

## Impact of an Oral Health Education Program on Institutionalized Visually Impaired Children in Syria

Batool Marwan Al Mughrabi<sup>1</sup> Yusra Hasan Haddeh<sup>2</sup>  
Mayssoon Ahmad Deeb Dashash<sup>3</sup>

<sup>1</sup>Master degree, Department of Pediatric Dentistry, Damascus University  
[Batool.mughrabi@damascusuniversity.edu.sy](mailto:Batool.mughrabi@damascusuniversity.edu.sy)

<sup>2</sup>Department of ophthalmology, Professor, Damascus University, Syria  
[Yusra.haddeh@damascusuniversity.edu.sy](mailto:Yusra.haddeh@damascusuniversity.edu.sy)

<sup>3</sup>Professor, Department of Pediatric Dentistry, Damascus University, Syria  
[Mayssoon.dashash@damascusuniversity.edu.sy](mailto:Mayssoon.dashash@damascusuniversity.edu.sy)

### Abstract:

**Background:** Children with visually impairments encounter numerous challenges in maintaining adequate oral hygiene. Their reliance on caregivers limits their ability to utilize visual aids and engage with the medical instructions typically found in standard dental health education programs.

**Aim:** The aim of this study was to evaluate the effectiveness of oral health education (OHE) delivered through two different methods: audio and tactile, on the Knowledge – attitude – behavior (KAB) related to oral health, as well as the oral health status of visually impaired children.

**Material and Methods:** A total of sixty-six visually impaired children, aged 5-18 years, residing at a specialized school for the visually impaired, were selected and randomly assigned into two groups of thirty- three participants each to take part in the oral health education program. Group 1 received audio aids, while Group 2 utilized Braille and tactile aids. The oral health status of the children was evaluated before and after the OHE program, which lasted six months. The program provided essential information and instructions on maintaining good oral hygiene, healthy eating habits, the mechanisms and prevention of dental diseases, and the importance of regular dental check-ups.

**Results:** The study demonstrated a significant reduction in the mean Oral Hygiene Index- Simplified (OHI-S) scores after the implementation of OHE in both groups when compared to baseline measurements. The difference was statistically significant ( $p<0.05$ ). There was a statistically significant difference in the OHI-s index between the two follow-up assessments, with results favoring the post- OHE stage. The mean score for the entire population decreased from 0.741 at baseline to 0.463 after 6 months. There was a significant difference in the Knowledge – Attitude – Behavior (KAB) scores, with the mean score rising from 7.72 prior to the program to 8.825 after six-months.

**Conclusion:** The findings suggest that combining audio, Braille & tactile models is effective in enhancing oral health education and improving the oral health status of visually impaired children.

**Keywords:** Visually impaired (VI), Audio, Braille, Caregiver, Oral health education (OHE).

Received: 18/9/2024

Accepted: 29/9/2024



Copyright: Damascus University- Syria, The authors retain the copyright under a CC BY- NC-SA

## دراسة تأثير تطبيق برنامج تثقيفي مخصص للأطفال المصابين بضعف البصر والمنتسبين لإحدى المدارس المتخصصة في دمشق

بتول مروان المغربي<sup>1</sup>، ميسون أحمد ديب دشاش<sup>2</sup>، يسرى حسن حدة<sup>3</sup>

<sup>1</sup>ماجستير في طب أسنان الأطفال - قسم طب أسنان الأطفال - جامعة دمشق

<sup>2</sup>أستاذة في قسم طب أسنان الأطفال - جامعة دمشق

<sup>3</sup>أستاذة في قسم أمراض العين - جامعة دمشق

### الملخص:

**خلفية البحث وأهدافه:** يعاني الأطفال المصابون بضعف البصر من تحديات عدة خلال محاولتهم للحفاظ على صحة فموية جيدة، وذلك لأنهم اعتمادهم على مقدم الرعاية بشكل مستمر للحصول على احتياجاتهم يحد من قدرتهم على الوصول للرعاية الصحية الفموية المناسبة، كما أنهم لا يمكنهم الاستفادة من برامج التثقيف الصحي التي تعتمد على وسائل التواصل البصرية في التفاعل ونقل التعليمات. إحدى المدارس اللصة بالمكفوفين في دمشق ويستخدم طريقتي التواصل للمسبية والسمعية وأثره على مركب (السلوك - الموقف - المعرفة) المرتبطة بالصحة الفموية، وفعاليتها في تحسين الحالة الصحية الفموية.

**مواد البحث وطرقه:** تم اختيار 66 طفل وطفلة مشخصون بضعف البصر الشديد وفقد البصر ومنتسبين لمدرسة خاصة بضعفي البصر والمكفوفين في دمشق، ثم توزيعهم عشوائياً في مجموعتين: المجموعة الأولى (وسائل التسجيل الصوتي) والمجموعة الثانية (الوسائل الكتابية).

تم إخضاع المشاركين لبرنامج تثقيفي مدته 6 أشهر ضمن المدرسة التي ينتسبون إليها، وتم تصميم الوسائل التعليمية للمجموعتين بالطريقتين الكتابية والصوتية على شكل قصص وأغاني ترفيهية وتعليمية.

