the healthy controls was 63.3% (36/60). Tables 1 & 2 show the dental status of the sample population. The mean numbers of decayed DMFT in DS patients were almost twice as high as that in healthy controls (13.2 ± 0.84 vs. 7.4 ± 3.94). Thus, there was a clear statistical significant difference in caries experience amongst DS patients in both age groups ($P < 0.01$), as measured by DMFT and as compared to healthy controls. The caries occurrence increased with age (Table 2). The distribution of DMFT/dmft among the cases and controls has shown high dmft among the 8-12 year old children while in the permanent dentition the highest score was among the 13 to 19 years age group. As for the treatment (filling) of the carious teeth, more treatment had been performed in the permanent dentition than in the primary. Significant number of children with caries in the primary dentition had no dental treatment at all. The treatment received and restorative care in DS children is presented in (Table 3). The RI for the DS patients was 0.4 compared with 0.5 for healthy control subjects, and MNI was 0.75. The overall proportion of patients with untreated caries reflect the concurrent increase in caries indices and access to dental treatment with age, the occurrence of untreated caries in deciduous or permanent teeth also varied amongst the age groups. In the studied group; the mean plaque index was 2.35 ± 0.7; the probing depth 2.96 ± 0.8, and the average periodontal attachment loss was 4.18 ± 1.3, all significantly greater than controls ($p < 0.01$) (Table 4). The assessment of the periodontal treatment needs of the DS children revealed that only 10% of the children had healthy gingiva compared with 38.3% among the healthy controls (Table 5). High proportion of DS patients ($p < 0.05$) require complex periodontal treatment. From these findings, the periodontal treatment needs (TN) have been calculated (Table 5). Fourteen (23.3%) of DS children needed oral hygiene care and 32 (53.3%) required complex periodontal treatment. Down syndrome patients have shown significantly higher proportion of malocclusion ($p < 0.01$), compared with non-DS subjects. The occurrence of other dentofacial abnormalities is presented in Table 6. The occurrence of malocclusions in boys and girls did not differ significantly. In the studied group all patients had at least one anomaly of occlusion. Among the normal individuals only 71.6% (43/60) had occlusion problems. Open bite and cross bite occurred far more frequently in the DS group than in the normal control subjects ($p <$

Table 1. Dental health status in patients and control groups (* Significant)

	Down's syndrome n= 60 (mean ±s.d.)	Control n=60 (mean ±s.d.)	t test	P value
DMF index	13.2 ± 0.64	7.4 ±3.94	1.81	<0.01*
Carious teeth	3.25 ± 0.61	1.87 ± 2.90	2.77	<0.01*
Missing teeth	7.14 ± 1.65	3.69 ± 5.53	1.52	<0.01*
Filled teeth	2.91 ± 2.02	2.08 ± 2.44	2.21	0.02*

Table 2. Proportion of patients free of caries, and dmft and DMFT averages (standard deviation) among children and adolescents with Down syndrome, by age groups and type of dentition

Primary dentition	Age group		
	4–7 years old (n = 10)	8–12 years old (n = 12)	
Decayed teeth	0.2 (2.6)	0.4 (1.3)	
Missing teeth	0.0 (0.1)	0.2 (0.9)	
Filled teeth	0.1 (1.1)	0.2 (0.7)	
dmft index	0.2 (0.9)	0.9 (1.4)	
Permanent dentition	Age group		
	4–7 years old (n = 10)	**8–12 years old (n = 12)**	**13–19 years old (n = 16)**
Decayed teeth	0.6 (0.2)	0.9 (1.2)	1.1 (0.9)
Missing teeth	1.1 (0.2)	1.2 (2.3)	4.6 (5.1)
Filled teeth	0.4 (0.7)	0.5 (0.9)	1.7 (3.2)
DMFT index	3.1 (2.0)	3.3 (2.4)	5.7 (3.8)

Table 3. Mean DMFT/dmft, Restorative Index (RI) and Met Need Index (MNI) for the two groups

Group	No	D	M	F	DMFT/dmft	Mean DMFT/ dmft	RI	MNI
DS	54	173	385	156	714	13.2	0.4	0.75
Control	38	71	136	76	283	7.4	0.5	0.74
Total	92	244	521	232	997	10.8	0.4	0.75

(RI) Restorative Index =F/F+D

(MNI) Met Need Index =M+F/DMF

Table 4. Periodental health in DS patients and control group

	DS N=60 Mean ± s.d.	DS N=60 Mean ± s.d.	t	p-value
Plaque index	2.35 ± 0.7	1.06 ± 0.68	4.6	<0.01*
Probing depth	2.96 ± 0.8	2.01 ± 0.57	5.6	<0.01*
Attachment loss	4.1 ± 1.2	3.2 ± 0.82	5.5	<0.01*

0.05). There were no significant difference between the two groups with respect to the other occlusion problems (Table 7).

