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Oral health status and reasons for not attending dental care among 12- to 16-year-old children with Down syndrome in special needs centres in Jordan

Abstract: *Objectives:* The objective of this study was to assess oral health status, treatment needs, soft and hard tissue findings, as well as reasons for not attending dental care among children with Down syndrome (DS) registered in special needs centres in Jordan. *Methods:* The sample consisted of a total of 206 participants with a mean age of 13.66 ± 1.47 comprising 103 with DS and 103 age- and gender-matched non-DS/public school children. Clinical levels of oral hygiene were assessed using Simplified Oral hygiene index, and caries detection was carried out according to WHO caries recording criteria. *Results:* Children who had DS had a significantly higher percentage of surfaces with severe gingival index (39.9 ± 9.1 versus 15.9 ± 8.0, $P < 0.001$) and a higher mean of probing pocket depth than children without DS (2.27 ± 0.2 versus 1.81 ± 0.32, $P < 0.000$). Significantly more peg-shaped maxillary lateral incisors and retained primary teeth ($P < 0.001$) were observed in subjects with DS, compared with non-DS children. Average decayed, missing and filled teeth (DMFT) was significantly lower in male children with DS compared with male non-DS children only ($P = 0.034$). The most common reason cited for not taking children to the dentist for DS group was 'Not aware of the dental problems of their children' and for non-DS groups 'No awareness of the importance of dental visit' (61.2% and 53%, respectively). *Conclusions:* While having similar caries level, Jordanian teenagers with DS had more dental anomalies, poorer periodontal health and less dental attendance than age- and gender-matched non-DS/public school children.

Key words: barriers to care; caries; Down syndrome; oral hygiene; periodontal disease; plaque

Introduction

Several epidemiological studies have shown that children and adolescents with disabilities appear to have poorer oral health than non-disabled individuals (1–3). Periodontal disease is the most significant oral health problem in people with Down syndrome (DS) (4, 5). Manual dexterity difficulties may lead to oral hygiene problems, which may lead to accumulation of plaque and debris, hence favouring development of gingivitis and periodontal disease. Children and young adults with DS tend to have

fewer caries because of some associated conditions such as delayed eruption of primary and permanent teeth, congenitally missing teeth and microdontia (2, 6–8).

Individuals with DS need more assistance from caretakers with their daily oral health care; a 3-month-supervised toothbrushing programme conducted twice a week on Kuwaiti children with DS was evaluated and showed that the mean plaque score decreased from 1.93 to 0.95 ($P < 0.001$) and the mean gingival score decreased from 2.00 to 0.83 ($P < 0.001$) (9). Many previous studies showed extensive treatment needs among children with disabilities. It appeared that a relatively high proportion of those children did not usually receive any form of professional oral care (10, 11).

Previous studies among Jordanians showed that approximately 80% of Jordanian healthy adults and children received dental examinations and treatment on an irregular basis and for emergencies (12, 13). In both studies, 'treatment not needed' as well as 'cost' were found to be the main barriers for regular dental attendance.

Many studies reported the oral findings of patients with DS (2–11); despite these multiple studies, the impact of DS on oral health is still unclear, in part due to small sample sizes, non-comparable study populations and the use of various parameters to assess oral health status.

There is little information about the oral health status of individuals with DS in Jordan. Therefore, this study was conducted to determine the oral health status and treatment needs of Jordanian children with DS attending special needs centres, and compare their findings to matched non-DS/public school children. Other aims included assessing their daily oral care practices and evaluating possible reasons for not attending dental care. Such knowledge will help determine the specific needs of this population to be able to construct and deliver preventive programmes through their institutions, which are targeted to their needs.

Methodology

Study design and sample selection

This comparative study was conducted over a period of 6 months in 2008 among children with DS aged 12–16 registered in special needs centres distributed in different geographic areas in Jordan. The sample was composed of children whose mothers agreed to allow clinical examination of the child and to answer the questionnaire in an interview. Among those invited to the study (150), 47 mothers did not agree to participate (response rate 69%). The reasons given by the majority of them were lack of time and lack of tolerance of child to be examined. After the mothers signed informed consent, the total sample consisted of 103 children with DS. For each DS selected, one without DS with approximately the same age and gender was selected from children attending the public schools in the same district. The study was approved by the Institutional Review Board of Jordan University of Science and Technology. Informed consent was obtained from mothers of subjects as well as from the management of the centres before recruiting the children into this study. All subjects were assessed with regard to frequency of brushing, oral hygiene status, caries experience and treatment needs.