تم قياس مشعرات الصحة الفموية باستخدام مشعر الصحة الفموية المعدل OHI-S، قبل وبعد تطبيق البرنامج ومقارنته لتقييم فعالية البرنامج في تحسين الحالة الصحية الفموية. تم تصميم استبيان مخصص لدراسة الوعي الصحي لدى هؤلاء المرضى، طريقة تعاملهم مع المشاكل الصحية الفموية، اتباعهم للطرق الوقائية ومواقفهم من تقديم الرعاية الصحية والزيارات للعيادة السنوية.

تم تقييم (السلوك - الموقف - المعرفة) عبر دراسة الأداء على الاستبيان حيث تم ترميز أسئلة الاستبيان للحصول على علامة نهائية توضع لكل طفل من أجل مقارنتها فيما بعد تطبيق البرنامج التثقيفي، كم تمت دراسة التغيرات على أجوبة الاستبيان في مرحلة ما بعد تطبيق البرنامج لتقييم تأثيره على مستوى الوعي المتعلق **النتائج:** توصلت الدراسة إلى أنه هناك تحسن واضح في مستوى الصحة الفموية عند مقارنة نتائج مشعرات البقايا والقلم OHI-S قبل وبعد البرنامج التثقيفي وقد كان الفرق ذو دلالة إحصائية عند مستوى الدلالة ( $p < 0.05$ ). انخفضت قيمة متوسط المشعر من 1.741 إلى 1.463 وكان الفرق ذو دلالة إحصائية.

كما بينت النتائج أن تطبيق البرنامج التثقيفي كان فعالاً في رفع مستوى الوعي الصحي لدى أطفال العينة وتغيير مواقفهم تجاه الرعاية السنوية بشكل إيجابي مما انعكس على ممارساتهم الصحية اليومية المتعلقة بالنظافة الفموية، وقد تبين ذلك من خلال ارتفاع معدل مجموع حاصل الإجابات على أسئلة الاستبيان عند مقارنتها بالنتائج التي حصلنا عليها قبل تطبيق البرنامج التثقيفي، وقد كان الفرق الحاصل ذو دلالة إحصائية عند مستوى الدلالة  $p < 0.05$  حيث كانت قيمة  $P = 0.014$  و  $0.010$

تاريخ الإيداع: 2024/9/18

تاريخ القبول: 2024/9/29



حقوق النشر: جامعة دمشق -

سورية، يحتفظ المؤلفون بحقوق

النشر بموجب الترخيص

CC BY-NC-SA 04

في المجموعتين على الترتيب، كما بينت الدراسة ارتفاع مستوى الإجابات على أسئلة الاستبيان عبر دراسة النسب المئوية للإجابات على الأسئلة بعد انتهاء تطبيق البرنامج بالمقارنة مع الأجوبة التي حصلنا عليها قبل تطبيقه.

**الخلاصة:** تبين الدراسة أن استخدام وسائل التواصل السمعية واللمسية والمكتوبة بطريقة بريل كانت ذات فعالية في تحسين الحالة الصحية الفموية وتحسن مستوى الوعي والمعرفة والسلوك الصحي الفموي .

**الكلمات المفتاحية:** ضعف البصر، الملفات الصوتية، طريقة بريل، التثقيف الصحي الفموي

## **INTRODUCTION:**

A person with special needs is someone who requires assistance from others to carry out daily tasks. They often encounter challenges when participating in activities commonly attended by sighted peers, which may be due to their mental or physical condition[1]. The term “special needs” encompasses various groups, including individuals with visual impairments who face significant difficulties in performing daily activities [2].

Individuals who are blind are defined as those having a central visual acuity of 20/200 or less in the better eye and/or a visual field of 20 degrees or less[3].

Visual impairment includes a wide range of conditions. Generally, individuals are classified as having low vision if their visual acuity is less than 6/18 but greater than 3/60. [4]. In this situations eyesight could not respond to visual correction[5].

Maintaining good oral hygiene can be particularly challenging for children with visual impairment, as they encounter ongoing obstacles in their daily dental routines, such as brushing their teeth. Limitation in hand-eye coordination, along with parents neglecting to encourage brushing after meals, can exacerbate these issues, especially when coupled with a sugar- rich diet[5, 6].

While these individuals face numerous daily challenges, oral care often becomes a low priorities[7]. Additionally, the lack of communication between visually impaired individuals and dentists worsens the situation. However, effective oral OHE could help bridge this gap[8].

Individuals who are blind or visually impaired may struggle to recognize early signs of dental diseases or take immediate action without assistance. This often leads to inadequate practices required to maintain overall health and, specifically, oral health[9].

Research indicate that visually impaired individuals tend to have poorer oral hygiene compared to their sighted peers, with various manifestations of dental disease [1, 10].

One significant factor that negatively affects oral health is the inability of visually impaired individuals to engage in educational programs and health improvement campaigns that rely on visual materials (such as pictures, videos, posters)[1, 11]. Therefore, there is a substantial need for innovative, customized techniques to improve communication with individuals with visually impairment[12].

