

Access this article online
Quick Response Code:

Website: www.jehp.net
DOI: 10.4103/jehp.jehp_233_18

Effectiveness of oral health education program using braille text in a group of visually impaired children-before and after comparison trial

Charu Khurana, Shourya Tandon¹, Sachin Chand¹, B. R. Chinmaya¹

Abstract:

CONTEXT: Vision is the most important sense for interpreting the world and when sight is impaired, especially in childhood it can have detrimental effects on one's life. To maintain the oral health status of such group requires special approach.

AIM: The aim of this study is to evaluate the impact of Braille text and verbal, oral hygiene instructions on the oral health status of visually impaired children.

SETTINGS AND DESIGN: A prospective nonrandomized before and after comparison trial without any control group was conducted among 165 children aged 7–19 years residing in one of the blind schools in Delhi.

MATERIALS AND METHODS: A questionnaire was developed to record the source of oral health knowledge and practices. Oral health status of the children was evaluated by recording plaque index (PI) and gingival index (GI) scores at 1, 3, and 5 months intervals. Periodic reinforcement of oral health education was performed with the help of instructions in Braille language.

STATISTICAL ANALYSIS: Paired *t*-test and McNemar tests were used to assess the difference between the scores before and after oral health education.

RESULTS: Among completely blind children, the mean difference of PI and GI score from baseline to the last evaluation was found to be 0.56 and 0.28, whereas among partially blind children, it was found to be 0.58 and 0.25, respectively. All the above values were statistically significant ($P < 0.001$).

CONCLUSION: Visually impaired children irrespective of the degree of blindness could maintain an acceptable level of oral hygiene when taught using Braille text for instructions. However, continuous motivation and reinforcement at regular intervals are required for the maintenance of oral health status.

Keywords:

Braille, health education, oral health, visually impaired children

National Oral Health Program, Centre for Dental Education and Research, All India Institute of Medical Sciences, New Delhi, Department of Public Health Dentistry, SGT Dental College Hospital and Research Institute, SGT University, Gurgaon, Haryana, India

Address for correspondence:

Dr. Charu Khurana, Research Officer, National Oral Health Program, Centre for Dental Education and Research, All India Institute of Medical Sciences, New Delhi, India.
E-mail: drcharukhurana@gmail.com

Received: 24-07-2018
Accepted: 20-11-2018

Introduction

“Just because a man lacks the use of his eyes doesn't mean he lacks vision”

-Stevie Wonder

Oral health is a vital component of overall health, which contributes to each individual's

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

well-being and quality of life by positively affecting physical, social and mental health, appearance, and interpersonal relations.^[1] Special and medically compromised patients present unique challenges to dentist's skills and knowledge. It has been observed with adequate training and understanding of the various medical complications and handicapping conditions these patients can be managed well.^[2] Providing comprehensive dental care for the visually

How to cite this article: Khurana C, Tandon S, Chand S, Chinmaya BR. Effectiveness of oral health education program using braille text in a group of visually impaired children-before and after comparison trial. *J Edu Health Promot* 2019;8:50.

impaired is not only rewarding but is also a community service that health-care providers are obligated to fulfil.^[2]

Blindness is defined by the World Health Organization (WHO) as having a: “visual acuity of less than 3/60 m or corresponding visual field loss in the better eye with the best possible correction,” meaning that whilst a blind person could see a distance of 3 m, a nonvisually impaired person could see 60 m. Visual impairment relates to a person’s eyesight which cannot be corrected to normal vision.^[3] (WHO 2013)

According to the WHO, 285 million people are visually impaired worldwide: 40 million blind ones and 246 million with low sight and among them over 15 million are in India.^[4] Studies have shown that oral hygiene of blind population is significantly worse than in an equivalently sighted one.^[2,5]

The oral hygiene status of people with visual impairment can be at a disadvantage since they are less able to detect early symptoms of tooth decay that are typically recognized through vision.^[6] For example, discoloration of teeth suggests tooth decay, and bleeding when brushing is an early sign of gingival inflammation. The observation of these symptoms would remind sighted people to seek dental treatment, whereas visual impaired people will be unable to take immediate action unless informed of the situation. Hence, promotion of oral health becomes more essential for this group.^[7,8]

The key oral health promotion tool used in dentistry is oral hygiene instructions.^[9] The visually impaired depend much more on sound, speech, and touch to orient them to a situation and Braille text is a tactile writing method which enables them to learn and understand easily. Hence, the oral health education should be modified to accommodate their handicap.^[10]

