

Child's dental visits, oral health knowledge and source of dental information among mothers of children with Down's syndrome in Riyadh, Saudi Arabia

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أجريت هذه الدراسة لتقييم زيارات الأطفال المصابين بمتلازمة داون لعيادة طبيب الأسنان وكذلك تقييم مستوى المعلومات المتعلقة بصحة الفم والأسنان ومصدر هذه المعلومات لدى الأمهات في الرياض، المملكة العربية السعودية. وزعت 250 استبيانه على الأمهات في ثلاث مدارس تعنى بتدريس الأطفال ذوي الإعاقات الذهنية وبلغ عدد الأمهات اللاتي أعدن الاستبانه 225 (90%)، أظهرت النتائج ان 57.41% من الأطفال قد زاروا طبيب الأسنان و61.9% تمت زيارتهم الأولى عند عمر 4-6 سنوات أو أقل وأن 72% زاروا طبيب الأسنان عند الإحساس بالألم. أظهر اختبار كاي المربع أن أطفال الأمهات الجامعيات قد قاموا بزيارة طبيب الأسنان عند عمر أصغر مقارنة بأطفال الأمهات الأخريات (P=0.03) بينما وجد أن عدد أكثر من اطفال الأمهات الغير عاملات قد قاموا بزيارة طبيب الأسنان فقط عند الإحساس بالألم (P=0.025) كذلك وجد أن غالبية الأمهات (97.8%) عرفت أسباب تسوس الأسنان وأن أكثر من 85% من الأمهات ادركن أسباب رائحة الفم الكريهة، كذلك وجد أن عدد أكثر من الأمهات الجامعيات اعتبرن تسوس الأسنان سبب آخر محتمل لرائحة الفم الكريهة (P=0.01). أكثر من 89% من الأمهات اعتبرن تقليل السكريات، تفريش الأسنان والزيارات الدورية لطبيب الأسنان طرق مهمة للوقاية من تسوس الأسنان بينما وجد أن 45% فقط من الأمهات عرفن فائدة الفلورايد للأسنان ووجد أن 60.8% من هؤلاء الأمهات ممن يحملان الشهادة الجامعية (P=0.007). وكذلك عرفت 92.4% من الأمهات أسباب وجود الدم على فرشاة الأسنان بينما وجد أن 10% من الأمهات غير المتعلمات لم يعلمن السبب نسبة لبقي الأمهات (P=0.045). وجد كذلك أن طبيب الأسنان هو المصدر الرئيسي لمعلومات الأمهات حول صحة الفم والأسنان. بناءً على نتائج هذه الدراسة نستطيع الاستنتاج ان معلومات الأمهات حول صحة الفم والأسنان تعتبر مرضيه بصورة عامه رغم الحاجة إلى تثقيف هؤلاء الأمهات في بعض النواحي مثل أهمية زيارة طبيب الأسنان، دور الفلورايد في صحة الأسنان وأسباب واعراض التهاب اللثة.

The study was conducted to assess the children's dental visit practices, level of oral health knowledge and source of dental information among mothers of children with Down's syndrome in Riyadh, Saudi Arabia. Two hundred and fifty self-administered questionnaires were distributed to the mothers of Down's syndrome children in three institutions that provided education to children with mental disabilities of which 225 (90%) were returned. The results showed that 57.41% of the children had visited the dentist, 61.9% had their first visit at the age of 4-6 years or earlier and nearly 72% of the children visited the dentist only when they had pain. Mothers with university education were found to make their childrens' dental visit at an earlier age (P=0.03) and more of the non-working mothers were found to make their childrens' visits only when in pain (P=0.025). The majority of mothers (97.8%) knew the causes of dental caries, and more than 85% of them recognized the causes of halitosis. More mothers with university education considered dental caries as another possible cause of bad breath (P<0.01). A high percentage (>89%) of mothers regarded sugar reduction, tooth brushing and dental visits as effective methods in reducing dental caries, but only 45% knew the benefits of fluoride to dentition and 60.8% of those mothers were those with higher educational level (P=0.007). Causes of presence of blood on the toothbrush were recognized by the majority of mothers (92.4%) while about 10% of illiterate mothers did not know the reason of blood on toothbrush (P=0.045) as compared to mothers with other educational levels. Sixty percent of mothers received their dental information from the dentist. Based on the results, overall mothers' oral health knowledge was considered to be satisfactory, but more dental health education is still needed with respect to the importance of dental visits, role of fluoride and causes as well as symptoms of gingival inflammation.