Traditional health awareness methods that depend on visual perception should be adopted to develop distinct approaches that align with their sensory experiences[10].

Blind or visually impaired individuals primarily rely on tactile and auditory senses to explore their environment. Thus, enhancing these two senses can facilitate the exchange of ideas and convey information that promotes healthier lifestyles[13, 14].

Despite increasing global awareness regarding oral health care, educational programs specifically aimed at children in developing countries remain scarce. For instance, studies in Syria have not indicated an improvement in the oral health status of school-age children recently, despite the noticeable increase in the number of dentists and health centers in Damascus[15].

The population diversity in Damascus which is a result of the Syrian war can serve as a minimized study base that represent the whole Syrian spectrum[16]. It is been shown that the post-war circumstances negatively affected the oral health status in the city, low quality food and flord deprived water represented condensed harm on children’s health[17].

The World Health Organization (WHO) reported that 70–95% of school-aged children in South-East Asia have experienced dental caries [18]. A recent study demonstrated that caries prevalence for the whole city of Damascus was at (79.1%) Therefore, it is crucial to promote health and educational initiatives in these regions [16].

The school years are vital for learning and personal development, during which habits and rules are established[15]. Consequently, this period is ideal for intervention to modify behaviors through school-based approaches, which are often more effective in delivering preventive and curative services[19, 20]. Schools provide an optimal environment for promoting oral health and implementing oral health education [18].

To date, there is no published data investigating the effectiveness of oral health education among visually impaired children in Syria.

Therefore, this study was undertaken in visually impaired school in Damascus, aiming to improve the awareness and oral health status through appropriate communication methods. The goal was to enable decision-makers to implement evidence-based measures to enhance the oral health and dental hygiene habits of these children.

**Methodology:**

group and Audio group) over a period of 6 months: from October 2021 to February 2022.

Study design, study setting, and study population

The study involved 66 visually impaired children aged 6 to 18 years, divided into two groups (Braille

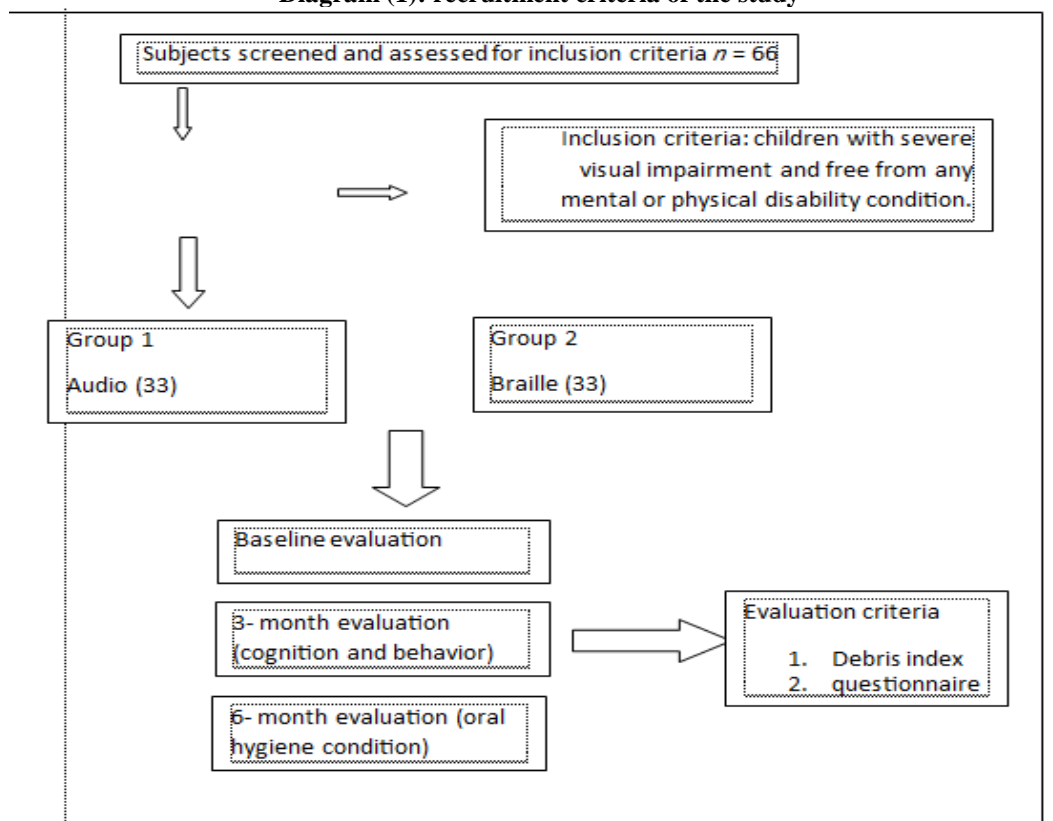
**Table (1): distribution of gender and age of the sample**

Variables		number	percent (%)
Gender	Male	41	62 %
	Female	25	38 %
Age	6 - 9 years	24	36 %
	10 – 13 years	29	44%
	14 – 17 years	13	20 %

This was a randomized trial comparing results before and after the intervention, as well as between the two groups, without control group. Each group’s baseline measurement served as its own control.

