



Effectiveness of Two Dental Educational Programs on the Oral Hygiene Status Among a Group of Visually Impaired Children

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ABSTRACT

Purpose: To assess the effectiveness of Audio and Audio-Tactile Performance (ATP) educational programs on oral hygiene status among a group of visually impaired children by Oral Hygiene Index Simplified (OHI-S) and assess the effectiveness of this programs in improving their oral hygiene knowledge, attitude and practice (KAP) and their satisfaction toward oral health via questionnaire before and after the programs.

Subjects and methods: A total of 86 visually impaired children ranging from (6-12) years were divided into two groups. (Group I):45 children who received the Audio method educational program. (Group II):41 children who received the Audio Tactile Performance method. The oral hygiene status was assessed for both groups by Oral Hygiene Index Simplified (OHI-S) at baseline and at two follow up examination after three months and six months. Questionnaires were taken at the baseline and at the end of the study to assess their oral hygiene knowledge, attitude and practice (KAP) and their satisfaction toward oral health. **Results:** No statistically significant difference in OHI-S scores between the two groups after 3 months from the beginning of the educational programs. A statistically significant difference in OHI-S scores between the two groups after 6 months from the beginning of the educational programs. A significant improvement in participant knowledge, attitude and practice (KAP) and their satisfaction toward the oral health in both groups after the educational programs.

Conclusion: Children with visual impairment could maintain accepted degree of oral hygiene, when taught by special customized techniques. Also for maintenance of oral hygiene practices, a regular reinforcement is required.

KEYWORDS

*Educational Program,
Visually Impaired, Audio.*

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INTRODUCTION

Health of the oral cavity is fundamental to general health⁽¹⁾. Oral health care is essential for all people. It is more significant for special needs children, as their ability to maintain good practices regarding oral health is limited. Visual impairment, is a type of disability. These children meet difficulties in directing their daily tasks⁽²⁾.

Visual perception is the capability to interpret the surrounding environment utilizing light in the visible spectrum reflected in the environment by the objects. Visual impairment, is the loss of vision that differs in degree between people which results from illness, trauma, congenital mutations or degenerative conditions⁽³⁾. Adequate information, instructions, and good care of oral hygiene are essential for children with visual impairment who are at high risk of having bad oral hygiene, because they are not in a situation to recognize early symptoms of oral diseases and might not be able to take an immediate action⁽⁴⁾.

Health education is an accepted methodology in oral diseases prevention. It is an approach of knowledge and skills transmission, which is important for enhancement of quality of life. The objectives of planned health educational program is not just to achieve new behaviors yet in addition to reinforce and keep up healthy behaviors, which will improve the health of individual and community⁽⁵⁾.

The conventional methods of teaching oral hygiene management such as using visual aids and brochures do not help the blind people⁽⁶⁾. They depend on senses like speech, touch and hearing, so different techniques must be specially designed to educate them. Braille system, is a tactile method introduced by Louis Braille. Braille is a system of bumps and indentations on a surface to address letters that can be perceived by touch. This method is utilized widely to educate individuals with visual impairment⁽⁷⁾.

Therefore this study was conducted to assess the effectiveness of audio and audio-tactile performance educational programs on oral hygiene status among a group of visually impaired children by calculating Oral Hygiene Index Simplified (OHI-S) and assess the effectiveness of this programs in improving their oral hygiene knowledge, attitude and practice (KAP) and their satisfaction toward oral health via questionnaire before and after the programs.

SUBJECTS AND METHODS

Sample size calculation was estimated using CDC Epi Info program version 7.2.0.1 (Atlanta, USA)⁽⁸⁾. The number was increased to compensate for the use of nonparametric test and to allow for losses of participants during the study.

In the present study 86 visually impaired children (severe visual impairment to total blindness) were included. 79 children attended all the educational sessions and follow up, while 7 children were excluded from the study as they did not attend all the sessions and follow up regularly.

Approval from the Research Ethics committee, Faculty of Dental Medicine for Girls, Al-Azhar University (REC code-PE-19-02), was obtained.

The present study was conducted at two schools for visually impaired children in Cairo, Egypt, namely, El Nour WI Amal School for girls and El Markaz El Namozagy School for boys, For a period of six months, after obtaining permission from school authorities. Written informed consent was obtained from participants' parents and verbal consent from the children.

