

Evaluation of Oral Health Education Programs for Visually Impaired Children: Knowledge, Attitudes, and Practices in Kerala

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ABSTRACT:

Background: Visually impaired children have unique challenges to getting and maintaining oral health: not having access to traditional visual learning resources, relying on others to care for them and not being able to see the plaque on their teeth. The use of non-visual sensory methods for oral health education has been suggested as an effective intervention but there is little evidence in the South Indian context.

Objective: The Multisensory Oral Health Education (OHE) program's effectiveness in improving knowledge, attitudes, and practices (KAP) among visually impaired children attending special schools in Kerala was assessed.

Methods: The 150 children aged 8-16 from six residential schools for the blind were selected for the quasi-experimental, single group pre test-post test study. A KAP questionnaire was validated and administered at baseline, immediately following the four-session multisensory intervention (tactile dentition models, braille leaflets, audio modules and modified Audio-Tactile Performance technique) and at three months. Paired t tests, the McNemar test and analysis of variance were used to analyze the data, and

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the significance level was set at $p < .05$.

Results: All assessments were completed with 142 children (94.7%) of the 150 enrolled. At the end of the intervention, mean knowledge scores increased from 6.8 (± 2.1) at baseline to 12.1 (± 1.8) immediately after the intervention ($p < .001$) and remained at 11.3 (± 1.9) at 3 months. There were similar, statistically significant improvements in attitude and practice scores. The percentage of children who brush twice a day increased from 28% to 61%, and fluoride toothpaste use increased from 41% to 79%. Children with low vision had scores which were slightly higher than those of the children with total blindness, but both groups significantly improved scores.

Conclusion: The structured multisensory OHE programme achieved considerable and mostly sustained gains in the oral health KAP of visually impaired children in Kerala. The learning methods of tactility and hearing should be introduced in the routine health program of special schools, and be reinforced on a regular basis.

Keywords: visual impairment, oral health education, knowledge attitudes practices, special needs dentistry, Audio-Tactile Performance, Kerala

1. Introduction

Oral health is part of overall health and quality of life, and is among the least addressed aspects of well-being among children with disabilities. The World Health Organization (WHO, 2022) has identified that people with disabilities have poorer oral health outcomes than the general population and have unmet oral health treatment needs, many of which are due to physical, attitudinal and informational barriers. Children with a sensory disability, specifically visual impairment, are at an even more difficult position as the usual means of disseminating oral health information – pictures, charts, showing them in the mirror, and reading to them from a printed pamphlet – are not accessible to them (Tagelsir et al., 2013). Visual input provides the largest amount of sensory input for children to learn self care behaviors. A child with vision is able to form a habit of brushing by observing his parent brush, and then by looking at the image in the mirror and checking the results. The blind or low vision child must then use touch, hearing, proprioception and verbal directions to navigate. This dependency is measurable and several research studies have found that children who are

visually impaired have higher plaque scores and more gingival inflammation than sighted children, and have a poorer brushing technique (Krishnakumar et al., 2009; Mahantesha et al., 2015). Not being able to see the plaque or bleeding gums eliminates one of the positive feedback loops that would otherwise encourage proper actions. This is a serious concern because of the magnitude of childhood visual impairment. In the world, millions of children have moderate to severe visual impairment or blindness and a large proportion of this is in South Asia. Many children who are blind would not be blind if the condition could have been prevented or cured, but many do become blind and are educated in special schools where they may be unable to receive full attention to their other needs. Oral diseases, which are largely preventable with self-care and dietary measures, are the exact type of health problem that can be tackled by a well-designed educational program, and therefore are an ideal and high-reward target for prevention. Although Kerala ranks consistently high in literacy and human development indicators, it has a well-established Network of Residential and Day Schools for Blind Children in the