Given that students who are visually impaired need to learn oral hygiene skills as do all children, dental instruction programs targeting these groups must be developed. Despite the urgent need for patients with visual impairment to learn these skills, little research has been conducted on teaching oral hygiene skills to them.^[11]

However, literature on giving oral health education and teaching oral hygiene skills to visually impaired children is very scanty or practically nil in Delhi. The dental profession has paid only a lip service in this regard. Based on these ground realities, this study was undertaken with the purpose to evaluate the effectiveness of repeated oral health education using verbal instructions and Braille text as an educative tool on oral health status of visually impaired children residing in one of the Blind Schools in Delhi.

Materials and Method

Study design, study setting, and study population

The study was conducted among 165 visually impaired males aged 7–19 years (mean 14.52 ± 4.32) residing in one of the Blind Schools in New Delhi. The study was conducted for 5 months from June to October 2015. This was a nonrandomized before and after comparison trial without controls. The baseline value of the same group served as its own control.

Children irrespective of the degree of visual impairment and who were free from any other form of mental or physical handicapping conditions were included in the study, whereas medically compromised children, children using any chemical mode of plaque control, and children under medications that could affect the state of the gingival tissues were excluded from the study.

Ethical considerations

Ethical approval was obtained before study from the ethical review board of the institute. Official permission to conduct the study was obtained from the school authority and informed consent from their parents/guardians/caretakers/individuals themselves before the start of the study.

Training and calibration

Before the commencement of the study, the examiner was trained and calibrated to ensure the consistent examination. The intraexaminer reliability for plaque index (PI) 1967^[12] and gingival index (GI) 1963^[13] using Kappa statistics was found to be 0.88.

Assessment plan

The Baseline or pre-intervention assessment was carried out in two phases:

Phase 1

A self-designed format was used to record the demographic details such as name, age, gender, the degree of visual impairment, sources of information about oral health, frequency, and proper method of brushing (modified bass technique).

All the children were divided into totally blind and partially blind groups according to the WHO definition of blindness and visual acuity was recorded using Snellen’s illiterate E chart.^[14] Based on the best-corrected visual acuity children were grouped into the following categories:

Completely blind: visual acuity worse than counting fingers at three meters (3/60) including the presence or absence of light perception in the better eye. Partially blind: visual acuity worse than 6/18 but better than 3/60 in the better eye.

Responses to questions for the frequency of tooth brushing was designated as sometimes, once or twice a day whereas for the question to method of brushing as proper or improper.

Phase 2

A clinical examination was undertaken for all visually impaired children by one examiner. PI (Silness and Loe) and GI (Loe and Silness) were recorded to assess their oral hygiene and gingival health status.^[15] Before the start of the study, how the instruments and how each would be used was explained.

Oral health education program

All the visually impaired children received oral health education and motivation at every 3-weeks in 5 months. Written material in the form of pamphlets in Braille was prepared with the help of Braille teaching staff members. These were distributed to each and every child for self-learning. The contents of pamphlets were based on the level of understanding and comprehension of participants. The instructions in the pamphlet comprised:

- Importance of oral health
- Importance and functions of teeth
- Importance of brushing twice a day
- Proper method of tooth brushing
- Different oral hygiene aids
- Distinguish between beneficial and harmful foods for oral health
- Harmful oral habits.

Assessment of the impact of oral health education intervention/postintervention

Frequency and method of tooth brushing were evaluated at the end of 5 months after completion of the oral health education program, whereas oral hygiene status and gingival health status were evaluated "twice" at the end of every 2 months.

Statistical analysis

The collected data were entered into Microsoft Excel 2007 and subjected to statistical analysis using SPSS version 20.0 (IBM Statistics Inc., Chicago, Illinois, USA). The statistical tests used was paired *t*-test and McNemar test to assess the difference between the scores before and after oral health education. A difference was considered to be of statistical significance if the value of *P* < 0.05.

Results

All the students of the visually impaired school aged 7–19 selected by nonprobability sampling method (convenience) participated in this study. Children were divided into two groups according to their visual impairment. Completely blind children 86 (52.12%)

represented a slightly larger proportion of the study population [Figure 1].

The source of oral health information showed in Figure 2: nearly 54.65% of completely blind children and 51.89% of partially blind children reported that they had not received any information about taking care of their teeth before the study. The main source of oral health information was found to be school among complete (23.25%) and partial (17.72%) blind children. There was no statistically significant difference between the groups (*P* > 0.05).