INTRODUCTION

Down's syndrome is a chromosomal abnormality (trisomy 21). Individuals with Down's syndrome have a high incidence of anatomical and developmental abnormalities and specific physical and functional problems associated with the

orofacial region.^{1,2} Functional difficulties may include swallowing, speech and mastication.²

Frequent preventive dental visits are necessary for all children especially those with Down's syndrome since most of them are not able to carry-out the necessary oral hygiene practices. A preventive dental visit consists of dietary counseling

Received June 2005, Revised 8 October 2005

Accepted 26 November 2005

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oral hygiene instructions, prophylaxis and topical fluoride application, in addition to re-evaluating the restored teeth, assessing the development of new caries and the necessity of any re-treatment.³ Shapira *et al.*⁴ reported a high degree of success in the prevention of dental caries and periodontal disease in young populations with Down's syndrome after implementation of a comprehensive 30-month preventive dental program. Another major factor in preventing dental diseases in children especially those with Down's syndrome is mother's knowledge of oral health and practices toward prevention of dental diseases.⁵ In addition, mothers have a major role in the success of any preventive measure applied to their children.

Children with Down's syndrome are known to be greatly predisposed to periodontal diseases and have increased incidence of facial, skeletal and orthodontic problems compared to non-Down's syndrome children.^{2,4} The high incidence of periodontal disease among children with Down's syndrome is attributed to several factors including inability to maintain proper oral hygiene due to physical and mental disability.^{4,5} The clinical pattern of periodontal disease involves generalized periodontitis with severe inflammation, tooth mobility and spontaneous gingival bleeding which may lead to early tooth loss.⁴⁻⁶

In developing countries, some studies reported a low incidence of dental caries among Down's syndrome children compared to the normal children.⁶⁻⁹ In Saudi Arabia, the prevalence of dental caries in general is higher than developing countries,¹⁰⁻¹² so it might be possible that the dental caries level is higher among Saudi children with Down's syndrome as compared with those in developing countries.

Studies recognized that individuals with Down's syndrome have a higher level

of dental care needs than do non-Down's syndrome individuals.^{2,15} Other studies reported that only a small percentage of the dental needs of institutionalized children with Down's syndrome were met and a major fraction of DMF surfaces were found to be decayed.^{4,13,14} Randell and co-workers in their study, however, reported that 60% of children with Down's syndrome had never been to a dentist.⁵

No previous studies were undertaken to assess the status of children's dental visits or mother's oral health knowledge with respect to children with Down's syndrome in Saudi Arabia.

The purpose of the present study was to investigate the children's dental visit practices, the level of oral health knowledge and the source of dental information among mothers of children with Down's syndrome attending in three institutions in Riyadh. In addition, the study aimed to evaluate the effect of mothers' education levels and occupation on their children's dental visit practices and knowledge of oral health of mothers.

PATIENTS AND METHODS

Two hundred and fifty mothers of children with Down's syndrome participated in this study. These children were attending three institutions which provided education to children with mental disabilities in Riyadh, Saudi Arabia.

In these institutions, children attended from 7:00 a.m. to 2:00 p.m. for educational purposes only. They bring their food and snacks from their homes and there are no preventive dental programs available in any of the institutions. The data for this study was obtained through a self-administered questionnaire. The questionnaire was tested on a group of parents who did not participate in the main study and appropriate modifications were made.

The aim of the study was explained to the mothers and confidentiality of the provided information was assured by an explanatory letter sent to each mother. The following areas were covered in the questionnaire:

- Demographic information such as age, sex, nationality of the child.
- Socioeconomic status such as educational level and occupation of mothers. Three categories of education were defined including illiterate, high school or less and university education. With regard to the occupation,¹⁶ five categories were defined including higher professions (doctor, dentist, pharmacist, lawyer, engineer), intermediate professions (teacher, accountant, government employee, journalist, translator), laborer (cook, nanny, housekeeper), retired and housewife.
- Dental visit practices including previous child's visit to a dentist, age of the child when first seen by dentist, his/her behavior during the dental visit and the frequency of dental visits.
- Mothers' oral health knowledge which included causes of dental caries, causes of bad mouth breath, ways of keeping the mouth and teeth healthy, effect of fluoride on dental health, causes of gingival disease and source of any dental information.