country. India is home to one of the largest number of visually impaired children in the world and despite its constantly high ranking in all the indicators of literacy and human development, Kerala has well-developed Network of Residential and Day Schools for Blind Children. The organized environment of these institutions can be used to develop and implement targeted health interventions. Oral health education programs are, however, often targeted at sighted children in such schools with materials and approaches developed for the sighted students, making them less relevant and effective (Hebbal & Ankola, 2012). Additionally, the residential setting of some of these schools can influence eating habits, snack time and the frequency of mealtimes, as well as hygiene practices during the day, and thus the maintenance of good oral health, both positively and negatively based on the support provided to the student. There is increasing evidence on the use of multisensory and adapted teaching approaches with this population. There is potential for improving knowledge and oral hygiene status using the Audio-Tactile Performance (ATP) technique, which enables children to explore enlarged tactile models of teeth, and simultaneously gain a verbal explanation before demonstrating the brushing action on themselves (Hebbal & Ankola, 2012; Joybell et al., 2019). Braille pamphlets, audio recordings and large high-contrast models for children with remaining sight offer alternative methods of achieving the same learning goals. However, rigorously-designed evaluations that integrated knowledge, attitudes and practices, and measured the long-term sustainability of the effect of the interventions are limited, especially in the South Indian context.

Knowledge-attitude-practice (KAP) is a structured approach for measuring health education programmes. Oral health knowledge refers to the cognitive knowledge of oral health concepts, attitude refers to beliefs and dispositions that influence oral health behavior and practice refers to the actual self-care oral health behaviors performed. While the three domains are not necessarily sequential, knowledge and positive attitudes are generally

considered to be important, although not necessarily sufficient, steps that lead to lasting behavior change (Glanz et al., 2015). In the context of this background, the present study was conducted to assess an organized multisensory oral health education programme for visually impaired children in the special schools of Kerala. These specific objectives were: (a) to evaluate baseline levels of oral health knowledge, attitudes and practices; (b) to measure the immediate effect of the intervention on the respective domains of KAP; (c) to observe the retention of immediate effects at the 3-month follow-up; (d) to assess effectiveness based on quality of vision, age and sex. The multisensory program was hypothesized to statistically significantly improve KAP in each of the three domains and that a significant amount of these gains would be maintained at follow-up.

2. Review of Literature

2.1 Oral health status of visually impaired children

Several studies have reported disadvantaged oral health status in children who are visually impaired compared to sighted children. Krishnakumar et al. (2009) found significantly higher plaque and gingival index in visually impaired children than in the non-visually impaired, suggesting that the problem was of ineffective brushing and not due to a lack of effort on the part of the visually impaired children. The same is true of the comparative studies that have been conducted internationally; while Tagelsir (2013), in the study of German children, observed that the visual impairment was correlated to the oral hygiene, it was not correlated to the number of caries, but targeted oral hygiene instruction may lead to disproportionate results. This difference in mechanism has always been correlated with the lack of visual feedback. If children are unable to see plaque, food debris or bleeding gums, they are unable to assess the effectiveness of their brushing and may rely on their parents or caregivers to do this. Access to appropriate health information is limited in some cases and the focus on other areas of rehabilitation rather than

oral health within some families and institutions also adds to the issue (Mahantesha et al., 2015).

2.2 Adapted oral health education strategies

Current approaches were recognized as somewhat unsuccessful and researchers have developed and tested various education adaptations through sensory modality. The Audio-Tactile Performance (ATP) technique developed and adapted by Hebbal and Ankola (2012) combines verbal description (audio), tactile learning using perceptual models (tactile), and supervised self-performance, and has been shown to lead to improvements in oral hygiene maintenance in visually impaired children. Further trials have used ATP as a comparison to Braille instruction and to conventional verbal instruction, with most showing a preference for the multisensory and hands on approach (Joybell et al., 2019; Bhor et al., 2016). Written oral health information has been provided in Braille to children who can read it well, but the percentage of visually impaired children who are able to read Braille is highly variable, and the use of Braille alone may leave children with other learning disabilities out of the loop. Therefore, tactile dentition models that children can feel the morphology of teeth and the angulation of a toothbrush have become important adjuncts, as have audio recordings. Large format visual aids of high contrast value is useful and can be used in conjunction with touch and auditory support for children with low vision (Chowdary et al., 2016). One reoccurring theme in these texts is behavioral reinforcement and repetition. Single-session interventions are likely to result in short-term gains that fade over time, while repeated sessions and periodic reinforcement are likely to result in long-term gains. This finding is consistent with health behavior theory that states that behavior change from knowledge to sustained action requires practice, feedback, and environmental cues (Glanz et al., 2015).

