Improvement of Oral Health Knowledge in a Group of Visually Impaired Students

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Purpose: The aim of this study was to evaluate the effectiveness of a repeated oral health education programme on oral health knowledge and hygiene of visually impaired students.

Materials and Methods: The study was conducted at one of the two visually impaired boarding schools of Istanbul, Turkey. The number of subjects was 65, comprising 28 totally and 37 partially visually impaired students between 7 and 17 years of age. A 24-item verbal questionnaire was developed to record their general health, impairment, the socio-economic profile and education level of their parents, oral health knowledge, sources of information about oral health, awareness of sugar intake/caries risk, frequency of dental check-ups and oral hygiene habits, as well as any difficulties they experienced thereby. They were given individual training on oral care three times with two-month intervals within the nine-month framework of the programme. To measure the oral hygiene status, plaque index (PI) and gingival index (GI) scores were recorded of all teeth at four sites throughout the sessions. After completion of the programme, the oral health knowledge of the students was evaluated using the same questionnaire to determine the effectiveness of the programme.

Results: Statistically significant improvements were found at the level of oral health knowledge and oral hygiene status both in totally and partially visually impaired students at the end of the study (p < 0.001) as compared with at the beginning. No significant difference was found between the knowledge of totally visually impaired and partially visually impaired students.

Conclusion: It was concluded that with an appropriate programme, the oral health knowledge of visually impaired students could be improved. This programme, if conducted on a one-to-one basis, ensures clinical and statistical significance.

Key words: education, oral health, visual impairment

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The goal of planned health education programmes is not only to bring about new behaviours, but also to reinforce and maintain healthy behaviours that will promote and improve individual, group or community health. Schools are thought to be a most suitable environment to provide health information to children in order to achieve the goal of health education programmes. As children in school are relatively accessible and already in a learning environment, dental health education programmes in schools are popular (Horowitz et al, 1976; Flanders, 1987; Frazier and Horowitz, 1990; Kupietzky, 1993; Vignarajah, 1997).

Health education is the process of transmission of knowledge and skills necessary for improvement in quality of life. Although the assumption that oral health education may modify children's oral health knowledge, and consequently change children's oral health behaviour, is still controversial, children must be aware of not only the causes of oral diseases, but also the current preventive measures to avoid them, such as fluoridation of drinking water (Holm, 1996; Williams and Kwan, 1996; Blinkhorn, 1998; Pine et al, 2000). As pointed out by Frazier and Horowitz (1990), school education programmes will enable children to make decisions about oral health regarding their own children in the future, or even their community.

It is of great importance to establish good oral routines and knowledge early in life, particularly in disabled patients. Fortunately, for children with sensory

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disabilities affecting sight and hearing, a variety of innovative teaching methods and mechanical aids are available to enhance their development towards a meaningful and productive life. These techniques are most effective when introduced early. They may need special instructions and approaches since loss of sight is a major physical deprivation. Therefore, early screening and intervention programmes are essential (Udin and Kuster, 1984; Tesini and Fenton, 1994; Blinkhorn, 1996).

The number of blind people in the world is not accurately known, but it has been estimated various times by the WHO. Blindness affects over 180 million people today and worldwide it is estimated that 45 million people are totally visually impaired (Stilma et al, 1991; Thylefors et al, 1995). It has been reported that in Turkey nearly 130 000 people are totally visually impaired; however individuals afflicted with partial loss of sight raise the number of those suffering from a visual handicap to over 750 000 people. More than 20 000 children are growing up in Turkey with a visual impairment and every year nearly 8800 children reach school age. Almost half of these youngsters have additional disabilities, such as deafness, physical disabilities or learning difficulties, which complicate their needs (Köseler, 1999). There are just 11 residential schools for the visually impaired in Turkey, teaching and preparing visually impaired students for a satisfying and productive life. Unfortunately, only approximately 1000-1200 children have a chance to attend a school for the visually impaired every year, while others have to be content with a place on the waiting list because of the limited capacity of these boarding schools. Those students on the waiting list in the meantime choose to attend regular schools, even though these schools do not cater for the visually impaired students' needs (Karacay, 1999).