-Inclusion Criteria:

1. Visually impaired children (severe visual impairment to total blindness).
2. Age between 6-12 years.
3. Children who are willing and able to return for follow up visits⁽⁸⁾.

-Exclusion criteria⁽⁴⁾:

1. Children who suffer from another disability.
2. Uncooperative children.
3. Children's parents who refused to sign the consent.
4. Children undergoing orthodontic treatment.

The study was conducted as follow:

(1)-Interaction:

- At first a series of interactive sessions were conducted with the visually impaired children. The investigator explained the purpose of the study to the children.

(2)- Pre-education examination:

a- Detailed chart was taking, including: Child's personal data, medical history and past dental history that were later confirmed during the clinical examination.

b- Clinical examination and oral hygiene status was conducted for the two groups at baseline. Examination was carried out while the child sitting on an ordinary chair in natural day light, while taking protective cross infection control measures using disposable gloves and masks. Examination was carried out using disposable mouth mirrors and sharp explorers. Caries Indices (DMFT and dmft) were assessed. The oral hygiene status was assessed by Oral Hygiene Index Simplified (OHI-S)⁽⁹⁾.

c- Assessment of children Knowledge, Attitude and Practices (KAP):

A structured simplified questionnaire in Arabic language was asked to the children by the examiner before the educational programs. It was divided into two parts:

First part: Include the personal information of the children.

Second part: Consisted of 13 closed-ended multiple choice questions, which were divided into three categories:

- Knowledge (4 questions): The children were asked about the beneficial effect of tooth brushing, the harmful effect of sweets, and fizzy drinks on teeth. Also the knowledge about the role of fluoride in dental diseases was assessed.
- Attitude (2 questions): The children were asked about the importance of regular dental visits and how often they visit the dentist.
- Practices (7 questions): The children were asked about the oral hygiene measures being used, the frequency of teeth brushing and its timing, duration of teeth brushing, what they used for teeth brushing, frequent changing of toothbrush, the parental supervision and if they take snacks during the daytime were also assessed.

d-Assessment of children satisfaction toward oral health: A questionnaire in Arabic language was done to assess the children satisfaction toward oral health before the educational programs.

Consisted of 5 (yes or no) questions: Do you complain from halitosis?, Do you complain from calculus?, Do you complain from food debris accumulation?, Do you feel easy teeth brushing? and Do you feel pain from teeth brushing?

(3)-Subjects grouping and randomization:

Children were divided randomly into the following two groups:

Group I: include 45 children who received the Audio method educational program.

Group II: include 41 children who received the Audio Tactile Performance (ATP) method.

Classes of each school were divided randomly into two groups to prevent mixing of children between the two groups.

(4)-Health education:

- Each child was given a new toothbrush and toothpaste to encourage them for maintaining oral hygiene.
- Oral health education were done for children of both groups, about: basic information about primary and permanent teeth and their importance, importance and method of tooth brushing, various oral and dental diseases, calculus and how to remove it, the effects of bad oral hygiene and tooth decay, causes of tooth decay, cariogenic and non-cariogenic diet, importance of balanced diet and instructions for maintenance of good oral hygiene.
- Children were informed to brush their teeth twice a day.
- **Group I: Audio group:**
- Oral health education was conducted for children verbally only.
- Fones technique was explained verbally to the children.
- An Arabic educational video cartoon has been played for children to hear it. Which contains information about how to keep oral health, importance of teeth brushing, importance of healthy diet and regular visits to the dentist.

- **Group II: Audio Tactile Performance group:**

Children were educated with a specially designed health education method "Audio tactile performance technique" (ATP), regarding oral hygiene maintenance:

Audio: children were first verbally informed about the importance of teeth, method of brushing, the amount of toothpaste to be used.

Tactile: the investigator taught the children about the parts of toothbrush by making them feel the bristles, handle, and neck area of toothbrush. This permitted the right situating of the toothbrush

in the mouth and developing a sequence of tooth brushing.

Performance: they were instructed to feel the teeth on a model then brushing on it using the Fones method with help. Tooth brushing technique was demonstrated to each child using a hand over hand technique. The process continued for each child individually until they were able to perform it independently, correctly and confidently. The children were asked to feel their own teeth with their tongue and any deposits to be appreciated by feeling of roughness.

An Arabic educational video cartoon has been played for children to hear it. It contains information about how to keep oral health, importance of teethbrushing, importance of healthy diet and regular visits to the dentist.