Clinical examination

One of the authors (NN) carried out the oral examination on all the subjects in her private dental clinic using disposable examination kits. Standardization was carried out by examining 15 patients, not included in the study population, on two occasions. The κ value was 0.89. Subjects were examined for the following parameters:

Dental caries

Caries was assessed using the World Health Organization Oral Health Survey Basic Methods (14), the decayed, missing and filled teeth (DMFT). A tooth was considered decayed when there were frank carious cavitations on any surface of the tooth. A tooth was classified in the index as missing if it was extracted because of caries. A tooth was classified as filled if it had a restoration for a carious lesion. Exfoliated teeth in the primary and mixed dentition, unerupted and those extracted for other reasons apart from caries were not included in the indices.

Oral hygiene status and periodontal health

Oral hygiene was assessed using Simplified Oral Hygiene Index (OHI-S) of Greene and Vermillion (15), which based on the amount of debris and calculus occurring on six representative tooth surfaces in the mouth. The oral hygiene of each child was classified as 'good' when the OHI-S score was 0–0.9, 'fair' when it was 1.0–2.9 and 'poor' when it was from 3.0 up to 6.0. Probing depth was measured at six sites (mesial, distal, and middle sites of the buccal and lingual sides) on each tooth using a Williams' periodontal probe. Gingival index (16) was evaluated on four sites on each tooth (mesial, distal, buccal and lingual).

Occlusion assessment

Angle's classification of occlusion was used to classify malocclusion. Crowding, spacing and anterior open bite were also recorded.

Dental and soft tissue anomalies

Dental and soft tissue anomalies investigated during intraoral examination included microdontia, hypodontia, peg lateral, fusion, pulp involvement, supernumerary teeth, hypoplasia, occlusal wear and fissured tongue. All were categorized as present or absent only. Findings were communicated to the parents/guardians, appropriate oral health education given and written referrals given to the dental clinic where necessary.

Questionnaire

A structured questionnaire was filled by direct interview with the participated mothers prior to clinical examination of their children. It included demographic questions concerning age and gender of the participating children. Income was classified as low (≤250 JD), average (<250 ≥ 750 JD) and high (>751 JD). Socioeconomic status was categorized into two groups based on monthly family income and education level. A monthly income <750 JD and education level less <12 was considered low socio-economic and higher than 751 and >12 years education as high socio-economic. Moreover, questionnaire included items that assessed home oral care practices, oral habits and reasons for not attending to dental care.

The questionnaire was pretested with 40 selected mothers (20 DS and 20 non-DS) who were requested to complete the questionnaire on two different occasions separated by 7 days. The questionnaire was found suitable for application among the study population as there was high concurrence with the answers to the items on both occasions. Internal consistency (Cronbach's alpha) of the questionnaire was tested and found to be acceptable (0.78).

Statistical analysis

Data collection and statistical analysis were performed using Statistical Package for Social Science 11.0 (SPSS 11.0; SPSS Inc., Chicago, IL, USA). Independent *t*-test was used for comparison in means and chi-squared with Yates' correction to identify differences in proportions. For all statistical analyses, a *P*-value <0.05 was considered statistically significant.

Results

The socio-demographic characteristics

A total of 206 participants (103 with DS and 103 without DS) aged 12–16 years with a mean (SD) age of 13.7 (1.5) were included in this study. About one-third (34%) of subjects were girls. Both income and level of education were significantly higher ($P = 0.016$ and 0.007, respectively) among mothers of children with DS when compared with mothers of children without DS (Table 1).

Table 2 presents participants' oral hygiene practices according to presence of DS. About 22.3% of those with DS and 18.4% of those without DS did not brush their teeth at all. Those with DS were less likely to brush their teeth, use auxiliary aids and use mouthwash compared with non-DS children. All non-DS subjects who reported brushing teeth maintained oral hygiene by themselves, and about 11.6% of those with DS who brush their teeth maintained oral hygiene with a help from their mothers or caregivers.