All the information was entered into a computer utilizing FoxPro program for windows. Statistical Package for Social Sciences (SPSS version 10) was utilized for all the statistical computations. Frequency distribution was used for the descriptive analysis and Chi-square test at 5% significance was used for the statistical relationship between the variables.

RESULTS

Socio-Demographic Background

Out of the two hundred and fifty questionnaires distributed, two hundred and twenty-five questionnaires were returned giving a response rate of 90%. The age of the children ranged from one to 19 years with a mean age of $7.24 \pm$ (SD 4.11). The mean age of male children was $7.27 \pm$ (SD 4.08) and $7.20 \pm$ (SD 4.17) for the females (Table 1). The majority of the children (91%) were Saudis.

Table 1. Percentage distribution of children by age and sex ($N=225$)

Sex	Age group in years				Mean age \pm S	TOTAL
	1-5 N (%)	6-10 N (%)	11-15 N (%)	16-19 N (%)		
Male	52 (38%)	59 (43%)	20 (14.6%)	6 (4.4%)	7.27 \pm (4.08)	137
Female	36 (42.4%)	28 (32.9%)	17 (20%)	4 (4.7%)	7.20 \pm (4.17)	85
TOTAL	88 (39.6%)	87 (39.2%)	37 (16.7%)	10 (4.5%)	7.24 \pm (4.11)	222

*Some mothers did not answer all the questions

Table 2 shows the educational level of mothers. Nearly 35% of mothers had university education and only 12.7% of the mothers were illiterate.

Table 2. Percentage distribution of mothers by level of education and type of occupation ($N=225$)*

Mothers' characteristics	N	(%)
Mothers' educational level	Illiterate	28 12.7
	High school or lower	113 51.6
	University	78 35.7
Mothers' occupational status	High profession	4 1.9
	Intermediate profession	61 29.1
	Labor	1 0.5
	Retired	3 1.4
	Housewife	141 67.1

*Some mothers did not answer all the questions

Table 3 Responses to questions regarding child's dental visit practices (N = 225)*

Questions	Responses	
	N	%
> Has your child ever visited a dentist?		
Yes	128	57.4
No	95	42.6
> At what age did your child visit the dentist for the first time?		
1-3 years of age	30	26.3
4-6 years of age	52	45.6
>7 years of age	32	28.1
> When does your child usually visit the dentist?		
Once every 6 months	22	14.4
Once every year	17	11.1
Once every 2 years	4	2.6
When in pain	110	71.9
> Is your child cooperative during treatment?		
Yes	73	52.5
No	45	32.4
Don't know	21	15.1

*Some mothers did not answer all the questions

With regards to the mothers' occupation, around 29% of the mothers had an intermediate profession, whereas 68.5% were housewives or retired and therefore not working. Due to the high percentage of non-working mothers, only two categories (working and non-working) were used when the occupational status of the mother was related to various mothers' responses.

More than half of the children (57.4%) visited the dentist and more than one-third of them (71.9%) visited the dentist at the age of 4-6 years or earlier. Nearly 70% of the children visited the dentist only when they had pain. About half of the children (52.5%) were cooperative during the dental appointment (Table 3).

