



IMPROVEMENT OF ORAL HEALTH STATUS IN A GROUP OF STUDENTS WITH VISUAL IMPAIRMENT IN ISTANBUL

ABSTRACT

Objectives: The purpose of this study was to determine the oral health status of a group of students with vision impairment and to compare the changes of oral hygiene after oral health education.

Materials and Methods: Dental examination of 6-19-year-old of 136 students with vision impairment in a Primary School for Individuals with Vision Impairment in Istanbul was performed. The students were divided into 6-9-year-age group (Group I) and 10-19-year-age group (Group II) and in the first visit, they were examined and their findings were recorded according to DMFT (Decayed, Missing, and Filled Teeth), DMFS (Decayed, Missing, and Filled Surfaces) indices of permanent teeth, dft and dfs indices of primary teeth and in the first visit and 3rd follow up period, their Dental Plaque (PI), Calculus (CI) and Oral Hygiene (OHI) Indexes were recorded. They received one-to-one oral health education (OHE). Statistical evaluation was carried out with Wilcoxon and Mann-Whitney U tests and $p < 0.05$ was found as statistically significant.


Results: Regarding the pre and post OHE results of periodontal indexes, PI and OHI scores statistically significantly increased after OHE in Group I ($p < 0.05$). On the other hand, CI results significantly decreased after OHE in Group II ($p = 0.042$). Comparing post OHE results of PI and OHI, Group I showed statistically significantly higher scores than Group II ($p < 0.05$). Comparing the difference values of PI and OHI between pre and post OHE, Group I showed statistically significantly lower scores than Group II ($p < 0.05$).


Conclusions: Students with vision impairment have a high prevalence of dental caries and poor oral hygiene. We emphasise the importance of providing proper dental education and regular dental visits to them.

Key Words: Oral hygiene education, vision impairment, students, dental plaque index

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INTRODUCTION

Oral health has significant biological, psychological, and social consequences due to its effects on aesthetics and communication; furthermore, quality of life is influenced by oral health status.¹ Good oral health is important for proper mastication, digestion, appearance, speech, and health.² The oral cavity serves an important role in the satisfaction achieved from daily life through functions such as mastication, aesthetics, phonetics, communication, and expression. Oral cavity is an integral part of the body, and dental treatment can affect and be affected by a patient's general physical and mental status.³ Oral health is an important aspect of overall health in children and is particularly important for children with special health needs. The oral health of children with visual impairment tends to be compromised as they are at a disadvantage and are often unable to adequately apply plaque control techniques.⁴

Visual impairment is the most frequently occurring disability, followed by speech, hearing, movement, and mental disabilities.⁵ The World Health Organization has estimated the number of individuals with visual impairment (presenting vision) to be 285 million (with 65% of them being aged >50 years). Of them, 246 million have low vision (63% aged >50 years) and 39 million are estimated to be blind (82% aged >50 years).⁶ In Turkey, reportedly, almost 130,000 individuals are totally visually impaired; however, individuals afflicted with partial loss of vision increase the number of those suffering from a visual handicap to >750,000. In Turkey, >20,000 children are growing up with a visual impairment, and almost 8800 children reach school age every year.⁷

Children with visual impairment face challenges in learning everyday skills, with maintenance of proper oral hygiene being one of them. These children have been found to have a poorer oral hygiene than their sighted peers.⁸ Chang and Shih⁹ have reported that children with visual disabilities have higher levels of oral diseases. Priority is given to teaching these children how to manage their disabilities; consequently, oral hygiene is neglected.

Oral hygiene maintenance is important for preventing periodontal disease and dental caries development. Poor oral hygiene, gingivitis, and periodontal diseases have been reported among the children with visual impairment in studies from India, Iran, and Turkey.^{4,7,10,11} Mann *et al.*¹² have suggested that this is attributable to their inability to visualize plaque on tooth surface, resulting in inadequate plaque removal and subsequent progression of dental caries and inflammatory diseases of the periodontium. Few studies have examined the health information needs of individuals with visual impairment and even fewer have investigated the dental health needs of this group.¹³ Despite the prevalence of visual impairment in Turkey being 0.2%¹⁴, little information is available regarding the dental health status and needs of individuals with visual impairment. Some studies have suggested that oral health is compromised in individuals with visual impairment, and these individuals tend to exhibit a higher incidence of dental caries and gingival disease.¹⁵⁻¹⁷ To determine the comparative oral health care needs of individuals with visual impairment as well as those of sighted people, the oral health status and experiences of such groups with respect to dentistry need to be established.¹⁸

The aim of current study was to determine the oral health status of a group of students with visual impairment and to compare the changes of oral hygiene after OHE.