2.3 The KAP framework and research gap

Many attempts to assess interventions to improve oral health use knowledge, attitude and practice surveys to assess the complementary aspects of

behaviour change. There has, however, been a bias towards clinical indices (e.g., plaque scores) or towards knowledge alone, and few studies have studied attitudes and self-reported practices together. In addition, there is limited evidence of the longevity of learning effects. Although there is the strong institutional setup for the education of children with disabilities in Kerala, published assessment of structured, multisensory oral health program for visually impaired children is limited. The present study seeks to fill this gap by examining a multisensory program in all three domains of KAP and by adding a three-month follow-up to examine retention, providing context-specific evidence to inform school health policy.

2.4 Theoretical underpinning

Oral health education programs can be effectively designed and evaluated from known health-behavior theory. Social cognitive theory focuses on the interaction of personal, behavioural and environmental factors and considers self-efficacy (confidence in ability to execute a behavior) a key factor influencing behavior (Glanz et al., 2015). Visual impairment children's self-efficacy in oral cleanliness are not only influenced by their knowledge but also by the conditions of practice and feedback. The Audio-Tactile Performance technique can be considered an operationalization of these principles: a pairing of cognitive input and guided mastery experience, which is the strongest source of self-efficacy. Even though the KAP model has been criticized for taking a merely linear progression from knowledge to action, it is still a practical, evaluative tool if its drawbacks are recognized. Knowledge and positive attitudes are typically necessary conditions for behaviour change, but are not sufficient, and improvements in all three areas are more likely to lead to programme impact than improved knowledge alone. This study thus assessed all three domains, and further analyzed individual items to determine which concepts and behaviors were most responsive to the intervention.

3. Materials and Methods

3.1 Study design and setting

A quasi-experimental single group pre-test–post-test design with three-month follow-up was used. This study was carried out in six residential and semi-residential special schools for the blind,

spread all over central and southern Kerala. Institutions were chosen as they had a large enough catchment of children in the target age group and were willing to join the project. The number of participants who went through the study is summarized as shown in Figure 1.

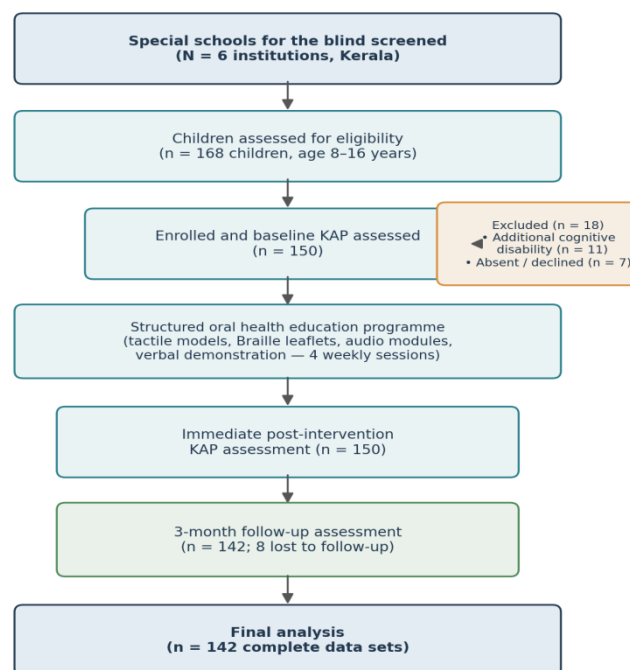


Figure 1. Flow of participants through the study.

Figure 1. Flow of participants through the study, from screening to final analysis.

3.2 Participants and sampling

Children between the ages of 8-16 years with a documented diagnosis of visual impairment (low vision or total blindness) were eligible. Children with known additional cognitive or developmental disabilities which would render them unable to understand the questionnaire and those whose parents/guardians refused consent were not included. A total of 168 children were screened, of which 18 were excluded (11 due to further cognitive disability, 7 due to absence or refusal) leaving 150 children enrolled. Sample size was calculated to detect a difference of one point in the mean knowledge score, 80% power, and a two-sided alpha of .05, which resulted in a sample size of at least 128 children, and the actual sample size actually exceeded that.