Blindness is one disorder that may result in frequent hospitalisations, separation from family and slow social development. Since a blind child's capabilities are difficult to assess, often such a child may be considered to be a late developer. Sensory defects often mask a child's intellectual capacity because responses cannot be the same as in other children. Visually impaired children may learn to speak later than sighted children and may start school when they are (a year or more) older. In addition they are deprived of the opportunity to learn by imitation. Each person with visual impairment must be considered in relation to individual aptitudes, interests, abilities and potentialities, with sight as one factor involved (Forrester et al, 1981; Udin and Kuster, 1984; Stilma et al, 1991; Tesini and Fenton, 1994; Thylefors et al, 1995).

Few studies have evaluated schoolchildren's oral health knowledge, attitudes, and preventive practices and only limited studies worldwide have specifically assessed these parameters among visually impaired schoolchildren and adolescents (Greeley et al, 1976; Horowitz et al, 1976; Anaise et al, 1979; Flanders, 1987; Frazier and Horowitz, 1990; Cohen et al, 1991; Kupietzky, 1993; Mac Taggart amd Carpenter, 1996; Martens et al, 1996; Vignarajah, 1997; Intaraprasong et al, 1999; Pine et al, 2000).

The purpose of this study was to evaluate the effectiveness of a repeated oral health education/motivation/instruction programme on oral health knowledge of the visually impaired children and adolescents in Istanbul, Turkey. The study was conducted by means of a questionnaire.

MATERIALS AND METHODS

The programme

The dental health education programme took place within a 9-month framework at one of the two visually impaired boarding schools in Istanbul, Turkey (Veysel Vardal Visually Impaireds' Boarding School, Kilyos, Sariyer, Istanbul). The number of subjects was 65, comprising 28 totally and 37 partially visually impaired students between 7 and 17 years of age (1st to 8th grades). Demographic information was obtained from school files.

A verbal questionnaire with 24 items was developed to record their general health, impairment, the socioeconomic profile and education level of their parents, oral health knowledge, sources of information about oral health, awareness of sugar intake/caries risk, frequency of dental check-ups, oral hygiene habits, as well as any difficulties they experienced thereby. The questionnaire was prepared according to the advice of psychologists and behavioural scientists. All the questions were asked privately. During the administration of the questionnaire, the students were permitted to seek clarification from the examiner when necessary.

All the visually impaired students underwent a clinical examination to measure oral hygiene status by one examiner (SY). Before the examination, the instruments, and how each would be used, were explained. Students who were not familiar with dental procedures were permitted to handle the instruments. Plaque (Pl) and gingival index (Gl) scores (Löe and Sillness, 1963) of all teeth at four sites were determined through clinical examinations using a standard dental mirror and explorer under artificial illumination in four visits.



Table 1 The numbers and the ratio of the students impairment and dentition	s according to ger	nder,
	Number	%
Females	28	41.54
Males	37	58.46
Totally visually impaired in mixed dentition	14	21.53
Totally visually impared in permanent dentition	14	21.53
Partially visually impaired in mixed dentition	21	32.30
Partially visually impared in permanent dentition	16	24.61

Table 2 The educ	ation le	vel of the	parents				
Education level	Mothe	ər	Fath	er	Tota	I	
	n	%	n	%	n	%	
Illiterate	17	26.2	1	1.5	18	13.85	
Primary School	39	60.0	40	61.5	79	60.75	
Medium School	4	6.2	15	23.5	19	14.85	
High school	5	7.6	9	13.5	14	10.55	
University	0	0	0	0	0	0	
Total	65	100	65	100	130	100	

Having been evaluated using the questionnaire and their clinical examinations, visually impaired students received one-to-one oral health education and motivation three times with 2-month intervals.

This education was provided in accordance with the skills, impairment and requirements of each individual student.

The individual education programme was based on:

- practical oral hygiene instruction aimed at ensuring the proper brushing of teeth twice a day with fluoride toothpaste and followed by flossing;
- giving the message of the importance of fresh breath;
- offering advice on diet, with suggestions of ways to reduce sugar consumption.

Enlarged dental models and toothbrushes were specially chosen (National Biological Labs, Inc. P.O. Box 578 Fairfax, VA 22030) and designed to teach oral health care. All the instructions were given clearly and concisely. Each step was described in detail before proceeding. At each visit, a new toothbrush, toothpaste containing 1000 ppm fluoride and dental floss were given to each child.