MATERIALS AND METHODS

The present study was registered with the Yeditepe University, Faculty of Dentistry, Institutional Review Board Committee, with the number 266. Signed informed consent forms were obtained from the parents of children, and the study was conducted according to the Helsinki Declaration.

Participants

A total of 136 students (age range, 6–19 years) with visual impairment with no systemic diseases were examined at the Türkan Sabancı Primary School for Children with Vision Impairment connected to the National Education Ministry in

Istanbul, Turkey. The students were divided into two groups according to their age: a 6–9-year age group (group I) and a 10–19-year age group (group II). The students with visual impairment received one-to-one OHE and motivation with the assistance of dental models and toothbrushes. All students had the ability to brush their teeth by themselves. They were educated by touching and holding toothbrushes with two pediatric dentists. Each of them were taught for twenty minutes. Apart from the tooth brushing education of the students, instructions regarding maintenance of good oral hygiene and horizontal scrub technique of tooth brushing were explained to all their parents.

Inclusion criteria of the study participants:

1. 100% bilateral visual impairment (as verified through school medical records)
2. Patient acceptance/cooperation for oral examination
3. Parental compliance

Exclusion criteria of the study participants:

1. Partial visual impairment/unilateral blindness
2. Concomitant medical conditions
3. Patient cooperation not attained
4. Parental consent not obtained
5. Those without the ability to brush their teeth or whose parents did not participate in the oral hygiene education sessions

Methods

Intraoral examinations of all students were performed in their schools under artificial illumination of headlamp using a mouth mirror and probe by two calibrated pediatric dentists. Interexaminer reliability was assessed using correlation coefficient (Table 1).

The students were examined on the first visit and then at the 3rd month following it, and pre- and post-OHE findings were recorded. Professional plaque control was not performed for these students in the school conditions. Therefore, following the Mann–Whitney-U tests were used to analyze the results. $p < 0.05$ was considered as significant.

first clinical examination, complete plaque removal was performed using toothbrushes by the pediatric dentists

Table 1. Inter-examiner reliability

Index	Intraclass correlation coefficient	95% confidence interval
DMFT	0.841	(0.798-0.923)
DMFS	0.829	(0.833-0.943)
dft	0.913	(0.897-0.970)
dfs	0.867	(0.822-0.934)
PI	0.906	(0.853-0.951)
CI	0.897	(0.829-0.919)
OHI	0.914	(0.865-0.953)

DMFT (Decayed, Missing, and Filled permanent Teeth), DMFS (Decayed, Missing, and Filled permanent teeth Surface), dft (decayed, filled primary teeth), and dfs (decayed, filled primary teeth surface), Plaque Index (PI), Calculus Index (CI) and Oral Hygiene Index (OHI).

Dental caries were diagnosed and recorded according to the criteria of the Decayed, Missing, and Filled (DMF) index. During the intraoral examination, the scores for Decayed, Missing, and Filled permanent Teeth (DMFT); Decayed, Missing, and Filled permanent teeth Surface (DMFS); decayed, filled primary teeth (dft); and decayed, filled primary teeth surface (dfs) were recorded in the first visit. Radiographs were not used for caries detection.

The periodontal health of students was evaluated using the Plaque Index (PI), Calculus Index (CI), and Oral Hygiene Index (OHI) and was recorded at the first visit and at the 3rd month for all students. Oral hygiene was evaluated using the Simplified Oral Hygiene Index and its components, the Plaque Index (PI-S) and the Calculus Index (CI-S).¹⁹

Statistical analysis

All the data were analyzed using Number Cruncher Statistical System (NCSS) 2007 Statistical Software (Utah, USA). Wilcoxon and

RESULTS

Group I comprised 21 (51.22%) males and 20 (48.78%) females; Group II comprised 56 (58.95%) males and 39 (41.05%) females. At the

first dental examination, the mean values of DMFT, DMFS, dft, and dfs were 2.93±1.79, 3.37 ±2.93, 5.22±3.5, and 11.46±11.47, respectively, in Group I and 3.64±3.02, 4.41±4.37, 0.88±1.58, and 2.02±3.92, respectively, in Group II.