3.3 Instrument

A KAP questionnaire was developed after examining previously validated questionnaires that have been used in similar population groups and taking expert advice from three public health dentistry specialists. The instrument consisted of three parts, knowledge (15 items, one mark per item; possible range 0 to 15), attitude (5 items, scored on a 5-point Likert-type scale; possible range 5 to 25), and practice (10 items; possible range 0 to 10). The content validity index (CVI = 0.86) was used to assess the content validity, and internal consistency of the instrument was acceptable (Cronbach's α = 0.79 for knowledge and 0.74 for attitude). To overcome the barriers of literacy and proficient use of Braille imposed by a self-administered form of the questionnaire, it was translated into Malayalam, back translated and administered orally by trained interviewers in a one-to-one format which suited the needs of the children in terms of their visual status.

3.4 Intervention

The educational program was delivered in four weekly sessions of about 40 minutes per session in small groups of 6-8 children. The four sensory adapted components included the enlarged tactile models of the dentition and a large toothbrush to enable children to experience the morphology of their teeth and the correct brush angulation, Braille leaflets summarising key messages for children who were fluent in Braille, audio modules explaining concepts around oral health and providing step-by-step instructions for brushing, and the modified Audio-Tactile Performance technique, whereby children were verbally instructed and then guided through the tactile exploration, before supervised self-performance of the brushing action, providing feedback individually in Braille. Topics discussed included the contributing factors to dental caries and periodontal disease, appropriate brushing frequency and method, the importance of fluoride in dental health, dietary management of sugar and the importance of routine dental visits. A total of two calibrated investigators provided all sessions to keep them consistent.

3.5 Data collection and analysis

The KAP questionnaire was used at three time points: baseline prior to the first session, immediately at the end of the last session and three months post intervention. The data were collected in a spreadsheet and analyzed by using the conventional statistical software. Paired t tests and repeated-measures ANOVA (with Bonferroni correction for pairwise comparisons) were used to compare continuous KAP scores at the three time points. Dichotomous practice behaviors were compared the change with the McNemar test. Independent-samples t tests and one-way analysis of variance were used to determine differences by degree of visual impairment, by age group and by sex.

Throughout, $p < .05$ was used as the criterion for statistical significance. The investigators were calibrated beforehand for the consistency in administering the questionnaire and delivering the intervention. There was a high inter-examiner agreement between the two examiners when scoring knowledge ($\kappa = 0.82$), as this was done in conjunction with joint review of the scoring criteria, mock administration with a small group of children not included in the study, and discussion to resolve any discrepancies. Prior to the main study, the questionnaire was conducted with ten visually impaired children to ensure clarity, accessibility and suitable completion time. The questionnaire was pilot tested with ten visually impaired children before the main study to confirm clarity, accessibility and appropriate completion time. The purpose of these measures was to reduce measurement error and to ensure that the observed changes were a reflection of the learning process, not the measurement process.

3.6 Ethical considerations

The study protocol was cleared by the institutional ethics committee and management of each of the selected school. Parents and legal guardians provided written informed consent, and after the purpose and procedures were explained in a way that was accessible to them, each child gave verbal assent. There was no obligatory attendance, the data was anonymised and children identified as needing dental treatment in the screening were referred for treatment.

4. Results

142 children (94.7% of the 150 enrolled) completed all three assessments and were included in the final analysis; eight children were lost to follow-up because they were transferred or had been missing for a prolonged period. The demographic characteristics of the sample analyzed is shown in table 1.

Table 1. Demographic characteristics of participants (n = 142).

Characteristic	Category	n	%
Age group	8–11 years	64	45.1
	12–16 years	78	54.9
Sex	Male	81	57.0
	Female	61	43.0
Degree of impairment	Low vision	78	54.9
	Total blindness	64	45.1
Onset	Congenital	96	67.6
	Acquired	46	32.4
Accommodation	Residential	104	73.2
	Day scholar	38	26.8

4.1 Overall changes in knowledge, attitudes, and practices

Mean scores in all three KAP domains improved markedly and statistically significantly from baseline to the immediate post-intervention assessment, and the gains were largely retained at three months (Table 2; Figure 2). Mean

knowledge scores rose from 6.8 (± 2.1) at baseline to 12.1 (± 1.8) immediately after the program, a mean increase of 5.3 points ($p < .001$), declining only slightly to 11.3 (± 1.9) at follow-up. Attitude scores improved from 16.4 (± 3.2) to 21.3 (± 2.6) and practice scores from 4.2 (± 1.5) to 7.6 (± 1.4), both highly significant ($p < .001$).