The frequency of brushing teeth reported by the children pre- and post-intervention of giving Oral health education is presented in Table 1. Preintervention results showed 52.12% children brush their teeth once a day and 12.12% of children not used to brush every day but sometimes whereas after dental health education; postintervention results showed 77.57% of children reported tooth brushing twice a day. On statistical evaluation, the overall result was found to be very highly statistically significant (*P* < 0.001).

On pre intervention, the majority of visually impaired children (52.72%) presented improper method of brushing. After oral health education program at the end of the study, 63.03% of children found to be following with the proper method of brushing. The difference in result found to be statistically significant (*P* < 0.01) [Table 2].

Clinical evaluation of PI and GI scores (mean) among complete and partially blind children from baseline to following two evaluations has been presented through Figure 3. PI and GI scores for complete blind children found to be 2.07 and 1.94 at baseline; 1.77 and 1.6 at the 1st evaluation; 1.51 and 1.36 at the 2nd evaluation, respectively. For partial blind children PI and GI scores found to be 0.93 and 0.77 at baseline; 0.79 and 0.65 at 1st evaluation; 0.65, and 0.52 at 2nd evaluation, respectively.

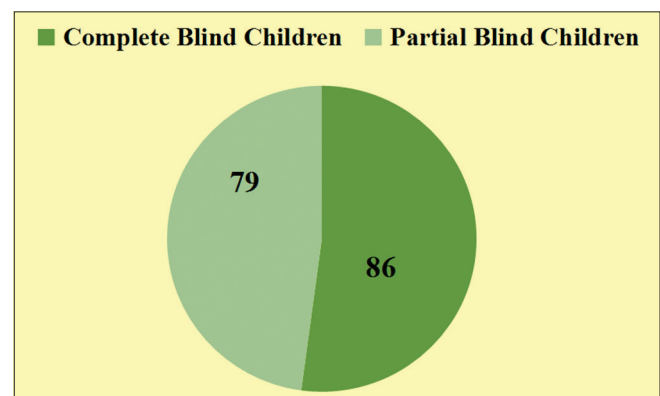


Figure 1: Distribution of study population with respect to degree of blindness

Table 1: Frequency of Tooth Brushing among the study population: Pre- and post-intervention

Study Population	Once a day (%)		Twice a day (%)		Sometimes (%)		P
	Pre int	Pos tint	Pre int	Pos tint	Pre int	Post int	
Complete blind children	50 (58.13)	21 (24.41)	25 (29.06)	61 (70.93)	11 (12.79)	4 (4.65)	0.001*
Partial blind children	36 (45.56)	11 (13.92)	34 (43.03)	67 (84.81)	9 (11.39)	1 (1.26)	0.01*
Total	86 (52.12)	32 (19.39)	59 (35.75)	128 (77.57)	20 (12.12)	5 (3.03)	<0.001*

*P<0.05. Mc Nemar-Bowker test. Pre int=Pre intervention, Post int=Post intervention

Table 2: Method of tooth brushing among the study population: Pre and post intervention

Study Population	Proper brushing method		Improper brushing method		P
	Pre int	Post int	Pre int	Post int	
Complete blind children	37 (43.02)	48 (55.81)	49 (56.97)	38 (44.18)	0.03*
Partial blind children	41 (51.89)	56 (70.88)	38 (48.10)	23 (29.11)	<0.01*
Total	78 (47.27)	104 (63.03)	87 (52.72)	61 (36.96)	<0.01*

*P<0.05. Mc Nemar test. Pre int=Pre intervention, Post int=Post intervention

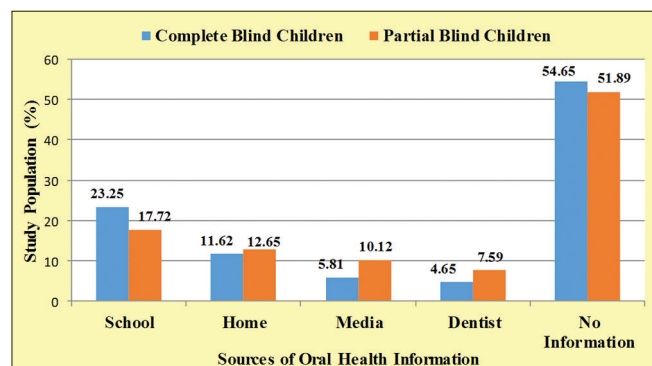


Figure 2: Distribution of study population with various sources of oral health information

Results for both complete and partially blind children found to be statistically significant ($P < 0.001$).