Discussion

It is difficult to estimate the percentages of DS in the UAE since there is no central data collection agency. Evidence would suggest that the percentage of people with disabilities in the UAE is similar to the worldwide average, i.e, 8-10% of the population (27).

The studied group revealed more males than females (though the data are small), with a ratio of 1.4:1, this might reflect the higher occurrence of DS in males as it was reported in other parts of the world (1,9,10,13). In this study the overall distribution of dental caries among the DS children was 90.0% and the proportion of DS children with caries that never received dental restorative treatment was higher in younger children with a primary dentition than in older children with a permanent dentition. An analysis of caries prevalence of children living in Emirate of Sharjah, UAE, showed a low level of restorative dental treatment in the primary dentition (28). The lower provision of restorative dental treatment for children with primary dentition is widespread and has been attributed to cultural factors involving both dental caregivers and parents. The most recent dental survey in the UAE found the prevalence of dental caries among healthy school children was 76.1% and the average dmfs score was 10.2 (29). Nunn, et al., reported mean deciduous caries experience to be 0.9 and the mean permanent caries experience (DMFT) was 2.0 in a study of physically handicapped children (30). The mean DMFT/dmft values were 2.5 and 3.4, respectively. Alavi, et al. (31), reported mean DMFT of 9.64 ± 4.64 in diabetic children in 2006. DMFT score and the frequency of decayed

Table 5: Periodental treatment needs status of the Down syndrome subjects					
CPITN	Down's syndrome n= 60 no	%	Control n=60 no	%	P value
Healthy gingival (code 0)	6	10.0	23	38.3	0.004
Bleeding on gentle probing (code 1)	8	13.3	19	31.6	0.05
Supra/subgingival calculus (code 2)	14	23.3	12	20.0	0.72
Pocket depth 3.5 to 5.5mm (code 3)	15	25.0	2	3.3	0.003
Pocket depth >5.5mm (code 4)	17	28.3	4	6.6	0.007
Total	60		60		
Periodontal treatment needs (TN) by percentage of children					
No of patients	TN0	TN1	TN2		TN3
60	6(10.0%)	8(13.3%)	14(23.3%)		32(53.3%)

teeth were higher in boys than in girls (31).

Older studies reported a dramatically lower decay rate in the population with DS compared with controls. More recent studies continue to support the lower decay rate in patients with DS, but the difference is shown to be far less than previously reported (32). Overall reduction in dental decay, controlling for eruption times, may explain the difference in the earlier and more recent studies. Older studies of caries in patients with DS used institutionalized populations whose diets were controlled. These groups may not have had the exposure to cariogenic foods at the rate of today's children with DS who are growing up at home. It is theorized that this may be due to delayed eruption of the teeth, increased spacing between teeth or possible differences in the chemical content of the saliva (33).

Met Need Index and Restorative Index of the studied DS children were low compared with healthy control subjects. This means that the preventive and restorative treatment needs of many DS children in the present study were unmet. Possible contributory factors include insufficiently trained dentists to treat patients with disabilities, and complex treatment needs requiring special care or general anesthesia (34). Consequently, only emergency treatment is sought when individuals experience dental pain which leads to filling or extraction. Periodontal disease and oral hygiene represent a significant problem for handicapped children. The findings from this study showed a high level of gingivitis and periodontal disease in this age group of DS children compared with the control group. The CPITN was introduced as an epidemiological and screening index for gingival and periodontal diseases (35). The simplicity, speed, and international uniformity of this index made it the index of choice in this study. Using this index, the results revealed that 90% of DS patients were having periodontal problems and only 10.0% had healthy gingiva. Also a significant number of these children had periodontal pockets and will need complex periodontal care. This is contrary to the findings of other studies (36,37) for this age group in normal children. These investigators found negligible severe or destructive periodontitis in their studies. Svatum and Gjermo (38) associated increased age, epilepsy, and high degree of mental deficiency as elements that apparently contributed to impairment of periodontal health and to increased treatment needs among

Table 6. Dentofacial abnormalities amongst Down's syndrome individuals (* Significant)

Abnormalities	Down's syndrome n= 60 no	%	Control n=60 no	%	P value
Fissure tongue	17	(28.3)	13	(21.6)	0.51
High arched palate	31	(51.6)	7	(11.6)	<0.01*
Malocclusion	59	(98.3)	5	(8.3)	<0.01*
Microdentia	11	(10.3)	3	(5.0)	0.03*
Fractured maxillary teeth	4	(6.6)	2	(3.3)	0.35
Hypertelorism	51	(85.0)	1	(1.6)	<0.01*
Delayed eruption	19	(31.6)	2	(3.3)	<0.01*
Lymphadenopathy	26	(43.3)	7	(11.6)	<0.01*