All Children, regardless of the severity of their visual impairment, were included in the study, they did not have any other mental or physical disabilities. However, children with medical complications or those enrolled in other educational programs were excluded.

**Diagram (1): recruitment criteria of the study**



Specially designed oral health education program

The basic oral health education provided was consistent for both groups. The OHE covered topics such as dental plaque, tooth brushing techniques, healthy dietary practices, and the importance of regular dental visits for maintaining good oral hygiene.

Dental plaque was explained in simple terms suitable for the children's age, and the process of dental caries was conveyed through a brief storytelling approach. This included discussing the role of sugar intake in dental disease, the frequency of sugar consumption, and identifying the most harmful type of sugar for causing caries (sticky sugars). Additionally, practical dietary advice was provided. Both students and teachers received individualized instruction on tooth brushing and were encouraged to ask questions. School teachers were asked to consistently reinforce the educational material, whether through playing audio files or reading Braille documents, based on participants' group assignments.

Pre- Implementation communication Techniques

Before the intervention, both groups participated in preparatory sessions designed to strengthen the relationship between the researchers and the students. These sessions involved exchanging personal information, introducing the study's objectives and methods, fostering an ideal rapport and harmony throughout the research process.

Teacher involvement

Essential educational information was presented via specially designed PowerPoint presentation to the institution's staff, who had close interactions with the participants. This aim was to educate all staff members, create a supportive communication environment, and incorporate their experiences into the research objectives.

Communication strategy for caregivers

Each student received a copy of the educational materials in each format to review at home. Caregivers were encouraged to assist their child in listening to the audio or reading the scripts according to the assigned group. They were also asked to apply the provided instructions through specially created chat groups focused on effective communication for the benefit of the child.

Educational techniques

**Group 1:** in this group, oral health education and motivation was delivered through a specially recorded audio story. The audio story was provided to the school authorities on a compact disc, and played regularly for children in their classrooms and

at home once a week. The story contained simplified information about maintaining good oral hygiene. To educate visually impaired children, the oral health education material was repeated every week by the teacher of the class. Another recorded story was shared with caregivers via social media, with confirmation that it would be replayed for the child every weekend. Teachers were encouraged to ask a set of questions related to the provided instructions to evaluate the child's awareness and progress through audio aids.

**Group 2:** in this group, oral health instructions and motivation to follow the oral health educational program were given to visually impaired children through Braille scripts. All children and teachers in the institutes received oral health education in the form of a Braille. The story was designed for individual use at home and at a class. Institute teachers were asked to read this story to the children weekly and engage in routine discussions about it. In both groups, the caregivers were informed to assist children in revising the information provided in the script at least once a week. Using plastic models, each child was allowed to feel the difference between clean and unclean teeth after applying of petroleum jelly to simulate dental plaque. Methods to prevent oral diseases were explained individually to all children. Brushing techniques were demonstrated on the models, enabling children to distinguish between cleaned and uncleaned tooth surfaces. This was followed by a hands-on application in each child's mouth using a hand over-hand technique. Some of these models were also provided to the institutes for ongoing education. Thus, the tactile sensation of the visually impaired children was utilized to enhance their oral health behavior.

Oral health examination

All the children were evaluated for oral health status using the Oral Health Index simplified and baseline and six months after implementing the specially designed educational program and motivational techniques. All the examinations were conducted by a single examiner, with and the recordings made by an assistant who had received training prior the program. OHI-s was recorded on five index teeth: 16, 11, 36, 31, and 46. For these indices, the surface around each tooth was divided into three units: distal, middle and mesial. The facial surface teeth 16, 11, 31 were recorded, while the lingual surfaces of teeth 36 and 46 were documented. The previously mentioned teeth were examined for any debris or calculus. Visually impaired children were

examined at their private institutes while seated on ordinary chair, under good illumination provided by natural light. Assistance of a class teacher was obtained to explain the examination steps and establish good rapport with the children. A copy of the introduced data in each form was given to each student according to their group for home revision. Caregivers were informed to help the child play the audio or read the Scripts, and to apply the instructions, through specially created chat groups for effective communication to benefit the child.

To assess knowledge improvement, a structured self-administrated questionnaire containing 12 questions was administrated before and after the educational program.

Oral health Knowledge - Attitude - Behavior questionnaire (KAB)

The questionnaire was divided into three parts: knowledge and cognition (self-assessment of oral health, pain, and current problems), oral health-related habits (frequency and timing of toothbrushing, use of supplementary oral cleansers, dental office routine visits, past dental experiences) and attitudes (self-assessment of dental fear, impressions of dental visits). Each answer was scored from 0 to 2.5, allowing for a final total score ranging from 0 to 2.5. The scores were compared before and after implementing the OHE to determine the effect of the provided information on the level of oral health awareness and dental habits.

Clinical examination

An oral clinical examination was performed for all participating children using a mirror and a probe, with results documented in the examination form. The DMFT (Decayed, Missing, and Filled Teeth) Index was utilized to assess the presence of carious, missing, and restored permanent teeth.