- **Braille pamphlet(10):**

Written instructions in the form of pamphlets in Braille was prepared with the help of Braille teaching staff members. It was written in Arabic Braille language to be easily understood by children. These were distributed to each child in the two groups for self-learning and to maintain good oral hygiene.

The instructions in the pamphlet comprised of:

1. Importance and function of teeth.
2. How to maintain good oral hygiene: Brush twice daily- Use soft-bristled toothbrush- Changing toothbrush every 3 months- Small amount of toothpaste- Clean the tongue daily - Regular dental checkup after every 6 months.
3. Distinguish between beneficial and harmful food habits for oral health: Rinse mouth every meal - Decrease the sugar consumption- Consume more fibrous diet (fruit and vegetables).
4. Causes of dental caries.

Also an Arabic translation of the same pamphlet was made and distributed among children's caregivers and teachers so that they can reinforce the instructions to the children.

Periodic reinforcement for both groups was performed at an interval every two weeks to check the running of the programs and motivate the children.

(5)- Posteducation examination:

- Two follow up examinations were conducted 3 and 6 months after educational programs to assess oral hygiene status using oral hygiene index simplified(OHI-s), for evaluating the effect of the dental educational program for each group.
- At the end of the study, the same questionnaires were done to assess their knowledge, attitude and practice (KAP) and their satisfaction about oral health after the implementation of the educational programs.

RESULTS

1-Oral Hygiene Simplified Index (OHI-S) :

At baseline, the median and range of the OHI-S scores were 2.60 (1.30-5.66) for group I and 3.16 (1.16-5.60) for group II. A higher value was recorded in group II, with no significant difference between groups ($p=0.177$).

At 3 months, the median and range of the OHI-s scores were 2.63 (1.32-5.21) for group I and

2.16 (0.83-5.16) for group II. A higher value was recorded in group I, with no significant difference between groups ($p=0.102$).

At 6 months, the median and range of the OHI-s scores were 2.05 (0.82-5.00) for group I and 1.30 (0.50-4.32) for group II. A higher value was recorded in group I, with a statistically significant difference between groups ($p=0.005$).

Comparing median OHI-S over time in each single group was statistically significant, $p=0.00$ for both groups. Table (1).

2- OHI-s Scoring:

At baseline, scores were 40% poor and 60% fair in group I, in comparison to 51.2% poor, 46.3% fair and 2.5% good in group II. There was no significant difference between groups ($p=0.295$).

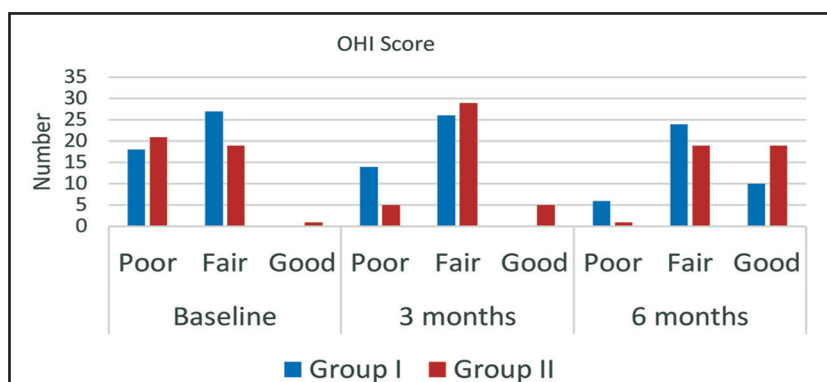
At 3 months, scores were 35% poor and 65% fair in group I, in comparison to 12.8% poor, 74.4% fair and 12.8% good in group II. This difference between groups was statistically significant ($p=0.009$).

At 6 months, scores were scores 15% poor, 60% fair and 25% good in group I, in comparison to scores 2.6% poor, 48.7% fair and 48.7 % good in group II. This difference between groups was statistically significant ($p=0.031$). Figure(1).

Table (1) Descriptive statistics and comparison of OHI between groups (Mann Whitney U test) and within the same groups throughout the study (Friedman test).