Regarding the pre- and post-OHE periodontal indices, the mean PI scores increased from 0.73 ± 0.54 to 0.91±0.53 and the mean OHI scores increased from 0.75±0.58 to 0.91±0.53 following OHE in Group I; these increases were significant

(p<0.01). Conversely, in Group II, the mean CI scores were significantly decreased from 0.02 ± 0.1 to 0 ± 0.03 following OHE (p=0.042). When the mean PI scores post OHE were compared between the groups, the scores in Group I were found to be significantly higher than those in Group II (p=0.004). Similarly, regarding the mean OHI scores post OHE, the scores in Group I were significantly higher than those in Group II (p=0.004) (Table 2).

Table 2. Scores of periodontal indices for the two study groups pre and post OHE

Index	Group		Pre OHE	Post OHE	P-value*	
PI	Group I	Mean±SD	0.73±0.54	0.91±0.53	0.025*	
		Median (IQR)	0.75 (0.28-1.04)	0.6 (0.2-1.16)		
	Group II	Mean±SD	0.71±0.62	0.63±0.57	0.259	
		Median (IQR)	1 (0.54-1.16)	0.6 (0-1)		
	P-value			0.773	0.004*	
	CI	Group I	Mean±SD	0.02±0.12	0±0	0.317
Median (IQR)			0 (0-0)	0 (0-0)		
Group II		Mean±SD	0.02±0.1	0±0.03	0.042*	
		Median (IQR)	0 (0-0)	0 (0-0)		
P-value			0.484	0.511		
OHI		Group I	Mean±SD	0.75±0.58	0.91±0.53	0.047*
	Median (IQR)		0.75 (0.28-1.04)	0.6 (0.2-1.2)		
	Group II	Mean±SD	0.74±0.64	0.63±0.58	0.134	
		Median (IQR)	1 (0.54-1.16)	0.6 (0-1)		
	P-value			0.920	0.004*	

Standart Deviation (SD), Oral Health Education (OHE), Plaque Index (PI), Calculus Index (CI) and Oral Hygiene Index (OHI)
*Statistically significant at p<0.05.

Table 3 shows a comparison of the differences in the periodontal indices pre and post OHE between the two study groups. Regarding the differences in the PI and OHI scores pre and post OHE between the groups, Group I exhibited significantly lower

scores than Group II (p=0.01 and p=0.008, respectively). A higher significant decrease in the PI and OHI scores was observed in Group II than in Group I post OHE (Table 3).

Table 3. Between-group differences in the pre- and post-OHE periodontal indices

Index		Difference between pre OHE and post OHE		P-value*
		Group I (n:41)	Group II (n:95)	
PI	Mean±SD	-0.18±0.49	0.08±0.76	0.01*
	Median (IQR)	-0.25 (-0.49-0)	0 (-0.3-0.45)	
CI	Mean±SD	0.02±0.12	0.02±0.08	0.484
	Median (IQR)	0 (0-0)	0 (0-0)	
OHI	Mean±SD	-0.16±0.52	0.11±0.79	0.008*
	Median (IQR)	-0.25 (-0.49-0)	0 (-0.3-0.45)	

Standart Deviation (SD), Oral Health Education (OHE), Plaque Index (PI), Calculus Index (CI) and Oral Hygiene Index (OHI)
*Statistically significant at p<0.05.

DISCUSSION

Oral diseases represent a major health problem

among individuals with disabilities.²⁰⁻²² Furthermore, the prevalence and severity of oral diseases among this group are higher than those in the healthy population.²³ Poor periodontal health and oral hygiene have been observed in children with disabilities.²⁴⁻²⁶ These findings may be associated with the low physical abilities of these individuals and consequent difficulties in tooth brushing. Oral health may be affected by the following: limited understanding of the importance of oral health management, difficulties in communicating oral health needs, anticonvulsant medications that affect gum health, and a fear of oral health procedures.^{21,27-29}

On comparison of the pre-OHE caries indices between the groups, significantly higher dft and dfs scores were observed in Group I than in Group II; furthermore, the PI and OHI scores increased post OHE in group I, whereas the CI scores decreased post OHE in Group II. The results indicated that the caries scores were higher in Group I than in Group II. This suggests that students in Group I did not perform tooth brushing properly and that their tooth brushing performance may have been influenced.