The OHI-s (Oral Hygiene Index Simplified), a modified oral care index, was measured both before and after the OHE program to compare and assess the results; readings were recorded in the designated table on the oral examination form.

Ethical consideration

Ethical approval was obtained from the ethical review board of the institute before applying OHE. Official permission to conduct the study was obtained from the school authority along with verbal consent from the parents, caretakers, or participants themselves before the program commenced.

Statistical analysis

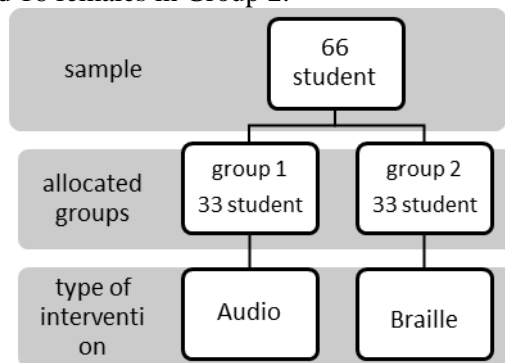
The collected data were entered into Microsoft Excel 2007 and analyzed using SPSS version 24 (IBM Statistics Inc.). The statistical tests applied included the paired *t*-test and chi square test to assess the

difference in OHI-S and (KAB) scores before and after the oral health education. A difference was considered statistically significant if the value of  $P < 0.05$ .

Results

Initially, a total of 70 participant were included in the study; however, four students dropped out, resulting in a final sample of 66 children residing in a visually impaired special school in Damascus. The response rate at the follow up stage was 94.3%.

The mean age of the study participants at recruitment was  $10.5 \pm 2.568$  years. The mean age in Groups I and II were  $10.2 \pm 2.750$  and  $10.8 \pm 2.382$  years, respectively. The gender distribution included 41 males and 25 females in the overall population: 24 males and 9 females in Group 1, and 17 males and 16 females in Group 2.



Oral status evaluation

Oral health examination at baseline identified mean DMFT score for the whole sample at 8.06 and mean dmft score at 4.865.

There was no significant difference in DMFT scores between the two groups when measured.

The mean dmft score comparison between both groups exhibited no significant difference as well. (table 2)

Table 2 presents a comparison of mean OHI-s scores between both groups at baseline and 6 months post-implementation.

In Group I, the OHI-s score decreased from 1.751 at baseline to 1.501 at 6 months post-implementation. This reduction in the mean OHI-s score was statistically significant ( $P > 0.01$ ) when compared with the baseline.

In Group II, the mean OHI-S score decreased from 1.731 at baseline to 1.425 at 6 months following the educational program.

The decrease in the mean OHI-S score in Group II was also statistically significant ( $P < 0.01$ ) compared to the baseline mean plaque score.

**Table (2): the differences between DMFT and dmft scores between recruited groups**

variables	group	Number of children	Mean	SD
DMFT	Audio	33	8.24	7.661
	Braille	33	7.88	9.433
dmft	Audio	33	5.06	6.675
	Braille	33	4.67	7.643

**Table (3): - OHI-s mean score**

	Group1	Group 2
Baseline	1.751 ± 0.66	1.731 ± 0.44
6 months	1.501 ± 0.39	1.425 ± 0.40
T value	2.604	3.281
P value	0.014	0.003
Inference	Sd	Sd

**Table (4): percentages of OHI-s values for Group 1**

Time of interval	OHI-s score	Frequencies	Percentage
Baseline	None	13	39.4%
	Less than third of the surface	14	42.4%
	One third to two thirds	3	9.1%
	More than two thirds	3	9.1%
6 – month	None	16	48%
	Less than third of the surface	14	42%
	One third to two thirds	2	6.1%
	More than two thirds	1	3%

**Table (5): percentages of OHI-s values for Group 2**

Time of interval	OHI-s score	frequencies	Percentage
Baseline	None	9	27.3%
	less than third of the surface	14	42.4%
	third to two thirds	8	24.2%
	more than two thirds	2	6.1%
6 month	None	18	54.5%
	Less than third of the surface	12	36.4%
	Third to two thirds	3	9.1%
	More than two thirds	0	0%

Oral health Knowledge - Attitude - Behavior (KAB) evaluation

To assess oral health awareness and daily dental routine, the scores from the self-administered questionnaire were compared before and after implementation of the program.

In Group I, the mean score increased from 7.77 at baseline to 8.79 six months post-implementation. This increase in the mean questionnaire score was statistically significant ( $P > 0.01$ ) at 6 months compared with the baseline.

In Group II, the mean score significantly increased from 7.67 at baseline to 8.86 six after the



**Impact of an Oral Health Education Program on Institutionalized ..... Mughrabi, Haddeh and Dashash**

educational program was implemented, this increase was statistically significant ( $P > 0.01$ ).