Table 4 shows that no statistically significant differences ($P>0.05$) were found between mothers with different educational levels and occupational

Table 4. Percentage distribution of the children's dental visit practices, mothers' educational level and occupational status (N = 225)

Dental Visit	Mothers' Educational Level			P**	Mothers' Occupational Status		P**
	Illiterate	High school or less	University		Working	Non-working	
> Have been to the dentist	67.9	57.1	52.6	0.373	52.3	58	0.267
> Never visited the dentist	32.1	42.9	47.4		47.7	42	
> Age at first dental visit							
1-3 years of age	6.3	24.5	36.5	0.030	31.3	24.9	0.115
4-6 years of age	50.1	43.9	46.4		54.5	43.5	
> 7 years of age	43.9	31.7	17		18.7	31.5	
> Frequency of dental visit							
Once every 6 months	8	17.3	13.2	0.606	20.5	13.9	0.025
Once every year	12	10.7	11.3		13.6	9.9	
Once every 2 years	-	1.3	5.7		6.8	-	
Only in pain	80.0	70.7	69.8		59.1	76.2	
> Child's cooperation during treatment							
Cooperative	38.1	65.7	39.6	0.014	41.5	58.9	0.091
Uncooperative	33.3	27.1	39.6		36.6	31.1	
Don't know	28.6	7.1	20.8		22.0	10.0	

*Some mothers did not answer all the questions

**Chi-square test

status in relation to the child's visit to the dentist. Regarding the child's age at the first dental visit, statistically significant differences were observed between children of mothers with different educational levels, as a higher percentage of children (36.5%) of mothers with university education was found to make their dental visit at an earlier age (1-3 years old) compared to only 6.3% of children of illiterate mothers ($P=0.030$). No statistically significant differences, however, were observed between the child's age at the first dental visit in relation to mothers occupational status ($P>0.05$).

For frequency of dental visits, children of mothers in all educational levels were found to visit the dentist only when in pain ($P>0.05$). A higher percentage (76.2%) of children of non-working mothers were found to make their dental visits only when in pain compared to 59.1% of children of working mothers, and this difference was found to be statistically significant ($P=0.025$). A higher percentage (65.7%) of children of mothers with high school or less were reported to be cooperative during dental appointment compared to other children and this difference was found to be statistically significant ($P=0.014$). However, no statistically significant difference was seen between the child's cooperation level during dental appointment in relation to the mother's occupational status ($P>0.05$) as shown in Table 4.

Mothers' Oral Health Knowledge

Bacteria was selected to be the main cause of dental caries by the majority of mothers (97.8%) as shown in Table 5. No statistically significant differences were found between the mothers of different educational levels or occupational status regarding their response to the causes of dental caries ($P>0.05$) as shown in Table 6.

Table 5. Responses to questions on mothers' general oral health knowledge (N=225)*

Questions	Responses	
	N	%
➤ In your opinion, what is the cause of dental caries?		
Bacteria	220	97.8
Genetics	33	14.7
Luck	27	12
Don't know	22	9.8
➤ In your opinion, what is the cause of bad mouth breath?		
Not brushing teeth	207	92
Gum inflammation	205	91.1
Dental caries	192	85.3
Don't know	17	8.1
➤ In your opinion, how can we prevent dental caries?		
Sugar reduction	202	89.8
Tooth brushing	218	96.9
Dentist visit	208	92.4
Don't know	1	0.4
➤ What is the role of fluoride?		
Kills germs	46	21.6
Makes teeth more resistant to caries	96	45
Cleans teeth	18	8.5
Don't know	53	24.9
➤ Blood on toothbrush is indication of:		
Dental caries	2	0.9
Gum inflammation	208	92.4
Weak teeth	19	8.4
Don't know	7	3.1

*Participants were allowed to choose more than one answer. Some mothers did not answer all the questions.

Not brushing teeth and gingival inflammation were recognized by the same percentage (92% - 91.1%, respectively) of mothers as possible causes of bad mouth breath followed by about 85% of mothers who regarded dental caries as a possible reason for bad mouth breath. Statistically significant differences were observed between mothers with university education and those in other educational levels regarding the responses about the relationship of dental caries and bad mouth breath ($P<0.01$). No statistically significant differences were noted, however, in the answers of causes of bad mouth breath between mothers based on their occupational status (Table 6). With

Table 6. Percentage distribution of mothers' general oral health knowledge, mothers' educational level and occupational status (*N* = 225)*