Evaluation

After completion of the individual programme, levels of oral health knowledge and comparisons between the answers of totally and partially impaired students were evaluated using the same verbal questionnaire as a means to determine the effectiveness of the programme. Responses to questions were designated as correct (he/she knows) or incorrect (he/she doesn't know). A correct response was rated one and an incorrect response was rated zero. Oral hygiene results were evaluated statistically using repeated measures of ANOVA at the Biostatistics Department of Faculty of Medicine, Cerrahpasa, Istanbul. The level of statistical significance was defined as p < 0.05.

RESULTS

All the students of the visually impaired school aged 7 to 17 participated in this study. The characteristics of children examined who attended the study are shown in Table 1.

Males (58.46%) and partially visually impaired (56.92%) represented a slightly larger proportion of the study population. The students were divided into two groups according to their impairment.



Fig 1 Source of oral health information: 'where did you receive information about taking care of your teeth?'

The distribution of their parents' education levels is shown in Table 2. Of the mothers and fathers, 26.2% and 1.5% were illiterate respectively. Of the parents, 60% of mothers and 61.5% of fathers were only educated to the primary school level. Only 7.6% of mothers and 13.5% of fathers were high school graduates. There were no university graduates. The distribution of the socio-economic status of parents is shown in Table 3; 85% of parents' socio-economic status is low.

The source of oral health information is shown in Fig 1: 57.1% of totally visually impaired students and 56.7% of partially visually impaired students reported that they had not received any information about taking care of their teeth before the study. Of totally visually impaired students and partially visually impaired

students respectively, 28.6% and 20% reported that the school is the main source of oral health information. Others received information about oral health from media, followed by dentists and home. Of totally visually impaired students and partially visually impaired students respectively, 3.6% and 4.6% reported that they were informed by the dentist, and 3.6% and 7.7% reported that their oral health information source was their families. There was no statistically significant difference between the groups regarding this question ($\chi^2 = 0.01$).

Table 4 summarises the answers of the students and also the evaluation of their oral health knowledge and attitudes towards the education programme. The McNemar Test was used to detect the statistical significance, and chi square analysis comparing the means of the groups indicated that there was no statistical difference. A follow-up Fisher's Significance Difference test determined this lack of statistical difference when comparing the correct answers in some questions. Most of the visually impaired students had 'inadequate' oral health knowledge and behaviour, however there was no statistical significance between the knowledge of totally and partially non-sighted students (Table 5).

To the question, 'What will happen unless we brush our teeth?', 35.71% of totally and 43.24% of partially visually impaired students answered correctly. At the last visit, the ratio rose to 92.85% and 97.29% respectively (p < 0.001). A large number of respondents (96.92%) incorrectly answered the question on the technique of brushing. By the end of the study only 4 out of 65 students (6.15%) incorrectly answered this question (p < 0.001). During the individual education programme, some children with manual incapability

Table 3 The distribution of the	socio-economic status of the parents	
Mother	Totally visually impared (n = 28)	Partially visually impaired (n = 37)
Average socio-economic status	1	3
Poor socio-economic status	27	34
Fisher p = 0.63, NS		
Father	Totally visually impared (n = 28)	Partially visually impaired ($n = 37$)
Average socio-economic status	6	9
Poor socio-economic status	22	28
Fisher $p = 1.00$, NS		
NS, not significant		

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	Visually impaire	d students (n = 65)			
	Correct (he/	(she knows)	Incorrect (he/ sh	e doesn't know)	
	At first visit	At last visit	At first visit	At last visit	McNemar p
Have you ever visited the dentist?	45	51	20	14	p = 0.031
What would you do if you have a	43	59	22	6	p<0.001
tooth decay?					
How often should you attend	20	44	45	11	p < 0.001
the dentist?					
What are the duties of a dentist?	27	55	38	10	p < 0.001
Have you got a toothbrush?	56	65	9	0	p = 0.003
Do you change your toothbrush	52	64	13	1	p < 0.001
regularly?					
Why do you change your toothbrush	43	61	22	4	p < 0.001
regularly?					
Is toothbrushing important for you?	63	65	2	0	NS
What will happen unless we brush	26	62	39	3	p < 0.001
our teeth?					
When do we brush our teeth?	48	63	17	2	p = 0.001
Are sweets/drinks containing sugar	42	63	23	2	p < 0.001
unhealthy for teeth?					
How do you brush your teeth?	2	61	63	4	p < 0.001
What is the best way to clean	26	60	39	5	p < 0.001
between teeth?					
Do you have toothpaste?	42	64	23	1	p < 0.001
How much toothpaste should	24	57	41	8	p < 0.001
we use?					
What does fluoride do?	19	59	46	6	p < 0.001
What is dental plaque?	8	52	57	13	p < 0.001
What is the meaning of oral/	13	48	52	17	p < 0.001
dental health?					
NS, not significant					