Comparison of PI and GI scores within the group at baseline, 1st, and 2nd evaluation is depicted in Tables 3 and 4. In a group of completely blind children, the mean difference of PI and GI score between the baseline and 1st evaluation was 0.30 and 0.14, between the baseline and 2nd evaluation, it was 0.56 and 0.28. The PI and GI score between the 1st and 2nd evaluation was 0.26 and 0.14, respectively. In a group of partially blind children, the mean difference of PI and GI score between baseline and 1st evaluation was 0.34 and 0.12, between baseline and 2nd evaluation, it was 0.58 and 0.25. The PI and GI scores between the 1st and 2nd evaluation were 0.24 and 0.13, respectively. All the above values were statistically significant ($P < 0.001$).

Discussion

The goal of planned health education programs is not only to bring about new behaviors, but also to reinforce and maintain healthy behaviors that will promote and improve health. The concepts of repetition and reinforcement of oral hygiene instructions show significant, positive, short range, and long-term effects.^[16]

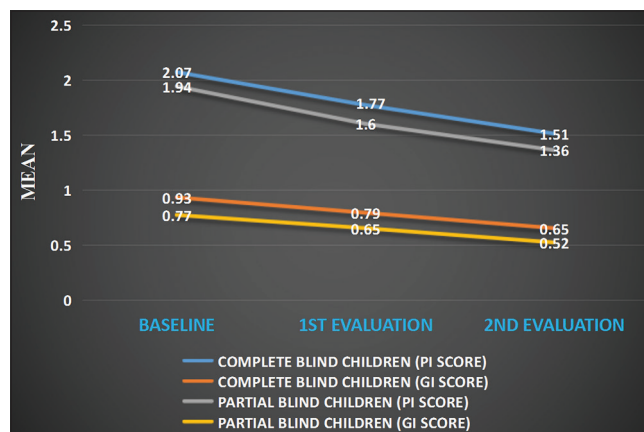


Figure 3: Clinical evaluation of plaque index and gingival index scores (mean) among complete and partial blind children on subsequent interval

Schools are thought to be the most suitable environment to provide health information to children to achieve the goals of health education programs, as children are relatively accessible and are already in a learning environment. However, some subgroups of children with disabilities are constantly getting neglected in receiving oral health education. The higher level of oral disease among the disabled may be because teaching students to manage their disability is of major concern among the educators and oral hygiene is of least priority.^[9]

Visual Impairment is perhaps the worst form of disability and even a very common one. Most importantly it makes an affected individual to constantly depend on others for even daily routine tasks, hurting an individual's self-esteem.^[17]

To conduct the following study a distinction was made between partially and completely visually impaired children because more explanation was needed in the latter category. In this study, it was seen that partially visually impaired children were more perceptive and conceptual and interacted more effectively than completely visually impaired children. This is in

Table 3: Reduction of mean plaque index scores at different time intervals on the basis of degree of blindness

Study population	Time (I)	Time (J)	Mean difference (I-J)	P
Complete blind children	Baseline	1 st evaluation	0.30	<0.001*
		2 nd evaluation	0.56	<0.001*
Partial blind children	Baseline	1 st evaluation	0.26	<0.001*
		2 nd evaluation	0.58	<0.001*
	1 st evaluation	2 nd evaluation	0.24	<0.001*

*P<0.05. Paired t-test

Table 4: Reduction of mean gingival index scores at different time intervals on the basis of degree of blindness

Study population	Time (I)	Time (J)	Mean difference (I-J)	P
Complete blind children	Baseline	1 st evaluation	0.14	<0.001*
		2 nd evaluation	0.28	<0.001*
Partial blind children	Baseline	1 st evaluation	0.14	<0.001*
		2 nd evaluation	0.12	<0.001*
	1 st evaluation	2 nd evaluation	0.25	<0.001*
		2 nd evaluation	0.13	<0.001*

*P<0.05. Paired t-test

agreement with results reported by Yalcinkaya and Atalay.^[18]

The study showed that the majority of all children (53.33%) had no information about taking care of their teeth. A study completed by Chang and Shih^[19] found that children with visual impairment were less knowledgeable about their oral care.

The present study revealed that a substantial proportion of the children (35.75%) reported brushing twice a day, but after dental health education program 77.57% of children came out with brushing twice a day. Studies conducted by Nandini^[21] and Ahmad *et al.*^[20] assessed 10.67% and 24.0% visually impaired children, respectively, who brush teeth twice a day without imparting any dental health education.