Mothers' Dental Knowledge	Mothers' Educational Level			<i>P</i> **	Mothers' Occupational Status		<i>P</i> **
	Illiterate	High school or less	University		Working	Non-working	
> Causes of dental caries							
Bacteria	100.0	97.3	97.5	0.68	95.5	98.6	0.18
Genetics	25.0	11.5	13.9	0.18	12.1	13.9	0.456
Luck	17.9	12.4	7.6	0.30	7.6	12.5	0.208
Don't know	17.9	9.7	5.1	0.12	4.5	10.4	0.124
> Causes of bad mouth breath							
Not brushing	96.4	88.5	94.9	0.17	89.4	93.1	0.259
Gum inflammation	85.7	89.4	96.2	0.13	93.9	89.6	0.227
Dental caries	82.1	79.6	94.9	0.01	89.4	81.9	0.119
Don't know	3.6	8	8.9	0.66	7.6	8.3	0.545
> Ways of preventing dental caries							
Sugar reduction	92.9	89.4	89.9	0.85	90.9	89.6	0.496
Tooth brushing	100	96.5	97.5	0.58	97.0	97.2	0.613
Dental visit	92.9	95.6	88.6	0.18	89.4	94.4	0.15
Don't know	0.00	0.00	0.00		0.00	0.00	0.00
> Role of fluoride							
Kills germs	30.8	25.9	12.2		14.8	26.8	
Makes teeth more resistant to caries	19.2	41.7	60.8	0.007	57.4	38.4	0.079
Cleans teeth	7.7	9.3	8.1		6.6	9.4	
Don't know	42.3	23.1	18.9		21.3	25.4	
> Blood on the toothbrush is an indication of:							
Dental caries	0.0	1.8	0.0	0.38	0.0	1.4	0.469
Gum inflammation	85.7	92.0	94.9	0.28	95.5	91.0	0.199
Weak teeth	0.0	10.6	8.9	0.20	7.6	9.0	0.478
Don't know	10.7	2.7	1.3	.045	1.5	4.2	0.296

*Participants were allowed to choose more than one answer. Some mothers did not answer all the questions

**Chi-square test

respect to the methods of prevention of dental caries, a high percentage (>89%) of mothers stated that sugar reduction, tooth brushing and dental visits are effective methods in reducing dental caries. No statistically significant differences were found between mothers' knowledge regarding methods of preventing dental caries and their educational levels or occupational status ($P>0.05$).

When asked about their knowledge of fluoride benefits to dentition, less than half of the mothers (45%) recognized that fluoride could make teeth more resistant to dental caries, while 24.9% of the respondents did not know the effect of fluoride on teeth (Table 5). Table 6 shows that significant difference were found between mothers' responses about the role of fluoride when mother's educational

level was compared ($P=0.007$) but not for mothers' occupational status ($P>0.05$). Table 5 shows the responses of mothers when they were asked about the cause of presence of blood on the toothbrush and Table 6 presents the relationship of mothers' responses and their educational levels and occupational status. The majority of mothers (92.4%) realized that blood on toothbrush might be a sign of gingival inflammation. More illiterate mothers (10.7%) stated that they did not know the reason for the presence of blood on toothbrush as compared to mothers in other educational levels and the difference was found to be statistically significant ($P=0.045$). In addition, more of the non-working mothers (4.2%) stated that they did not know the reasons for the presence of blood on the toothbrush as compared to the working mothers but the difference was not found to be statistically significant ($P>0.05$).

Tables 7 and 8 present the source of mothers' dental knowledge. Sixty percent of mothers received their information from the dentist, whereas only 8.9% received their information from relatives and friends. Nearly half of the mothers with university education and half of the working mothers stated that they received their information from magazines and newspapers as compared to mothers in other educational levels and non-working mothers and these differences were found to be statistically significant ($P<0.001$).

Table 7. The source of the mothers' dental information ($N = 225$)*

Source	Responses	
	N	%
Dentist	135	60
TV, radio	99	44
Friends & relatives	20	8.9
Magazines, newspapers	81	36

* Participants were allowed to choose more than one answer. Some mothers did not answer all the questions

Table 8. Source of dental information among children's mothers in relation to their educational level and occupational status ($N = 225$)*