(13%) preferred to use the scrubbing technique more frequently because it required less training and less manual dexterity.

Initially, it was found that 64.61% of respondents thought that sweets and/or drinks containing sugar were unhealthy for teeth. By the last visit, 96.92% of respondents recognised sugary products as unhealthy for teeth (p < 0.001).

At the first visit, 43.07% of respondents knew the best way to clean between teeth, and at the last visit the ratio rose to 92.31% (p < 0.001). A large number of the respondents in both groups incorrectly answered the question on the amount of toothpaste to use. At the last visit, 57 out of 65 answered this correctly.

On the question of action of fluoride in strengthening enamel, 67.8% of totally and 35.13% of partially visually impaired students initially answered correctly.

Most of the participants in both groups had limited ability to define plaque, but 13.8% of respondents recognised that plaque was the causative factor of periodontal disease (Table 4).

At the first visit, 20% of children described oral health as 'having fresh breath and not having tooth ache'. They could not define any other points. At the last visit, 73.84% of respondents were able to correctly define oral health.

Table 6 shows the frequency of brushing reported by students at the first visit. The frequencies of brushing reported by children and adolescents were: 73.84%

Table 5 Comparison of the totally	and visually in	npaired studer	nts' response:	s to the que	stionnaire					
	Totally visually	impaired (n = 28)			Partially visual	ly impaired (n = 37			A first	At last
1	Correct		Incorrect		Correct		Incorrect		vsit	visit
1	At first visit	At last visit	At first visit	At last visit	At first visit	At last visit	At first visit	At last visit	χ^2	χ^2
Have you ever visited the dentist?	18	21	10	7	27	30	10	7	NS	NS
What would you do if you have a tooth										
decay?	17	25	11	σ	26	34	11	с	NS	Fisher NS
How often do you attend the dentist?	6	22	19	9	11	32	26	വ	NS	Fisher NS
What are the duties of a dentist?	00	22	20	9	19	33	18	4	NS	Fisher NS
Have you got a toothbrush?	24	28	4	0	32	37	Ŋ	0	Fisher N	S NS
Do you change your toothbrush regularly?	20	27	00	1	32	37	Q	0	NS	Fisher NS
Why do you change your toothbrush										
regularly?	16	26	12	N	27	35	10	2	NS	Fisher NS
Is toothbrushing important for you?	26	28	N	0	37	37	0	0	Fisher N	S NS
What will happen unless we brush our										
teeth?	10	26	18	0	16	36	21	Ţ	NS	Fisher NS
When do we brush our teeth?	20	28	00	0	28	35	6	2	SN	Fisher NS
Are sugars/drinks containing sugar										
unhealthy for your teeth?	16	27	12	Ч	26	36	11	1	NS	Fisher NS
How do you brush your teeth?	7	26	26	0	0	35	37	2	NS	Fisher NS
What is the best way to clean										
between teeth?	12	26	16	0	14	34	23	ო	NS	Fisher NS
Do you have toothpaste?	20	27	00	Ч	22	37	15	0	NS	Fisher NS
How much toothpaste should we use?	00	26	20	N	16	31	21	9	NS	Fisher NS
What does fluoride do?	9	25	22	ო	13	34	24	с	NS	Fisher NS
What is dental plaque?	ю	20	25	00	ß	32	32	Q	NS	NS
What is the meaning of Oral/Dental Health?	Ð	21	23	7	00	27	29	10	NS	NS
NS, not significant										

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Table 6 Frequency of toothbrushing reported	by students	at the beginning of	the study	
	Once o	or twice a day	Not ev	veryday but sometimes
	n	%	n	%
Totally visually impared students (n = 28)	19	71.42	9	28.57
Partially visually impaired students (n = 37)	28	75.67	9	24.32
Total (n = 65)	47	73.84	18	26.15