Time	Group I			Group II			P value (between groups)
	Median	Range	Mean $\pm$ SD	Median	Range	Mean $\pm$ SD	
Baseline	2.60 ^a	1.30; 5.66	2.96 $\pm$ 1.18	3.16 ^a	1.16; 5.60	3.21 $\pm$ 1.17	.177ns
3 months	2.63 ^a	1.32; 5.21	2.69 $\pm$ 1.13	2.16 ^b	0.83; 5.16	2.25 $\pm$ 0.94	.102ns
6 months	2.05 ^b	0.82; 5.00	2.22 $\pm$ 1.10	1.30 ^c	0.50; 4.32	1.54 $\pm$ 0.78	.005*
P value (within the same group)	0.00*			0.00*			

Significance level $P \leq 0.05$, * significant, ns=non-significant



Figure(1) Bar chart illustrating frequency of OHI scores at different observation times.

3- Questionnaire (KAP):

a- Knowledge:

There was a statistically significant difference between responses before and after the programs

with a significant increase in the (yes) response within the same group, ($p=0.00$) for both groups.

There was no significant difference between groups before and after the programs. Table (2).

Table(2) Descriptive statistics and comparison of Knowledge questionnaire between groups and within the same group (chi square test).

Questions	Res- ponse	Group I No. (%)			Group II No. (%)			P value between groups	
		Before	After	P value within group	Before	After	P value within group	Before	After
Q1 Brushing teeth prevents caries	Yes	14 (32.6%)	38 (95%)	0.00*	11 (28.2%)	39 (100%)	0.00*	0.669 ns	.157 ns
	No	29 (67.4%)	2 (5%)		28 (71.8%)	0 (0%)			
Q7 Using fluoride strengthens teeth	Yes	4 (9.3%)	36 (90%)	0.00*	1 (2.6%)	35 (89.7%)	0.00*	0.203 Ns	.970 ns
	No	39 (90.7%)	4 (10%)		38 (97.4%)	4 (10.3%)			
Q11 High frequency of sweets affects teeth adversely	Yes	21 (48.8%)	40 (100%)	0.00*	17 (43.6%)	39 (100%)	0.00*	.634 ns	1 ns
	No	22 (51.2%)	0 (0%)		22 (56.4%)	0 (0%)			
Q12 Sugary liquids and soda drinks affect teeth adversely	Yes	4 (9.3%)	33 (82.5%)	0.00*	5 (12.8%)	36 (92.3%)	0.00*	.611 ns	.190 ns
	No	39 (90.7%)	7 (17.5%)		34 (87.2%)	3 (7.7%)			

Significance level $p \leq 0.05$, *significant, ns=non-significant

b-Attitude:

There was a statistically significant difference between responses before and after the programs with a significant increase in the (yes) response for question 9 and a significant increase in the (regularly every 6-12 months) response for question 10, within the same group.(P=0.00) for both groups.

There was no significant difference between groups before and after the programs. Table (3).

c-Practice:

There was a statistically significant difference between responses before and after the programs within the same group.

There was significant difference between groups after the programs, regarding questions 2, 3 and 6. There was no significant difference between groups before and after the programs, regarding questions 4, 5, 8 and 13. Table (4).

Table(3) Descriptive statistics and comparison of attitude questionnaire between groups and within the same group (chi square test).

Questions	Res-ponse	Group I No. (%)			Group II No. (%)			P value between groups	
		Before	After	P value within group	Before	After	P value within group	Before	After
Q9 Regular visits to dentist are necessary	Yes	1 (2.3%)	33 (82.5%)	0.00*	0 (0%)	36 (92.3%)	0.00*	.338ns	.190ns
	No	42 (97.7%)	7 (17.5%)		39 (100%)	3(7.7%)			
	Regularly every 6-12 months	0 (0%)	17 (42.5%)		0 (0%)	23 (59%)			
Q10 How often you visit your dentist	Rarely	4 (9.3%)	1 (2.5%)	0.00*	0 (0%)	0 (0%)	0.00*	.132 Ns	.318ns
	When I feel toothache	14 (32.6%)	14 (35%)		12 (30.8%)	8 (20.5%)			
	Don't visit the dentist	25 (58.1%)	8 (20%)		27 (69.2%)	8 (20.%)			

Significance level $p \leq 0.05$, *significant, ns=non-significant

Table (4): Descriptive statistics and comparison of practice questionnaire between groups and within the same group (chi square test).