Table 7. Frequencies of occlusion anomalies among Down syndrome subjects and normal individuals

	DS N=60 No	%	Control N=60 No	%	P
Vertical					
Open bite	9	10.0	2	03.3	0.04
Deep bite	2	03.3	8	13.3	0.06
Transverse					
Cross bite	16	26.6	5	8.3	0.02
Scissor bite	3	05.0	1	1.6	0.32
Sagittal					
Maxillary overjet	4	06.6	10	16.6	0.10
Distal molar occlusion (unilaterally or bilaterally)	6	10.0	11	18.3	0.21
Mandibular overjet	8	13.3	2	3.3	0.06
Mesial molar occlusion (unilaterally or bilaterally)	13	21.6	4	6.6	0.04

handicapped children. Using a different periodontal index, Tesini and Fenton (39) found poor periodontal health of persons with physical or mental disabilities. They equated this to their lack of adequate oral hygiene measures and consequently abundant calculus formation. Some studies report an incidence of periodontal disease to be between 90 and 96% of adults with DS. This is thought to be related to a lowered host immune response due to the compromised immune system in DS (40-42). The amount of plaque and calculus seen on the teeth is not proportionate to the severity of the disease (43). Common conditions seen in DS are marginal gingivitis, acute and subacute necrotizing gingivitis, advanced periodontitis, gingival recession and pocket formation, horizontal and vertical bone loss with suppuration, bifurcation and trifurcation involvement in the molar area, marked mobility of posterior and anterior teeth, and frequent loss of teeth especially in the mandibular anterior area (43). Good oral hygiene and semi-annual prophylaxis appointments may not be enough to prevent the progression of periodontal disease in these patients. Early, aggressive treatment is needed. These patients may need to be seen as often as every three months for

scaling and root planing and may also benefit from the use of combination of drugs (chlorhexidine, fluorine and erythrosine) within dentifrice in controlling dental biofilm and in the reduction of gingival bleeding (44). With the majority of children in this study needing scaling, polishing and oral hygiene instructions, there is an increasing need for comprehensive preventive dental program to promote better oral hygiene and prevent the development and progression of periodontal diseases since the hallmark of management of these children is prevention. Oral and dental anomalies are frequent findings among mentally and physically handicapped children, leading to improper functioning of stomatognathic complex. In the present study, most of the individuals with DS had high arched palates (51.6%) and malocclusion (98.3%), findings consistent with the results of other studies (45,46). There is general agreement that the frequencies of mandibular overjet, cross bite, and anterior open bite are remarkably high in DS individuals (47,48). The higher incidence of Class III malocclusion is due to the underdevelopment of the midface, not to prognathism, and it is reported that the craniofacial dysplasia becomes accentuated with age. This midface dysplasia also contributes to the narrow maxilla and crowding seen in individuals with DS, as demonstrated in this study in which there were a significantly high proportion of subjects with DS with crowding of the upper arch. Though different criteria have been used, the findings of this study agree with previous studies in that patients with DS have remarkably increased frequencies of mandibular overjet, mesial molar occlusion, cross bite, and anterior open bite when compared to normal individuals. The incidence of missing permanent laterals has been reported as high as 35-43% compared with 2% in the general population. The microdontia, especially in the mesio-distal dimension, is significantly more common among DS individuals compared with non-DS. Rotated teeth, spaced teeth, peg shaped teeth (especially laterals) and more congenitally missing permanent teeth are common findings. The incidence of macroglossia has been reported as 11-60% in patients with DS, which is consistent with the findings of the current study, although the presence of true macroglossia has been questioned by some investigators. There is agreement, however, on the presence of a relative macroglossia due to the small palatal space and hypotonic tongue. Fissured tongue and protruding tongue due to forward position of the mandible in relation to maxilla, and open mouth is a common finding. It was reported that 40 to 50% of children with DS are born with some type of cardiac abnormality and an abnormally large percentage may develop Mitral Valve Prolapse (MVP) by adulthood (49). They are more likely, depending on the type of the cardiac defects, to require antibiotic prophylaxis for infective endocarditis prior to dental procedures.

In conclusion, the findings of this study revealed that the rate of caries, periodontal disease, and malocclusion in DS children exceeds that of healthy children. Preventive, restorative, and periodontal treatment needs are unmet in DS children. These findings reinforce the importance of promoting the integration of the dentists to the interdisciplinary team that provides healthcare for this group of children.

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