The tooth brushing technique is an important factor for effective maintenance of oral hygiene. An Overall 52.72% of children of our study presented improper method of brushing, whereas 38.63% of children following improper brushing method reported by Dorout *et al.*^[21] In our study, after receiving oral health education 63.03% of children came out with following proper brushing method.

In the present study, oral health education in the form of verbal instructions and Braille text was utilized to stimulate motivation in these children. On clinical evaluation, this study showed a statistically highly significant result in the mean plaque and GI scores

(that is increase in mean difference of PI and GI score) at all-time intervals (1st and 2nd evaluation) among both groups of completely and partially visually impaired children as compared to the baseline. The study conducted by Chowdary *et al.* (2016)^[22] divided visually impaired children into three different groups on the basis on different education tool (verbal, Braille text and in combination, respectively) and evaluated plaque and GI scores at the end of 3 months and revealed reduction in plaque and gingival scores among all groups. One of the studies reported by Krishnakumar *et al.*^[23] reported a significant reduction in plaque scores after giving oral health education using the audio-tactile method. Similarly, in 3 months follow-up study, Bansal^[24] recorded improvement in GI scores after using auditory aid as an education tool. Various studies^[25-28] have been conducted to explore different education tools to make visually impaired children understand about the importance of oral health and eventually have recorded improved results in their oral health knowledge, practices, and status also.

Hence, this study has shown that the customized, individualized teaching methods for visually impaired children are extremely beneficial and when special children are concerned, health education needs to be extended to parents and other responsible persons such as their instructors who are specially trained to teach them. Visually impaired people have an equal right to have a good oral health and social care information needs which are worthy of exploration.^[29]

Limitations of the study

- The blind school taken up for the study includes only males as students. Thus, data for gender differences could not be able to make out
- Children might have had the tendency to give socially acceptable answers, which became a potential bias for the study
- This study was done without control group. Comparative studies with control group should be done to get better result
- Further studies need to be conducted on a large scale with the appropriate sample size calculation involving as many blind schools as possible.

Conclusion

The findings of this study revealed statistically significant reduction in the mean PI and GI scores among both complete and partial visually blind children at all time intervals (1st and 2nd evaluation) as compared to the baseline ($P < 0.001$) thus, the present showed that an effective, repetitive dental health education could not only improve awareness and attitude toward importance of oral health but also can bring a significant change

in oral hygiene and gingival health status of visually impaired children. However, continuous motivation and reinforcement at regular intervals are required for the maintenance of oral health status.

Recommendation

- Promote awareness and training to utilize oral hygiene aids among visually impaired people
- Different brands of oral health care products should imbibe their products' name and basic details in also Braille language so that can be easily identified and utilized by visually impaired people.