Questions	Res-ponse	Group I No. (%)			Group II No. (%)			P value between groups	
		Before	After	P within group	Before	After	P within group	Before	After
Q2 How many times do you brush?	Once	5 (11.6%)	9 (22.5%)	0.00*	3 (7.7%)	0 (0%)	0.00*	0.075 ns	.002*
	Twice	9 (20.9%)	31 (77.5%)		2 (5.1%)	39(100%)			
	Rarely	29 (67.4%)	0 (0%)		34 (87.2%)	0(0%)			
Q3 When do you brush your teeth	Morning	5 (11.6%)	7 (17.5%)	0.00*	3 (7.7%)	0 (0%)	0.00*	0.252 Ns	.002*
	Morning and evening	7 (16.3%)	27 (67.5%)		2 (5.1%)	39(100%)			
	Before bedtime	3(7%)	4 (10%)		6 (15.4%)	0 (0%)			
	Other times	28 (65.1%)	2 (5%)		28 (71.8%)	0 (0%)			

Questions	Res-ponse	Group I No. (%)			Group II No. (%)			P value between groups	
		Before	After	P within group	Before	After	P within group	Before	After
Q4 For how long you brush your teeth	<2 min	41 (95.3%)	11 (27.5%)	0.00*	37 (94.9%)	7 (17.9%)	0.00*	0.92 ns	.312ns
	>2min	2 (4.7%)	29 (72.5%)		2 (5.1%)	32 (82.1%)			
Q5 What do you use to clean your teeth	Brush & paste	25 (58.1%)	40 (100%)	0.00*	16 (41.0%)	39 (100%)	0.00*	0.156 ns	1ns
	Other things	4 (9.3%)	0 (0%)		9 (23.1%)	0 (0%)			
	Nothing	14 (32.6%)	0 (0%)		14 (35.9%)	0 (0%)			
Q6 Do you change your toothbrush	Yes	1 (2.3%)	35 (87.5%)	0.00*	0 (0%)	39 (100%)	0.00*	0.338 Ns	.023*
	No	42 (97.7%)	5 (12.5%)		39 (100.0%)	0 (0%)			
Q8 Your parents	Watch you when brushing	3 (7.0%)	17 (42.5%)	0.00*	1 (2.6%)	23 (59%)	0.00*	0.641 Ns	.332 ns
	Don't watch you but instruct to brush	8 (18.6%)	12 (30%)		7 (17.9%)	9 (23.1%)			
	Don't care about brushing	32 (74.4%)	11 (27.5%)		31 (79.5%)	7 (17.9%)			
Q13 Do you eat snacks during the day	Yes	37 (86.0%)	17 (42.5%)	0.00*	38 (97.4%)	14 (35.9%)	0.00*	.605 ns	.548ns
	No	6 (14%)	23 (57.5%)		1 (2.6%)	25 (64.1%)			

4-Assessment of children satisfaction toward oral health:

There was a statistically significant difference between responses before and after the programs within the same group, regarding questions 1 ,3 ,4 and 5 for both groups. There was no statistically significant difference before and after the program, regarding question 2 in group I, while there was statistically significant difference before and after the program in group II.

There was a statistically significant difference between groups before and after the programs

regarding question 1.

There was a statistically significant difference between groups after the program regarding questions 2 and 4. While no significant difference between groups before and after the programs regarding questions 3 and 5. Table (5).

5- Prevalence of dental caries:

Caries was detected in 86.7% in group I and 87.8% in group II, with no significant between groups ($p=0.874$), (Table 6).

Table (5) Descriptive statistics and comparison of assessment of children satisfaction toward oral health questionnaire between groups and within the same group (chi square test).

Questions	Response	Group I			Group II			P value between groups	
		Before	After	P value within group	Before	After	P value within group	Before	After
Q1 Do you complain from halitosis	Yes	32 (74.4%)	8 (20%)	0.00*	36 (92.3%)	2 (5.1%)	0.00*	w0.032*	.047*
	No	11 (25.6%)	32 (80%)		3 (7.7%)	37 (94.9%)			
Q2 Do you complain from calculus	Yes	19 (44.2%)	12 (30%)	0.182 ns	24 (61.5%)	4 (10.3%)	0.00*	.116ns	.029*
	No	24 (55.8%)	28 (70%)		15 (38.5%)	35 (89.7%)			
Q3 Do you complain from food debris accumulation	Yes	41 (95.3%)	2 (5%)	0.00*	35 (89.7%)	1 (2.6%)	0.00*	.330 Ns	.571 ns
	No	2 (4.7%)	38 (95%)		4 (10.3%)	38 (97.4%)			
Q4 Do you feel easy teeth brushing	Yes	1 (2.3%)	31 (77.5%)	0.00*	1 (2.6%)	37 (94.9%)	0.00*	.944ns	.026*
	No	42 (97.7%)	9 (22.5%)		38 (97.4%)	2 (5.1%)			
Q5 Do you feel pain from teeth brushing	Yes	29 (67.4%)	3 (7.5%)	0.00*	25 (64.1%)	0 (0%)	0.00*	.790 ns	.81 ns
	No	14 (32.6%)	37 (92.5%)		14 (35.9%)	39 (100%)			

Significance level $p \leq 0.05$, *significant, ns=non-significant.