Source	Mothers' Educational Level				Mothers' Occupational Status		
	Illite- rate	High school or less	Uni- versity	p	Wor- king	Non- working	p
➤ Dentist	53.6	62.8	57.0	0.58	83.6	59.0	0.31
➤ TV, radio	42.9	40.7	50.6	0.38	42.4	43.1	0.52
➤ Friends, relatives	17.9	8.8	6.3	0.18	9.1	9.0	0.58
➤ Magazines, newspapers	17.9	30.1	50.6	0.001	50.0	27.1	0.001

*Participants were allowed to choose more than one answer. Some mothers did not answer all the questions

**Chi-square test

DISCUSSION

The purpose of this study was to investigate the dental visit practices of children with Down's syndrome and also to determine the effect of mothers' level of education and occupational status on their oral health knowledge, source of dental information and children's dental visits practices in Riyadh, Saudi Arabia.

The oral health practices of non-institutionalized Down's syndrome is not well-reported in Saudi Arabia as well as in the other parts of the world.⁵

This study showed that some practices regarding dental visits appeared satisfactory such as commencing time of dental visits, and age at first dental visits. The practices seen in this study were different from those reported by Randell *et al.*⁵ in U.S.A.

Data showed that a high percentage of children visited the dentist only when they were in pain especially children of non-working women as compared to other children. This may suggest a lack of awareness of the value of oral disease prevention among the mothers. Another possible reason is that the mothers were too occupied with other general health problems and daily basic needs to consider dental visits a high

priority. These findings contradict the findings of Allison *et al.*² and Goldstein *et al.*¹⁷ who reported that children with Down's syndrome were more likely to visit a dentist yearly compared to non-Down's syndrome children.

In this study, about half of the children were reported to be cooperative during dental appointment. This agrees with what is reported by Scully¹⁸ that cooperation of Down's syndrome children is generally good although sometimes they could not maintain their attention for an adequate length of time.

With regard to the oral health knowledge among mothers, it was instructive that the majority of mothers considered bacteria as the main cause of dental caries and knew that sugar reduction, tooth brushing and dental visits are effective methods in reducing dental caries. This might be attributed to a high concern regarding healthcare among mothers. The mothers of this study showed greater oral health knowledge than those surveyed by Randell *et al.*⁵ who stated that tooth decay may be caused by a lack of calcium in diet.

This study showed that a high percentage of mothers regarded lack of tooth brushing and gingival inflammation as possible causes of bad mouth breath. Dental caries as another possible cause was recognized by more highly educated mothers. Dental caries is one of the known causes of halitosis especially if it is extensive and cavitated since it acts as a site for stagnation of food debris and plaque.

The results also indicated that less than half of the participants, mostly those with university education were aware of the role of the fluoride and its ability to reduce dental caries. The same findings have been reported earlier.⁵ It might be because some children have never received fluoride treatment because they made their dental visits only when

in pain or if there was a problem. This is supported by the findings of Allison *et al.*² This suggests that the questions about fluoride and caries and their possible role in causing bad breath is a more specific dental information and is directly related to mothers' educational level. More attention should be directed towards improving the deficiency of knowledge regarding these specific knowledge areas among mothers in different educational levels.

It was encouraging to find that a high proportion of mothers recognized that the presence of blood on the toothbrush could be a sign of gingival inflammation. It is extremely important for mothers of children with Down's syndrome to be able to identify the causes and symptoms of gingival inflammation since the prevalence of gingival inflammation and periodontitis is high and is considered to be the main cause of premature loss of teeth among those children.^{3-5,19,20} More illiterate and non-working mothers, however, stated that they did not know the cause of the presence of blood on toothbrush. This indicates that education may be an influencing factor in mothers' oral health knowledge considering that most of the non-working mothers were illiterate. Another possible reason for this lack in mothers' knowledge may be due to the dentist's inadequate role in explaining various dental health concerns regarding those children, although, analysis of the source of knowledge revealed that the dentist represented the main source of oral health knowledge among mothers in all educational levels.

Down's syndrome children together with their mothers' oral health knowledge have not been studied adequately in Saudi Arabia and other parts of the world. This makes comparison of some findings of this study not possible at all or difficult at the best.

Although the overall mothers' knowledge of oral health was considered to be satisfactory, more dental health education is needed with respect to the importance of dental visits, role of fluoride and causes and symptoms of gingival inflammation.