The oral hygiene status according to OHI-S index was better in those without DS (Fig. 1). Only 23% in the non-DS group had poor hygiene in comparison with 40% in the DS ($P = 0.000$) group.

Table 1. **Socio-demographic characteristics of the participants**

Category	Down syndrome *n* (%)	No-Down syndrome *n* (%)	*P*-value
Age (year)			
12	34 (33.0)	34 (33.0)	0.878
13	17 (16.5)	17 (16.5)	
14	18 (17.5)	18 (17.5)	
15	18 (17.5)	18 (17.5)	
16	16 (15.5)	16 (15.5)	
Gender			
Male	68 (66.0)	68 (66.0)	1.000
Female	35 (34.0)	35 (34.0)	
Monthly income			
Low	27 (26.2)	13 (12.6)	0.016
Average	54 (52.4)	54 (52.4)	
High	22 (21.4)	36 (35.0)	
Mothers' years of education			
<12	25 (24.3)	9 (8.7)	0.007
12	36 (35.0)	37 (35.9)	
>12	42 (40.8)	57 (55.3)	
Mothers' employment			
Employed	30 (32)	33 (32)	0.322
House wife	70 (68.0)	70 (68.0)	

Table 2. **Oral hygiene practices for the two groups of study (*n* = 206)**

Variable	Down syndrome *n* (%)	No-Down syndrome *n* (%)	*P*-value
Tooth brushing			
No	23 (22.3)	19 (18.4)	0.604
Yes	80 (77.7)	84 (84.6)	
Floss			
No	100 (97.1)	77 (74.8)	<0.005
Yes	3 (2.9)	26 (25.2)	
Mouth wash			
No	94 (91.3)	80 (77.7)	<0.035
Yes	9 (8.7)	23 (22.3)	

Children who had DS had a significantly higher percentage of surfaces with severe gingival index (39.9 ± 9.1 versus 15.9 ± 8.0, $P < 0.001$) and a higher mean of probing pocket depth than healthy subjects (2.27 ± 0.2 versus 1.81 ± 0.32, $P < 0.000$).

Oral health status and dental and oral findings

The average DMFT was significantly lower in male children with DS compared with male non-DS children only ($P = 0.034$). No significant difference was found between boys and girls within each group (Table 3). No significant difference was found in percentage of caries-free children between children with DS (43.7%) and without DS (50.2%).

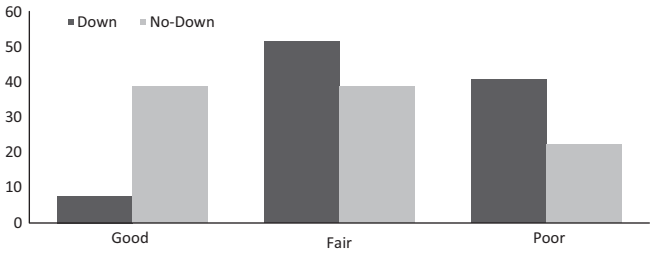

Fig. 1. Oral hygiene status for the two groups of study (n = 206), P = 0.00.

Table 3. **Mean decayed, missing and filled teeth (DMFT) scores in relation to gender for the two groups of the study (n = 206)**

Gender	Down syndrome Mean (SD)	No-Down syndrome Mean (SD)	*P*-value (Down syndrome versus No-Down syndrome)
Male	2.82 (3.28)	4.07 (3.51)	0.034
Female	4.29 (4.48)	5.60 (5.22)	0.263
Total	3.32 (3.77)	4.59 (4.21)	0.023
P-value (male versus female)	0.060	0.080	

Extraction was the most common type of treatment in the DS group, while restoration was the commonest treatment followed by extraction for the non-DS group.

As shown in Table 4, the most common dental finding in DS group was occlusal teeth wear (36%) compared with only 11.7% in the no-DS group, followed by peg laterals, which is seen in 20.4% of subjects with DS compared with only 2.9% in the no-DS group. Hypodontia was seen in 51.5% of the DS group and in 4.9% of the no-DS group. Regarding the soft tissue findings, fissured tongue was seen in 56.3% in the DS group and in 2.9% in the no-DS group.