**Table (6) mean score of the questionnaire**

	Mean score	sd	p_value
	Baseline	3 months	
Group 1	7.77	8.79	0.014
Group 2	7.67	8.86	0.010

**Table (7): percentages of KAB answers before implementation**

Question	Yes	No	I don't know
Do you think you have healthy teeth?	8 participants (11.5%)	3 participants 3.8%	55 participants 84.7%
Have you been to dentist before?	18 participants 27.3%	48 participants 72.7%	
When did you last visit the dentist?	Less than 6 months 3 participants (3.5%)	More than 6 months 12 participants (17.4%)	Don't remember 51 participants (79.1%)
Was it a good experience?	52.7% 35 participants	47.3% 31 participants	
Do you visit dental clinic periodically?	17.3% 9 participants	87.2% 57 participants	
Are you in tooth pain currently?	66.6% 44 participants	33.4% 22 participants	
Do you brush your teeth daily?	8.2% 5 participants	91.8% 61 participants	
How often?	Everyday 9 participants (13.3%)	Once a week 15 participants (22.7%)	Not specified 42 participants (60%)
Do you need help while brushing?	22 participants 33.8%	44 participants 66.2%	
Do you use extra means of cleaning?	3 participants 4.4%	63 participants 95.6%	

**Table (8): percentages of KAB answers after implementation**

Question	Yes	No	I don't know
Do you think you have healthy teeth?	17 participants (25.5%)	49 participants (74.5%)	
Have you been to dentist before?	50 participants (76.9%)	16 participants (23.1%)	
When did you last visit the dentist?	Less than 6 months 23 participants (33.5%)	More than 6 months 14 participants (20.9%)	Don't remember 29 participants (45.4%)
Was it good experience?	30 participants 44.8%	36 participants 55.2%	
Do you visit dental clinic periodically?	21 participants 32.8%	35 participants 67.2%	
Are you in tooth pain currently?	23 participants 34.8%	43 participants 65.2%	
Do you brush your teeth daily?	36 participants 55.2%	30 participants 44.8%	
Do you need help while brushing?	44 participants 66.8%	22 participants 33.2%	
How often do you brush your teeth?	Everyday 37 participants 56.2%	Once a week 28 participants 43.2%	Not specified 1 participant 0.66%
Do you use extra means of cleaning?	6 participants 9.9%	60 participants 90.1%	

**Discussion:**

Poor communication between health staff and individuals with visual impairments, along with their reluctance to perform dental procedures on this populations, creates a serious gap[3].

Additionally, there is an argent need for better education among caregivers and health workers regarding oral health needs[21]. Endrighi *et al* suggested that caregivers and their children positively influence each other's tooth-brushing habits over time[22]. Alsadhan *et al* reported that most of the mothers of the visual impairments children were so focused on their children's needs that they neglected to seek appropriate oral health education[11]. This highlights a two-way relationship involving practitioners, visually impaired children, parents, and school caregivers

Teachers are considered a vital source of information for schoolchildren. However, this aspect is often overlooked in health improvement plans[23]. Therefore, in our program, oral health enhancement training was provided to school staff to

effectively communicate health-related information to VI children.

This underscores the importance of educational and awareness programs designed to bridge these gaps, and facilitate optimal communication. Such programs enable individuals with disabilities and those around them to better understand dental and oral health, fostering healthier lifestyles.

In this research, all stakeholders connected to visual impaired children were involved including caregiver, dentists, and teachers to ensure the best collaborative care.

There are challenges in delivering information to VI children due to their inability to visualize oral health structures or the outcomes of oral diseases, making oral health education a complex task that often relies on visual media[11]. Therefore, specially designed educational programs enhance communication skills to address the special needs of visually impaired individuals. Technique such as Braille provide a novel yet effective means of

communication, utilizing their advanced tactile sensation[8].

Plastic models can help support imagination and simulate tangible structures[24]. Likewise, audio techniques are perceived as entertaining and can be effectively express feelings and attitudes [23]. These methods can interpret the painful or stressful aspects of dental disease through engaging stories or songs.

In this study, audio recordings were specially designed as a short story about a child experiencing dental pain and visiting a dental clinic, with sound effects immersing the listener in the clinic atmosphere. Other recordings were joyful songs describing dental structures, brushing and healthy meals, which proved effective in younger children.

The results showed an increase in the average knowledge-attitude-behavior score six months after oral health education in both groups, although there was no statistical significance between them.

Statistical test results on audio and tactile methods showed a significant difference in KAB scores before and after the application of OHE. The improvement in children's perceptions toward oral health, dental prevention and daily healthy routines suggests the positive impact of repetitive educational sessions and the reinforcement of provided information[25], as well as the importance of continuous home reviews by caregivers[21].

In this study, all participants received a domestic version of audio or printed materials, with caregivers encouraged to review the content with their children. This highlights the significance of home feedback in a child's education, integrating institutional efforts to achieve optimal collaboration. Communication with parents is crucial for maximizing the program's benefits. It is recommended to employ parental involvement to reinforce key concepts [20]. According to Sardana *et al*, home care methods were beneficial in establishing a solid basis of knowledge, and helped in the ongoing review of introduced information, which effectively improved participants' oral hygiene[26].

Children in both groups received the same oral health education package. However, two delivery methods were tested for implementation. The scripts and audio files contained simplified information about tooth structure, the effect of sugar consumption, the interaction between bacteria and debris, and the mechanisms of dental caries, emphasizing the importance of dental hygiene, periodic checkups and preventive measures.