Table 2. Mean ($\pm$ SD) KAP scores at baseline, immediate post-intervention, and three-month follow-up (n = 142).

Domain (max)	Baseline	Post	Follow-up	Mean diff*	p
Knowledge (15)	6.8 $\pm$ 2.1	12.1 $\pm$ 1.8	11.3 $\pm$ 1.9	+5.3	< .001
Attitude (25)	16.4 $\pm$ 3.2	21.3 $\pm$ 2.6	20.6 $\pm$ 2.8	+4.9	< .001
Practice (10)	4.2 $\pm$ 1.5	7.6 $\pm$ 1.4	7.1 $\pm$ 1.5	+3.4	< .001

*Mean difference is baseline to immediate post-intervention; paired *t* test.

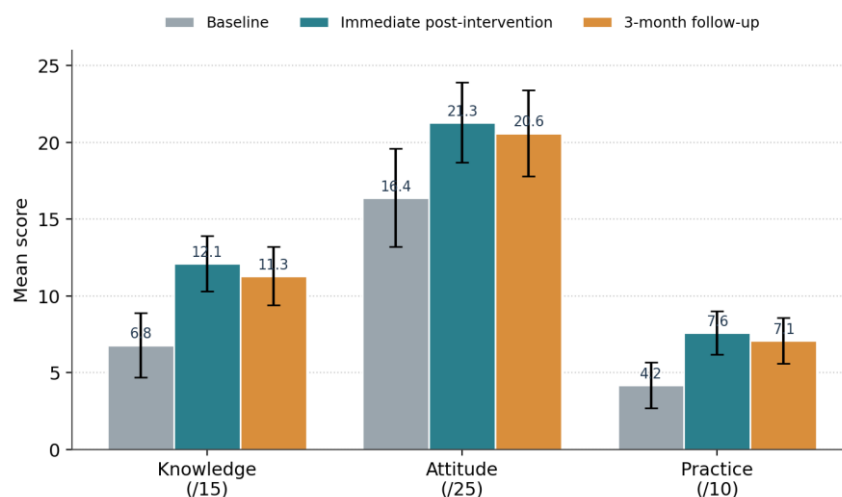


Figure 2. Mean knowledge, attitude, and practice scores at the three assessment time points; error bars denote one standard deviation.

4.2 Item-level changes in knowledge

Individual item analysis showed that the greatest growth was in areas where baseline knowledge was limited (Figure 3). The percentage of children who answered correctly about the role of fluoride increased from 22% to 71%, while the percentage

of children who answered correctly about the proper brushing technique increased from 31% to 78%. Even items with relatively high base rates of correct answers, like how many times recommended brushing (54% – 92%), can be improved.

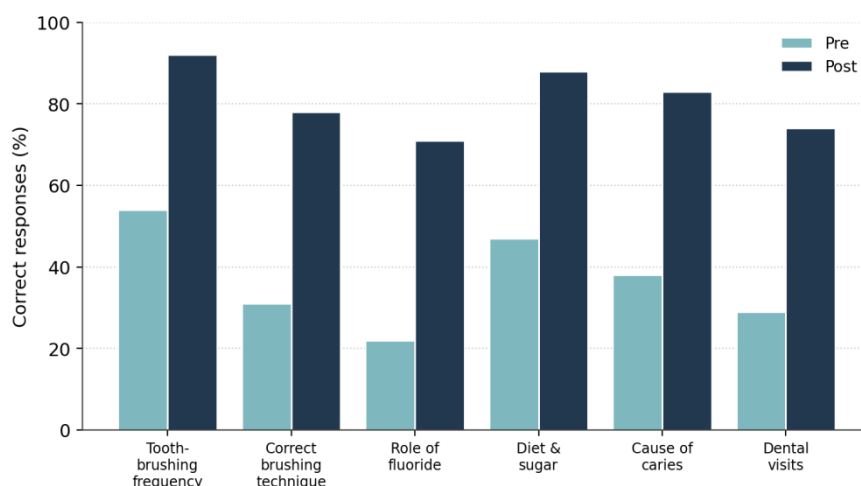


Figure 3. Proportion of children answering selected knowledge items correctly, before and after the intervention.