Table (6) Descriptive statistics and comparison of prevalence of dental caries between groups (chi square test)

	Group I (n=45)	Group II (n=41)	P value (between groups)
Caries	39 (86.7%)	36 (87.8%)	0.874ns
Caries free	6 (13.3%)	5 (12.2%)	

Significance level $p \leq 0.05$,

*significant, ns=non-significant.

DISCUSSION

Studies on oral health status of visually impaired people reported that they have poorer oral hygiene and low utilization of dental services⁽¹¹⁾.

Conventional methods for teaching oral hygiene care, such as using of disclosing agents to visualize the plaque and remove it by tooth brushing, then re-disclosing periodically to screen improvement of oral hygiene status. These methods is not useful to visually impaired children because they depend mainly on feeling and hearing. Therefore, the main difference between normal and visually impaired children is the difficulty of plaque removal.

So, they need special ways of education and motivation regarding oral hygiene and its effect on oral and general health, in addition to the need of regular dental visits⁽⁵⁾.

Schools are the best environment to teach preventive dental health practices and through them education can reach their families and community members as well the best place to make a prolonged educational program, where a follow up procedures could be accessible^(12,13).

Clinical examination of all children was done by the same researcher, to ensure standardized procedures in evaluating oral health status. It was performed under natural day light using disposable mouth mirror and standard dental explores. This goes in line with several studies, which used natural daylight^(14,15) and in contrast with one study which used artificial illumination⁽¹⁶⁾.

Tooth brushing is an essential factor for effective removal of dental plaque. In this program, Fone's method was used, as it is the most commonly recommended method and could be easily practiced. This was in accordance to another study⁽¹⁷⁾. On contrary, another study was in contrast with this study, where horizontal scrub method was used⁽¹²⁾.

Direct continued motivation was performed by the means of periodic reinforcement to optimize and maintain good oral health behaviors and establish the concept that oral health care is a part of your body self care. This was in accordance with several studies that used the reinforcement concept^(18,10).

The difference between this study and similar studies was in the type of the index used. Similar studies used plaque index which measure the plaque score for each surface of the selected teeth (mesial, distal, facial and lingual), whereas the oral hygiene index simplified examined one surface only from the selected teeth which was more easily and more applicable in institutionalized children and give the same purpose which is measurement of oral hygiene status of participants⁽¹⁸⁾.

At baseline, there was no significant difference in OHI-S score between the two groups. After implementation of the educational programs, a higher value was recorded in audio group, with a statistically significant difference between the two groups. This were in accordance with another study⁽⁵⁾.

The results of this study also were in accordance with another study which concluded that the "ATP" along with oral health education served as a very effective customized method of teaching oral hygiene practices and its maintenance to the visually impaired children⁽¹⁹⁾.

In the current study, an improvement in oral health was detected due to advancement in dental knowledge, instructions given, demonstration of teeth brushing technique and motivation. This finding is in agreement with the observations of another studies^(5,19).

Prevalence of dental caries, was detected in 86.7% in audio group and 87.8% in ATP group. This revealed that visually impaired children have high caries index, which in accordance with another investigations which revealed the same observation^(20,21).

Regarding knowledge, attitude, practice and children satisfaction toward oral health, there was a significant improvement within each group after implementation of the educational programs. This is in accordance with several previous studies^(18,22-25).

At the beginning of the study, In audio group, 60% of visually impaired children had fair oral hygiene, while in ATP group 46.3% of visually impaired children had fair oral hygiene. Which is in line with another study⁽²⁶⁾.

CONCLUSION

Children with visual impairment could maintain accepted degree of oral hygiene, when taught by special customized techniques. Also for maintenance of oral hygiene practices, a regular reinforcement is required.

RECOMMENDATIONS

Further school-based dental educational programs concerning primary prevention should be established for visually impaired children. Also teachers and parents' training programs can ensure continuity of reinforcement.

Conflict of Interest

None declared.

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