Table 7 Oral health in	nstruments. An	swers to: 'wh	at is the bes	t way to clea	n our teeth?'		
	Toothbrush, to dental floss	oothpaste,	Toothbrush,	toothpaste	l don't know		Wilcoxon test
	At first visit	At last visit	At first visit	At last visit	At first visit	At last visit	
Totally visually impaired students (n = 28)	0	18	22	9	6	1	Z = 4.6 p < 0.001
Partially visually impaired students (n = 37)	2	25	32	12	3	0	Z = 5.01 p < 0.001

once or twice a day (71.42% totally, 75.67% partially visually impaired); 26.15% not everyday but sometimes (28.57% and 24.32% respectively).

Table 7 shows the knowledge about the individual oral hygiene aids. At the first visit, while none of the totally visually impaired students could recognise all three oral hygiene aids, 78.57% of totally and 86.49% of partially visually impaired students reported the toothbrush and toothpaste as the only necessities. Some students had no idea whatsoever about the instruments (21.42% of totally and 8.1% of partially impaired). The Wilcoxon Test was used to conduct the statistical evaluation. There was statistically significant improvement in both groups at the last visit (p < 0.001).

Although regular visits to a dentist were rare for both groups, 69.23% of respondents indicated that they had received dental service. These dental visits were mostly reported either as attending the dentist whenever they had dental problems or as never having visited dentist.

All but 3 of the students screened lived at the school during the week. Out of 65 students, 40 return home to live with their families on weekends.

Table 8 shows the scores of PI and GI. In the beginning of this study, a greater proportion of visually impaired students had insufficient oral hygiene. Baseline values of means and standard deviations of PI and GI were 1.30 ± 0.46 and 1.17 ± 0.38 respectively. It was noted that PI and GI scores of the partially visually impaired group in mixed dentition were the best. However, totally visually impaired students both in mixed dentition (PI = 1.35 ± 0.39 , GI = 1.23 ± 0.53) and in permanent dentition (PI = 1.56 ± 0.53 , GI = 1.33 ± 0.36) showed the poorest results. A continuing decrease was seen in both PI and GI throughout the sessions. In the last visit, the records were PI = 0.85 ± 0.40 , GI = 0.80 ± 0.36 and statistically significant (p < 0.001). The significance of changes from baseline was tested using repeated measurements of ANOVA. A statistically significant difference was obtained between the measurements of PI and GI. However, with further analysis it was seen that the difference was among all groups, not in a certain group of students (Table 8).

DISCUSSION

The objective of this study was to examine the influence of an individual oral health education programme on visually impaired children and adolescents. Although few oral health evaluation studies have been conducted, the data obtained in this study

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Table 8 Statistical evalua	ation and mea	ans and stand	ard deviations	of Plaque Ind	lex and Gingiv	al Index score	õ			
	1st visit		2nd visit		3rd visit		4th visit		Repeated M of ANOVA	easures
Plaque Index and Gingival Index	Ы	GI	E	ਹ	đ	ਗ	Б	ß	PI F/p	GI F/p
vi students ($n = 65$)	1.30 ± 0.46	1.17 ± 0.38	1.10 ± 0.46	0.98±0.35	0.95 ± 0.44	0.87 ± 0.36	0.85 ± 0.40	0.80 ± 0.36	56.81 p < 0.001	42.30 p < 0.001
Totally vi: mixed dentition (n = 14)	1.35 ± 0.39	1.23 ± 0.53	1.12 ± 0.42	1.00 ± 0.43	0.94 ± 0.44	0.86 ± 0.44	0.85 ± 0.42	0.81 ± 0.42	1.740 NS	0.222 NS
Totally vi: permanent dentition (n = 14)	1.56 ± 0.53	1.33 ± 0.36	1.40 ± 0.45	1.16 ± 0.28	1.21 ± 0.40	1.05 ± 0.23	1.09 ± 0.35	1.01 ± 0.19	1.740 NS	0.222 NS
Partially vi: mixed dentition (n = 21)	1.23 ± 0.44	1.00 ± 0.21	0.99 ± 0.42	0.82 ± 0.27	0.80 ± 0.36	0.72 ± 0.31	0.66 ± 0.29	0.62 ± 0.34	1.740 NS	0.222 NS
Partially vi: permanent dentition (n = 16)	1.13 ± 0.43	1.18 ± 0.37	0.98 ± 0.47	1.02 ± 0.37	0.92 ± 0.49	0.91 ± 0.38	0.88 ± 0.46	0.85 ± 0.37	1.740 NS	0.222 NS
vi, visually impaired; NS, not sigi	nificant									

allowed for information about the oral health knowledge, skills and also education characteristics of Turkish visually impaired children and adolescents.