The improvement of KAB scores aligns with Alamsya's study in Indonesia, which compared between audio and Braille techniques for enhancing oral health knowledge. Their findings indicated that oral hygiene scores increased within the first week and one month following dental health education for both methods[27].

The interactive sessions were valuable in establishing a strong rapport with the students and primarily assessing dental attitudes, oral hygiene routines, and perceptions of the dental team and clinics

An educational formal classroom-based session occurred weekly with each class. This approach enhanced verbal communication and helped students better understand the provided instructions. Students were allowed to practice oral hygiene step- by- step using a plastic model and a toothbrush. Shrivastava *et al* reported that positive reinforcement from educators and demonstrations of tooth brushing motivated students to understand, remember and correctly apply the steps, which was evident in the improvement of oral health status after six months[28].

To evaluate plaque and calculus among the participants in the present study, the OHI-s was used. This index classifies status based on the proportion of tooth surface covered with debris or calculus reduction in debris indicates, improved plaque removal ability and effective cleaning, while a decrease in calculus reflects the frequency of dental clinic visits.

The results of this study demonstrated a significant difference in the mean oral hygiene scores from baseline to six months post- implementation using both methods.

For the audio method, the mean oral hygiene score before dental health education was  $1.751 \pm 0.66$ , which decreased to  $1.501 \pm 0.39$ . In the braille-tactile method, the score fell from  $1.731 \pm 0.44$  to  $1.425 \pm 0.40$ .

These findings align with the study by Barkha *et al*. In India, which indicated a decrease in mean plaque and gingival scores for visually impaired participants at various time intervals across all three groups compared to baseline [29]. Another study conducted by Shaleen *et al* showed a significant improvement in oral health status following oral health education among VI individuals, with significant reduction in gingival scores for both Braille and Compressed speech groups [30].

The percentage of children with no debris at baseline was 39.4% After implementing the program, the percentage rose to 48.5% in group1 and increased

from 39.4% to 48.5% in group2. For calculus, the percentage was 72.7% before training and showed no change in Group1, while it decreased from 75.8% to 72.7% in Group2.

The increase in the proportion of children with no debris reflects the improvement in brushing techniques and cleaning frequency, corroborated by questionnaire responses indicating that the percentage of students reporting daily cleaning rose from 8.2% to 55.2% after implementation. Participant were not informed about the examination date to prevent bias.

There was no improvement in calculus classification, which may be attributed to the fact that periodontal diseases require a longer period of time to heal, making changes undetectable within a six-month follow-up. Additionally, the low prevalence of calculus among children (4.7% of the entire sample), contributed to this finding. Nevertheless, Future long-term studies with multiple time intervals could be conducted to assess knowledge retention.

Dental issues like this often necessitate clinical intervention, which can present various barriers for VI children. Future studies could explore the role of

parents in facilitating regular dental health service visits.

while this study was the first of its kind in the country, it was limited by the number of participants enrolled in the visually impaired school. Moreover, a larger sample size that includes more than one school would possibly provide a broader perspective and more applicable results.

### **Conclusion:**

It can be concluded that Braille-Tactile and Audio methods are effective in enhancing oral health-related knowledge and improving the oral health status for institutionalized visually impaired children when incorporated into a specially designed educational program.

It is recommended to support this type of OHE by involving the entire network of individuals concerned with the VI child in the educational process to achieve comprehensive benefits. It is beneficial to develop tailored programs for each category, ensuring that caregivers receive thorough training on oral health preservation and the importance of periodic check-ups. This approach would positively affect their healthy lifestyle.