CONCLUSIONS

- The majority of the children had visited the dentist and most of them made their first visit at an age younger than 6 years, however, nearly three quarters of the children visited the dentist only when in pain.
- Sugar reduction, tooth brushing and dental visits were regarded by the mothers as effective methods of caries prevention.
- The effect of fluoride on dentition was recognized by less than half of the surveyed mothers and a high proportion of them were mothers with high educational levels.

REFERENCES

1. Allison PJ, Lawrence HP. A paired comparison of dental care in Canadians with Down syndrome and their siblings without Down syndrome. *Community Dent Oral Epidemiol* 2004; 32: 99-106.
2. Allison PJ, Hennequin M, Faulks D. Dental care access among individuals with Down syndrome in France. *Spec Care Dentist* 2000; 20: 28-34.
3. Sheehy E, Hirayama K, Tsamtsouris A. A survey of parents whose children had full mouth rehabilitation under general anesthesia regarding subsequent preventive dental care. *Pediatr Dent* 1994; 16: 362-364.
4. Shapira J, Stabholz A. A comprehensive 30-month preventive dental health program in a pre-adolescent population with Down syndrome: A longitudinal study. *Spec Care Dentist* 1996; 16: 33-37.
5. Randell DM, Harth S, Seow WK. Preventive dental health practices of non-institutionalized Down syndrome children: A controlled study. *J Clin Pediatr Dent* 1992; 16: 225-229.
6. Barnett ML, Press KP, Friedman D, Sonnenberge EM. The prevalence of periodontitis and dental caries in a Down syndrome population. *J Periodontol*, 1986; 57: 288-293.
7. Orner G. Dental caries experience among children with Down syndrome and their sibs. *Arch Oral Biol* 1975; 20: 627-634.
8. Chan AR. Dental caries and periodontal disease in Down syndrome patients. *Univ Tor Dent J* 1994; 7: 18-21.
9. Vigid M. Dental caries experience among children with Down syndrome. *J Ment Defic Res* 1986; 30: 271-276.
10. Al-Shammery AR, Guile EE, El-Backly M. Prevalence of caries in primary school children in Saudi Arabia. *Community Dent Oral Epidemiol* 1990; 18:320-321.
11. Akpata ES, Al-Shammery AR, Saeed HI. Dental caries, sugar consumption and restorative dental care in 12- to 13-year old children in Riyadh, Saudi Arabia. *Community Dent Oral Epidemiol* 1992; 20: 343-346.
12. Al-Tamimi S, Peterson PE. Oral health situation of school children, mothers and school teachers in Saudi Arabia. *Inter Dent* 1998; 48: 180-186.
13. Stabholz A, Mann J, Sela MN, Schurr D, Steinberg D, Shapira J. Caries experience, periodontal treatment needs, salivary pH and *streptococcus mutans* counts in a preadolescent Down syndrome population. *Spec Care Dentist* 1991; 11: 203-208.
14. Gizani S, Declerck D, Vinckier F, Martens L, Marks L, Goffin G. Oral health condition of 12-year-old handicapped children in Flanders (Belgium). *Community Dent Oral Epidemiol* 1997; 25: 352-357.
15. Sterling ES. Oral and dental consideration in Down syndrome. In: Lott IT, McCoy EE (eds). *Down syndrome: Advances in medical care*. New York: Wiley-Liss, 1991.

16. Al-Sadhan SA. Oral health practices and dietary habits of intermediate school children in Riyadh, Saudi Arabia. *Saudi Dent J* 2003; 81-87.
17. Goldstein H. Utilization of health services over a one year period by an adolescent population with Down's syndrome. *Dan Med Bull* 1988; 35: 585-588.
18. Scully C. Down's syndrome: Aspect of dental care. *J Dent* 1976; 4: 167-174.
19. Maclaurin ET, Shaw L, Foster TD. Dental caries and periodontal disease in children with Down's syndrome and other mentally handicapping conditions. *J Paedia Dent* 1985; 1: 15-19.
20. Ulseth JO, Hestnes A, Stouner LJ, Storhaug K. Dental caries and periodontitis in persons with Down's syndrome. *Spec Care Dentist* 1991; 11: 71-73.