On comparing the pre- and post-OHI PI and OHI scores between the groups, group I was found to exhibit significantly lower values than group II. A higher significant decrease in the PI and OHI scores was observed in Group II than in Group I post OHE. Tooth brushing effectiveness is related to psychomotor skills and hand function ability.³⁰ A study has reported that chronological age is a reasonable predictor of tooth brushing ability and that the tooth brushing skills of children approach those of adults by the age of 10 years.³¹ The results of the present study suggest that 10–19-year-old students with visual impairment possess the physical ability required for tooth brushing. This is contrary to the findings of Powell³² who reported that the oral hygiene level improved with IQ and was not related to chronological age.

In the present study, students with visual impairment were examined on the first visit and then at the 3rd month. The visits had originally been planned in the 1st and 3rd month after the

first examination. However, 1 month after the first examination, the students were on a semester break; therefore, the second visit had to be performed in the 3rd month following the first examination. A school-based intervention in children with visual impairment has shown an improvement in oral hygiene shortly following the end of intervention; this study by Costa³³ demonstrated that the oral health condition 3 months following the end of intervention was poorer than the condition immediately following the end of intervention.

According to Price *et al.*³⁴, when teachers and institutional attendants are included to assist in intervention, a better result can be expected. In the present study, the students with visual impairment received one-to-one OHE and motivation. Their teachers did not attend the education sessions. In future investigations, the involvement of teachers in education and motivation sessions should be planned. According to the literature on preventive OHE, targeting caregivers to establish dental home care could be a successful strategy to improve the oral health of children with special health care needs.³⁵ Therefore, we adopted this strategy by including an additional OHE session with parents to improve the oral hygiene of the visually impaired students.

In a previous study in which oral health intervention was performed with students with Down's syndrome, it was reported that a majority of the children were able to perform tooth brushing by themselves. If disabled individuals are motivated and encouraged for self-care, they can manage their own oral hygiene.³⁶ Therefore, the students in the present study, comprising children and adolescents, can become capable of managing their own hygiene.

The common methods of tooth brushing in children are the horizontal scrub and modified Bass methods. The horizontal stroke is the most commonly used brushing stroke in children.^{37,38} The advantages of the horizontal scrub method are that it is easy to learn and practice for effective plaque removal.³⁹⁻⁴¹ It is important that brushing techniques for patients with disabilities who have fine and gross motor deficiencies are effective and

simple. Horizontal scrub method is often recommended for such individuals because it is easy and can yield good results.⁴² A study of dental health status in Greek children and teenagers with cerebral palsy, mental retardation, and visual disorders reported that children with vision problems had better oral hygiene than those with other disabilities because the former are able to better comprehend the oral hygiene instructions and possess superior kinetic skills.⁴³ The horizontal scrub technique was explained to the students and their parents in the present study.

The present study was performed at a public school. Similarly, Bekiroglu *et al.*¹⁰ conducted their study at a public school (Türkan Sabancı Primary School for Children with Vision Impairment); in their study, it was found that only 26.40% of the children were caries-free. In contrast, examinations by Oredugba and Akindayomi⁴⁴ and Desai *et al.*⁴⁵ were performed in private schools; in their studies, 66.7% and 53% of the subjects were found to be caries-free. The educational level and socioeconomic status of students' parents are higher in most private schools than in public schools. Therefore, children in private schools tend to be more aware of oral health care than those in public schools. Looking at these studies, the present study may be extended by including the examination of individuals with visual impairment in private schools.

Visual impairment affects the oral health through physical, social, or informational barriers associated with impairment, attendant medical condition (and associated medical disorders), and a lack of customized information.⁴⁶ The provision of good oral instructions and tactile devices to improve the tooth brushing skills of children with visual impairment is considered the most important aspect of oral hygiene education.^{47,48} Children with visual impairment depend more on sound, speech, and touch to orient themselves to a particular situation.⁴⁹ Therefore, modification of OHE is required when teaching these groups of children. Shetty and Hegde⁵⁰ have evaluated the Gingival Index (GI) and PI scores of children with visual impairment at the beginning of their study

and following OHE. They imparted OHE with the assistance of specially designed models, and tooth brushing was taught with specially formulated music-aided instructions in a song format. They found a significant drop in PI and GI scores from the pre- to post-OHE levels.