Oral health can have a significant impact on overall well-being. Oral health education gives the individual accurate information with which to take actions for the benefit of their health. Thus it is important to maintain and improve existing oral health education programmes to better reach the targeted children (Udin and Kuster, 1984; Flanders, 1987; Frazier and Horowitz, 1990; Holm, 1996; Williams and Kwan, 1996; Oliveira et al, 2000). In this study, a modification in the teaching approach rather than a change in basic methods of oral hygiene was preferred.

A distinction was made between children who at one time had sight and those who had never seen and thus could not form visual concepts. The reason for this distinction was that more explanation was needed for children in the latter category. In this study it was seen that partially visually impaired children were more perceptive and conceptual than totally visually impaired youngsters. Consequently, they interacted more effectively with their environment than totally visually impaired. This is in agreement with results reported by Greeley et al (1976) and Anaise (1979). However, there was no statistically significant difference between the oral health knowledge of the totally and partially visually impaired students both at the beginning and at the end of the study.

At the level of developing personal skills in relation to oral hygiene practices, the participation of the individual is crucial (Ruel-Kellerman, 1984; Löe, 1990). During the programme, learning ability and personal factors of the students were taken into consideration as well. The modalities of listening, touching, tasting and smelling are extremely important for blind children in that they help them learn coping behaviour. At the individual level, coping skills were developed to facilitate decision-making and to enhance self-esteem, social and life skills. When employing oral health education, such advanced topics as dental anatomy, caries aetiology and prevention must be understood, since then the visually impaired can listen and feel their ability to absorb and retain these concepts and terminology is enhanced (Branson and Branson, 1986; Greeley et al, 1976; Morsey, 1980; Udin, 1988; Tesini and Fenton, 1994).

Children had the tendency to give socially acceptable answers, which was a potential bias. At the beginning of the study 96.9% of the students reported that toothbrushing was highly important for them. However, 26.15% of respondents reported that they only sometimes brushed their teeth.



It was found that the socio-economic status of the parents was mostly low, their education level was poor and only a small percentage of students (5.93%) reported that they had received oral health information from their family.

Because of the socio-economic and socio-cultural make up of our country, parents and particularly the parents of the disabled children are unable to meet the financial and emotional needs of their children. Parents have a lack of knowledge of contemporary pedagogical methods and in addition require support from the government in the fields of education and learning. Whilst attending these schools, the children have free access to health care, education and other social benefits. However, upon leaving school, the students will lose most of these benefits.

The study showed that school is the main source of the oral health information. Whether or not totally visually impaired students are able to become productive members of society is completely dependent upon the education they receive. As such, educational opportunities provided for children without disabilities should also be provided for the visually impaired. It is disappointing to note that in Turkey every year, only approximately 25% of visually impaired children of an age to attend school are able to benefit from these educational opportunities in special schools (Köseler, 1999).

Over half (57.1% of totally and 56.7% of partially visually impaired students) reported that they had not received any information about taking care of their teeth before. This finding shows the need for increasing the amount of oral health information at school. Since visually impaired children spend their days and even weekends at boarding school, it would be more effective to improve the amount of information they receive about oral health knowledge, preventive practices and dietary habits, at school.

Even though 64.28% of totally and 72.97% of partially visually impaired students reported that they had dental experience before, it is noticeable and thoughtprovoking that the oral health education that they reportedly received from the dentist was only 3.6% and 4.6% respectively.