## References:

1. Solebo, A.L., L. Teoh, and J. Rahi, *Epidemiology of blindness in children*. Archives of disease in childhood, 2017. **102**(9): p. 853-857.
2. McPherson, M., et al., *Implementing community-based systems of services for children and youths with special health care needs: how well are we doing?* Pediatrics, 2004. **113**(Supplement 4): p. 1538-1544.
3. Schembri, A., et al., *The impact of blindness on the oral health and the perceived need to seek treatment in a community of Maltese older adults*. Biomedical Journal of Scientific y Technical Research. 2018; 5 (4): 1-9. doi: 10.26717/BJSTR, 2018. **1224**.
4. Solebo, A.L., L. Teoh, and J. Rahi: Epidemiology of blindness in children. Archives of disease in childhood. 2017, 102(9):853-857. 10.1136/archdischild-2016-3105324. Cupples, M., et al., *Improving healthcare access for people with visual impairment and blindness*. Bmj, 2012. **344**.
5. Khurana, C., et al., *Effectiveness of oral health education program using braille text in a group of visually impaired children-before and after comparison trial*. Journal of Education and Health Promotion, 2019. **8**(1): p. 50.
6. Liu, L., et al., *Oral health status among visually impaired schoolchildren in Northeast China*. BMC oral health, 2019. **19**(1): p. 1-7.
7. Deshpande, A.P., et al., *Oral Hygiene Status, Salivary and Microbiological Parameters Among Visually Impaired and Normal-Sighted Children After Specialized Oral Health Education: An Interventional Study*. Cureus, 2024. **16**(3).
8. Deshpande, A.P., et al., *Unleashing the most effective oral health education intervention technique for improving the oral hygiene status and oral health knowledge in visually impaired young individuals: A systematic review and meta-analysis*. Journal of Education and Health Promotion, 2023. **12**(1): p. 9.
9. Jain, M., et al., *Oral health status and treatment need among institutionalised hearing-impaired and blind children and young adults in Udaipur, India. A comparative study*. 2013. **12**(1): p. 41-9.
10. Bhor, K.B., et al., *Effectiveness of oral health educational interventions on oral health of visually impaired school children: A systematic review and meta-analysis*. Special Care in Dentistry, 2021. **41**(3): p. 291-308.
11. AlSadhan, S.A., et al., *Dental and medical health status and oral health knowledge among visually impaired and sighted female schoolchildren in Riyadh: a comparative study*. BMC Oral Health, 2017. **17**: p. 1-6.
12. Ruin, S., et al., *Barriers and Challenges for Visually Impaired Students in PE—An Interview Study with Students in Austria, Germany, and the USA*. 2023. **20**(22): p. 7081.
13. Shankar, K.S., et al., *Effectiveness of Oral Health Education Interventions Using Braille on Oral Health among Visually Impaired Children: Proposal for a Systematic Review*. Journal of Pharmacy and Bioallied Sciences, 2024. **16**(Suppl 1): p. S97-S101.
14. Wong, M., H. Tan, and T. Chan, *Oral health education for visually impaired children*. Community Health Project Report Series, 2005. **136**: p. 1-22.
15. Al Bardaweel, S. and M. Dashash, *E-learning or educational leaflet: does it make a difference in oral health promotion? A clustered randomized trial*. BMC Oral Health, 2018. **18**(1): p. 1-8.
16. Ballouk, M.A.-H. and M.J.B.O.H. Dashash, *Caries prevalence and dental health of 8–12 year-old children in Damascus city in Syria during the Syrian Crisis; a cross-sectional epidemiological oral health survey*. 2019. **19**: p. 1-6.
17. Ballouk, M.A.-H. and M.J.B.r.n. Dashash, *The gingival health status of 8–12 year-old children in Damascus city in Syria during the Syrian Crisis: a cross-sectional epidemiological oral health survey*. 2018. **11**: p. 1-5.
18. Subedi, K., et al., *Effectiveness of oral health education intervention among 12–15-year-old school children in Dharan, Nepal: a randomized controlled trial*. BMC Oral Health, 2021. **21**: p. 1-11.
19. Dashash, M., A.N. Ghannam, and L.J.B.o. Darjazini Nahhas, *Assessment of oral health status and quality of life in hearing-impaired children from Syria*. 2024. **10**(1): p. 57.
20. Al Zaher, N. and M.J.B.O.H. Dashash, *An educational intervention for improving knowledge of Syrian school children about avulsion using the " save your tooth" poster*. 2021. **21**: p. 1-6.

21. Sharififard, N., et al., *A music-and game-based oral health education for visually impaired school children; multilevel analysis of a cluster randomized controlled trial*. BMC Oral Health, 2020. **20**: p. 1-9.
22. Endrighi, R., et al., *The Longitudinal Reciprocal Relationships of Tooth Brushing Behaviors Between Underserved Children and Their Caregivers*. Annals of Behavioral Medicine, 2024. **58**(5): p. 353-362.
23. Alshemari, M.A. and S.A. Alkandari, *Oral Health Knowledge and Attitudes Towards Oral health education among elementary school teachers in Kuwait*. Oral Health Prev Dent, 2021. **19**(1): p. 595-602.
24. Křížová, P., et al., *Oral health in youth with visual impairment: A longitudinal survey*. Scientific Reports, 2024. **14**(1): p. 12273.
25. Gautam, K., et al., *New vision for improving oral hygiene status of visually impaired students aged from 9 to 17 years*. Journal of Family Medicine and Primary Care, 2020. **9**(10): p. 5303-5308.
26. Sardana, D., et al., *Effect of specially designed oral health preventive programme on oral health of visually impaired children: use of audio and tactile aids*. International dental journal, 2019. **69**(2): p. 98-106.
27. Alamsyah, R.M. and S.E. Natassa. *Difference in effectiveness of dental health education between braille and audio method towards the knowledge and oral health (OHIS) score among the blind children in Karya Murni Foundation, Tunanetra Foundation and Binjai Special Needs Foundation. in International Dental Conference of Sumatera Utara 2017 (IDCSU 2017)*. 2018. Atlantis Press.
28. Debnath, A., et al., *New vision for improving the oral health education of visually impaired children- a non randomized control trial*. Journal of Clinical and Diagnostic Research: JCDR, 2017. **11**(7): p. ZC29.
29. Tiwari, B.S., et al., *Effectiveness of different oral health education interventions in visually impaired school children*. Special Care in Dentistry, 2019. **39**(2): p. 97-107.
30. Vyas, S., et al., *Impact of comprehensible learning modes on oral health among visually impaired adults*. Special Care in Dentistry, 2018. **38**(5): p. 271-280.