Education and motivation of the parents of children with visual impairment is vital toward improving and maintaining oral health and the overall general health of these children.⁵¹ Bhandary and Shetty⁸ have assessed the basic information on the oral health care knowledge of parents/care providers of children with visual impairment through a simple pre-structured questionnaire and have reported that there is a general lack of awareness among the care providers of these children regarding dental diseases and their prevention; furthermore, they have found the importance of oral hygiene among these care providers to be low. In a future investigation, we plan to obtain information on oral health care from parents of children with visual impairment through a questionnaire and plan to provide an OHE conference to parents, teachers, and care providers regarding oral hygiene, tooth brushing, and dietary guidance for children with visual impairment to enhance their health care.

CONCLUSIONS

A high caries prevalence demonstrates extensive unmet needs for dental treatment in students with visual impairment. It is an alarming situation that suggests the requirement of immediate dental treatment prior to a prevention-based intervention program for this group of children. The dental treatment costs were met by the Institution of Social Security. Therefore, dentists play a key role in not only diagnosing the oral health conditions of these children but also treating them and maintaining their oral health to contribute to their general well-being.

In the present study, the periodontal health of the students with visual impairment improved at the 3rd month follow-up. These results suggest that providing OHE interventions that include supervised tooth brushing during the school

classes can be a valuable approach for improving oral hygiene status. Further studies are necessary to assess the long-term sustainability of such educational interventions.

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CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this paper.

İstanbul İlindeki Bir Grup Görme Engelli Öğrencinin Ağız Diş Sağlığındaki Değişiklikler

ÖZ

Amaç: Bu çalışmanın amacı, bir grup görme engelli öğrencinin ağız ve diş sağlığı durumlarının belirlenmesi ve ağız-diş sağlığı eğitimlerinden sonra ağız hijyenindeki değişikliklerin değerlendirilmesidir.

Gereç ve Yöntemler: Yaşları 6-19 arasında olan, T.C. MEB Türkan Sabancı Görme Engelliler İlköğretim Okulu'nda okuyan 136 görme engelli öğrencinin ağız-diş muayeneleri yapıldı. Öğrenciler yaşlarına göre 6-9 yaş grubu (Group I) ve 10-19 yaş grubu (Group II) şeklinde ikiye ayrıldı. Muayene çıplak gözle ve ayna-sond yardımı ile gün ışığında gerçekleştirildi. Muayene sırasında DMFT, DMFS, dft, dfs, plak (PI), diştaşı (DI) ve oral hijyen indeksleri (OHI) kaydedilen tüm öğrencilere, birebir diş fırçalama eğitimi verildi (OHE). 3 ay sonra aynı çocukların ağız-diş sağlığı gelişimlerinin izlenebilmesi amacı ile ikinci kez muayeneleri yapıldı. İstatistiksel değerlendirmede Wilcoxon ve Mann Whitney U testleri kullanıldı ve sonuçlar $p<0,05$ anlamlı kabul edildi. **Bulgular:** OHE'den sonra Group I'in PI ve OHI değerlerinde artış olduğu görüldü ($p<0,05$). Diğer bir taraftan, OHE'den sonra Group II'nin DI değerlerinde azalma gözlemlendi ($p=0,042$). OHE sonrası PI ve OHI skorları karşılaştırıldığında, Group I'deki değerlerin Group II'den istatistiksel olarak anlamlı derecede yüksek bulundu ($p<0,05$). Group I'in eğitim öncesi-sonrası, PI ve OHI değerleri arasındaki farkın, Group II'deki değerler arasındaki farktan istatistiksel olarak anlamlı derecede düşük bulundu ($p<0,05$). **Sonuçlar:** Görme engelli öğrencilerin diş çürüğü sıklığının fazla

olduğu ve ağız hijyeninin zayıf olduğu görüldü. Bu bireylerin düzenli aralıklarla ağız-diş sağlığı kontrollerinin yapılmasının ve uygun eğitimlerin verilmesinin çok önemli olduğunu düşünmekteyiz. **Anahtar Kelimeler:** Ağız hijyeni eğitimi, görme engelli, öğrenciler, dental plak indeksi.

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