It was also evident that visually impaired children mostly went to the dentist only when their teeth hurt or when they had advanced oral problems. That might have led to a negative experience in the dental office. Because of a lack of information and preventive services, visually impaired adolescents had to receive more invasive and traumatic procedures. With lowintensity oral hygiene education and radical dental procedures performed by dentists, the children's knowledge and attitudes will always remain negative to the

Patients with special needs would benefit from not only education about oral health, but also improvements in their physical and social environment, which would have a major impact on oral well-being (Blinkhorn, 1996). Hence it is important to achieve some associated factors as well. Many children in this study appeared to have lacked important information about oral health and preventive methods. Most did not appear to know about the benefits of fluoride to dental health. Several factors, in addition to oral health education programmes, are known to be involved in the decrease of caries prevalence, such as fluoride in the drinking water, fluoridated toothpaste and pit-fissure sealants, particularly in disabled children (Huntley and Ralston, 1977; Udin and Kuster, 1984; Mac Taggart and Carpenter, 1996). Encouraging twice-daily use of fluoride toothpaste in high-risk children has the potential to close the dental health gap between disabled and not disabled children. Oral health education programmes, nevertheless, are likely to be an important influence on the oral health of disabled children (Udin, 1988; Stilma et al, 1991; Cohen et al, 1991; Blinkhorn, 1996; Mac Taggart and Carpenter, 1996; Martens et al, 1996; Intaraprasong et al, 1999; Pine et al, 2000).

Few studies have evaluated Turkish schoolchildren's dental health, oral hygiene and dietary habits, parents' education levels and their attitudes towards children's oral hygiene behaviours. It has been shown that schoolchildren and their parents, without any chronic illnesses and impairment, are also not knowledgeable enough (Eronat and Koparal, 1994; Akyüz et al, 1996; Petersen, 1996).

In the beginning of the study, 96.9% of respondents could not define the correct brushing technique and their oral hygiene status was very poor. Although Bass method was instructed to all students, horizontal scrubbing technique was shown to some children with manual incapability and/or with associated disability, or younger children. Simmons et al (1983) and Honkala et al (1986) reported that visual motor and hand function skills might have been predictive of toothbrushing skills. Moreover, Unkel et al (1995) reported that chronologic age was a reasonable predictor of toothbrushing ability, and children younger than ten years of age might not have the physical dexterity required for toothbrushing. This information from dental literature must surely be considered when teaching dental behaviours to visually impaired children.

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Educational research shows that simple incentives and reinforcement by professionals encourage visually impaired students to change their behaviour and maintain the change. Many dental promotion programmes have been developed and these are often run by dental professionals. This study shows that the personal human touch of a dentist teaching particularly visually impaired children is extremely beneficial.

Schoolteachers may also act as the deliverers of dental health education in disabled children's schools. There are many advantages to teaching schoolteachers with the aim of improving dental hygiene behaviours in the students with special needs. Firstly, they are able to instruct all children rather than only those seeking dental care. Secondly, they have daily influence on children at a time when children are developing their value systems. Thirdly, the close attention built in classrooms allows teachers to individualise information to suit each child, and lastly, teachers are skilled in educational psychology. Classroom dental education programmes have repeatedly shown that children benefit in terms of knowledge and attitudes, but the results have been equivocal with regard to improvements in behaviour and health (Simmons et al, 1983; Flanders, 1987; Frazier and Horowitz, 1990; Kupietzky, 1993; Vignarajah, 1997; Kay and Baba, 1998).

However, it is also clear that without appropriate information and skills, behaviour change cannot come about, even if attitudes towards dental health care are favourable.

In this study, a statistically significant correlation was found out at the level of oral health knowledge in both totally and partially visually impaired students as a result of regular motivation and instructions.

Kiyak (1993) reported that dental behaviours are a function of the characteristics of age, gender, culture, perceived dental needs and health beliefs. Cultural impacts are very important and an appreciation of how these vary is needed in order to apply the conclusions from this study to a wider visually impaired population. Within this study, the schoolteachers reported that each student had to have a couple of toothbrushes and toothpaste according to boarding school rules. However, students often complained about their toothbrushes falling down and being unable to find them. They also noted that telling their parents to buy a new toothbrush was a worry for them because of the income levels of families. Free toothpaste and toothbrushes four times a year had been a significant benefit to the families of students and also a great psychological relief for them.

A modification in the teaching approach rather than a change in basic methods of oral hygiene was pre-



ferred in this study and it clearly illustrates that with a variation of the 'Tell, Show and Do' approach, the oral health knowledge of visually impaired children and adolescents can be established.

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