Acknowledgment

The authors would like to thank the participants of the study and management of Blind School Association, Delhi.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Gift HC, Atchison KA. Oral health, health, and health-related quality of life. *Med Care* 1995;33:NS57-77.
2. Nandini NS. New insights into improving the oral health of visually impaired children. *J Indian Soc Pedod Prev Dent* 2003;21:142-3.
3. Brown D. An Observational Study of oral Hygiene Care for Visually Impaired Children BDS, Elective; 2008. Available from: <http://www.gla.ac.uk/enlighten>. [Last accessed on 2016 Jan 23].
4. World Health Organization. Visual Impairment and Blindness (Fact Sheet 282); 2011. Available from: <http://www.who.int/mediacentre/factsheets/fs282/en>. [Last accessed on 2016 Feb 24].
5. Solanki J, Gupta S, Chand S. Comparison of dental caries and oral hygiene status among blind school children and normal children, Jodhpur City, Rajasthan, India. *Univ Res J Dent* 2014;4:22-5.
6. Schembri A, Fiske J. The implications of visual impairment in an elderly population in recognizing oral disease and maintaining oral health. *Spec Care Dentist* 2001;21:222-6.
7. Kumar S, Konde S, Raj S, Agarwal M. Effect of oral health education and fluoridated dentifrices on the oral health status of visually impaired children. *Contemp Clin Dent* 2012;3:398-401.
8. Anaise JZ. Periodontal disease and oral hygiene in a group of blind and sighted Israeli teenagers 14-17 years of age. *Community Dent Oral Epidemiol* 1979;7:353-6.
9. O'Donnell D, Crosswaite MA. Dental health education for the visually impaired child. *J R Soc Health* 1990;110:60-1.
10. Mahantesha T, Nara A, Kumari PR, Halemani PK, Buddiga V, Mythri S, *et al.* A comparative evaluation of oral hygiene using braille and audio instructions among institutionalized visually impaired children aged between 6 years and 20 years: A 3-month follow-up study. *J Int Soc Prev Community Dent* 2015;5:S129-32.
11. Krishna Kumar RV, Fareed N, Shanthi M. The Effectiveness of oral health education program with and without involving self – Maintainable oral hygiene skills among the visually impaired children. *Int J Sci Study* 2013;1:51-5.
12. Loe H. The gingival index, the plaque index and the retention index systems. *J Periodontol* 1967;38:Suppl: 610-6.
13. Loe H, Silness J. Periodontal disease in pregnancy. I. Prevalence and severity. *Acta Odontol Scand* 1963;21:533-51.
14. Snellen's illiterate E chart. Available from: <http://www.apps.who.int/classifications/icd10/chapter7/H53-H54>. Last accessed on 24-05-2015.
15. Wei SH, Lang KP. Periodontal epidemiological indices for children and adolescents: I. Gingival and periodontal health assessments. *Pediatr Dent* 1981;3:353-60.
16. Emler BF, Windchay AM, Zaino SW, Feldman SM, Scheetz JP. The value of repetition and reinforcement in improving oral hygiene performance. *J Periodontol* 1980;51:228-34.
17. Titiyal JS, Pal N, Murthy GV, Gupta SK, Tandon R, Vajpayee RB, *et al.* Causes and temporal trends of blindness and severe visual impairment in children in schools for the blind in North India. *Br J Ophthalmol* 2003;87:941-5.
18. Yalcinkaya SE, Atalay T. Improvement of oral health knowledge in a group of visually impaired students. *Oral Health Prev Dent* 2006;4:243-53.
19. Chang CS, Shih Y. Knowledge of dental health and oral hygiene practices of Taiwanese visually impaired and sighted students. *J Vis Impair Blind* 2004;98:5.
20. Ahmad MS, Jindal MK, Khan S, Hasmi SH. Oral health knowledge, practices, oral hygiene status and dental caries prevalence among visually impaired students in residential institute of Aligarh. *J Dent Oral Hyg* 2009;1:22-6.
21. Dorout IA, Tobaigy FM, Moaleem MM, Ahmad M, Shubayr MA, Kinani HM. Knowledge and oral health related behaviour among visually impaired subjects in Jazan region, Saudi Arabia. *J Dent Oral Hyg* 2015;7:33-9.
22. Chowdary PB, Uloopi KS, Vinay C, Rao VV, Rayala C. Impact of verbal, braille text, and tactile oral hygiene awareness instructions on oral health status of visually impaired children. *J Indian Soc Pedod Prev Dent* 2016;34:43-7.
23. Krishnakumar R, Silla SS, Durai SK, Govindarajan M, Ahamed SS, Mathivanan L. Comparative evaluation of audio and audio – Tactile methods to improve oral hygiene status of visually impaired school children. *CHRISMED J Health Res* 2016;3:55-9.
24. Bansal M. Effect of auditory aid in improving oral hygiene among visually impaired children in Chandigarh city, India – A Longitudinal study. *Oral Health Dent Manage* 2014;13:894-6.
25. Avasthy K, Bansal K, Mittal M, Marwaha M. Oral health status of sensory impaired children in Delhi and Gurgaon. *Int J Dent Clin* 2011;3:21-3.
26. Ganapathy AK, Namineni S, Vaaka PH, Vamsilatha K, Das R, Devi M, *et al.* Effectiveness of various sensory output methods in dental health education among Blind children – A comparative study. *J Clin Diagn Res* 2015;9:zc75-8.
27. Kadkhoda J, Rezaie A, Amiri A. Effect of visual impairment education on the improvement of oral hygiene and reduction of periodontitis prevalence. *Int J Med Dent* 2014;4:7-12.
28. Joybell C, Krishnan R, V SK. Comparison of two brushing methods- fone's vs modified bass method in visually impaired children using the audio tactile performance (ATP) technique. *J Clin Diagn Res* 2015;9:ZC19-22.
29. Beverley CA, Bath PA, Booth A. Health information needs of visually impaired people: A systematic review of the literature. *Health Soc Care Community* 2004;12:1-24.