Table 4. **Proportion of oral findings for the two groups of study (n = 206)**

Oral conditions	Down syndrome *n* (%)	No-Down syndrome *n* (%)	*P*-value
Dental findings			
Hypoplasia	9 (8.73)	2 (1.94)	0.000*
Peg laterals	21 (20.4)	3 (2.9)	
Fusion	1 (0.9)	0 (0)	0.000*
Microdontia	1 (0.9)	0 (0)	
Hypodontia	53 (51.5)	5 (4.9)	0.000*
Pulp involvement	26 (25.2)	17 (16.5)	
Occlusal wear	36 (35.0)	12 (11.7)	
Soft tissue findings			
Fissured tongue	58 (56.3)	3 (2.9)	0.000*
Occlusal findings			
Crowding	39 (37.9)	32 (31.1)	
G. spacing	53 (51.5)	16 (15.5)	0.000*
Malocclusion	72 (69.9)	42 (40.8)	
Open bite	37 (35.9)	5 (4.9)	

*Statistical significant.

Malocclusion was seen in 69.9% of the DS group and in 40.8% of the no-DS group. Open bite also was seen in 35.9% of the DS group compared with only 4.9% in the no-DS group. Angle Class III malocclusion was seen in the majority of the DS group (47.5%) compared with 11.65% the no-DS group.

Dental visits and reasons for not attending to dental care

About one-third (32%) of subjects with DS did not visit the dentist in their entire life in comparison with 15.5% of non-Ds children. Also, 58.3% of the DS group and 50.5% of the non-DS group had visited the dentist irregularly because of pain in the majority of the cases for the two groups. Only 9.7% of the DS group visited their dentist regularly, compared with 34% for the non-DS group. Table 5 describes the reasons for not taking children to dental care as reported by the mothers. Approximately two-third (61.2%) of the DS group and 45.0% of non-DS group were not aware that their children have dental problems. About 40.9% of DS group and 53.0% of non-DS group were not aware of the beneficial effects of frequent 6-month or even annual check-up/visit to the dentists on their children. About a third (32.3%) of the DS group and 23.3% from the non-DS group cited fear of children as a reason for not taking children to dental care.

Discussion

This study presented a comprehensive overview of the oral health status, behaviours and needs of children with DS attending special needs centres, which, to the best of our knowledge, is the first published study conducted to explore these issues among DS children in Jordan.

The geographic distribution of the sample (north, south and the middle) is considered representative as majority (63%) of Jordan population live in the middle zone according to the department of statistics of Jordan. Moreover, we believe that the sample was large enough and drawn from an economically diverse area to make the study group reasonably representative of other regions of Jordan. It is worth noting that there are no clear statistics of the prevalence of DS in Jordan.

Table 5. **Reasons cited by mothers for not attending dental care**

Reasons	Down syndrome *n* (%)	No-Down syndrome *n* (%)
Fear	33 (32.3)	24 (23.3)
Financial	28 (26.9)	24 (23.3)
Not aware of the dental problems of their children	63 (61.2)	46 (45)
No awareness of the importance of dental visit	42 (40.9)	55 (53)
Total	103	103

Unlike special needs centres, all public schools in Jordan have oral health preventive programme targeting all students; therefore, this study focused on patients with DS attending special needs centres as access to these centres is easy; they were compared with healthy children in public schools to highlight the specific needs of this population compared with normal children to help tailor oral health promotion programmes targeted to their needs in their institutions. It is generally difficult to access children with special needs, as their parents tend to keep them at home with little or no integration in the society. Attempts are made to encourage Jordanians to send these children to special needs centres to help them learn skills to take care of themselves and even become more integrated in the society. Down syndrome Children with DS are the most commonly institutionalized among all other disabilities.

In our study, two-third of the participants with DS were boys, a percentage higher than that found by Asokan *et al.* (10) on children with DS aged ≤15 years in India (n = 102) where half of the participants were boys (55.8%). This was not strange, as in Jordan; families tend to send their sons to special needs centres more often than their daughters.

In general, oral hygiene and periodontal health were poor, and most of the children had gingival bleeding. The poorest oral hygiene and periodontal health was found among subjects with DS, a finding similar to what was reported in pervious studies (5, 8, 10).

Thirty-two per cent of participants with DS had not been to the dentist before, although the lack of access to care is not limited to those with DS. Healthier people in Jordan still attend dental facilities only when there is a dental problem (17).

Many individuals with DS participated in this study had poor oral hygiene, a finding similar to that from previous studies (18, 19). High percentage of the children in this study reported brushing their teeth at least once daily although this effort was not fully organized or supported by parents. Lack of both parental and child oral health education might explain these findings. Parents' failure to organize or support their children's tooth brushing efforts coincided with findings from previous studies that reported lack of acceptable levels of knowledge and awareness of periodontal problems among Jordanian adults (13). The use of other recommended oral hygiene methods such as dental floss and mouthwash was found to be rare among DS children; this also could be attributed to the lack of oral health education. Similar results were reported by Oredugba & Akindayomi (20) where oral hygiene was better in children who received assistance. Unfortunately, in our result, only 8.7% of children with DS got help from their mothers and 2.7% from their caregivers during their oral hygiene practice. A good percentage of healthy children reported using mouthwash as all public schools in Jordan have a fluoride mouth-rinsing programme.

The mean DMFT in this study was higher in non-DS children than in DS children, which is similar to findings of studies in other countries (21, 22). The high score of DMFT in the current study in comparison with previous reports was due to the high prevalence of carious lesions among DS group and due to the fact that extraction was the most common type of treatment provided for them even for restorable teeth. In Jordan, DMFT is also high among healthy children (23).

The prevalence of Class I malocclusion in the DS group in this study was 34%, which is similar to the result (40%) reported by Scully and Cawson (24). Nearly half, 47.5%, of the individuals with DS had Class III malocclusion while only 11.7% of the healthy children did. Two more studies reported similar results (25, 26). This may be related to hypoplasia of the mid-face, which contributes to the narrow maxilla and crowding seen in individuals with DS; as demonstrated in this study, there was a significantly high proportion of subjects with DS with crowding of the upper arch (37.9%). It had been demonstrated that an individual with DS can be an excellent orthodontic patient and should not be excluded from the patient population. However, orthodontic prognosis may be poor because of learning disability, parafunctional habits and severe periodontal disease.

Peg-shaped lateral incisor was also a common finding in the DS group. It was suggested that the slow rate of cell growth and a consequent reduced cell number that characterized the syndrome may be responsible for the underdevelopment of the upper jaw, the delayed dental development and the reduction in number and size of teeth.

More than half of the DS group had one or more missing teeth. This finding was reported in many previous studies (11, 25). The eruption sequence in DS can be irregular, and the prevalence of tooth agenesis is increased in the primary as well as in the permanent dentition (11). The clinical relevance of early recognition of hypodontia is an adequate treatment plan for maintenance of primary teeth or early orthodontic intervention.

As illustrated in our results, mothers of non-DS children were more aware of the oral health problems their kids have had than mothers of DS children. Therefore, this might help in clarifying why non-DS children had better oral hygiene and more frequent dental visits or treatments than DS children. This result agrees with findings from Allison *et al.* (27). The most important aim of dental care for this group of children is to prevent dental disease, thus avoiding the problems associated with the disease and the need for operative treatment, as about third of the mothers in our sample reported that their children did not cooperate easily during treatment and felt fear from equipment noise. It is, therefore, necessary to educate the parent so that they understand the importance of dental health for their children and its relationship to their medical condition. Aspects of preventive care include dietary counselling, provision of any necessary fluoride supplements and oral hygiene instructions.

Limitations to this study included difficulties in making bitewing radiographs for all individuals to assess proximal carious lesions and any bone loss. In addition, the study was carried out on children attending special needs centres. Therefore, generalizations must be made carefully as this is a rather unique population as judged by their gender distribution, which many not reflect DS population in Jordan.

Another limitation is that children with DS were compared to healthy ones as access to mentally challenged population or any other disability groups is difficult in Jordan.

Conclusions

It can be concluded from this study that individuals with DS in Jordan have poor oral health and limited dental care. In addition, mothers have limited knowledge of their children dental needs. This study suggests that oral health promotion programmes should be introduced to special care centres with parental education as an integral component of such programmes.

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Conflict of interest

The authors declare that they have no conflict of interests.

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