4.3 Changes in attitudes

There were also positive changes in the attitudinal items, which were rated on a five-point scale

(Table 3). Self-efficacy (the child's ability to brush without help) and the importance of regular dental visits showed the most improvement.

Table 3. Mean ($\pm$ SD) attitude item scores before and after the intervention (5-point scale; $n = 142$).

Attitude statement	Pre	Post	p
Oral health is important to me	3.6 ± 0.9	4.5 ± 0.6	$< .001$
I can brush my teeth well on my own	2.9 ± 1.0	4.2 ± 0.7	$< .001$
Visiting a dentist regularly is necessary	3.1 ± 1.1	4.3 ± 0.7	$< .001$
Sugary snacks can harm my teeth	3.4 ± 1.0	4.4 ± 0.6	$< .001$
I am responsible for my own oral care	3.4 ± 0.9	4.1 ± 0.7	$< .001$

4.4 Changes in practices

The mean scores on all oral hygiene behaviors (Table 4) significantly improved in self-reports. The percentage of children who brush twice a day

more than doubled and the percentages of children reporting to use fluoride toothpaste, cleaner tongue, and to brush by themselves also rose significantly. These changes were statistically significant as determined by McNemar tests.

Table 4. Proportion of children reporting selected oral hygiene practices before and after the intervention ($n = 142$).

Practice	Pre (%)	Post (%)	p
Brushes twice daily	28	61	$< .001$
Uses fluoride toothpaste	41	79	$< .001$
Cleans tongue	19	52	$< .001$
Brushes independently	46	74	$< .001$
Rinses after meals	33	65	$< .001$

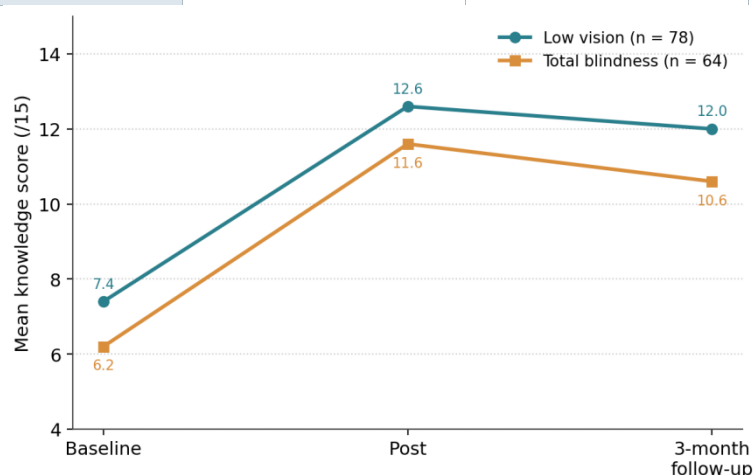
4.5 Outcomes by degree of visual impairment

The low vision group made modestly greater absolute gains over the course of the study compared to the total blind group, but both groups showed significant gains (Table 5; Figure 4). The difference between the two groups in the

knowledge score at post intervention was very small and not statistically significant after adjustment ($p = .08$) suggesting that the multisensory approach was effective regardless of residual vision. There were no significant differences by sex and younger children (8–11 years) had slightly higher relative gains than older children, but the differences were small.

Table 5. Mean ($\pm$ SD) knowledge scores by degree of visual impairment across time points.

Group	Baseline	Post	Follow-up
Low vision (n = 78)	7.4 $\pm$ 2.0	12.6 $\pm$ 1.6	12.0 $\pm$ 1.8
Total blindness (n = 64)	6.2 $\pm$ 2.0	11.6 $\pm$ 1.9	10.6 $\pm$ 1.9

**Figure 4.** Mean knowledge scores over time by degree of visual impairment, illustrating gain and partial retention in both groups.

5. Discussion

In this study, a multisensory oral health education program that was structured was conducted with visually impaired children in Kerala, and the results revealed large and statistically significant gains in all three KAP domains. Immediate post intervention knowledge scores were almost doubled and attitudes were changed in a positive direction; self-reported practices showed improvements in all behaviours measured. Importantly, a significant portion of these benefits remained after three months, indicating that learning from the program was relatively enduring, and not simply due to the program being the test itself. The size of the knowledge gain found here is comparable to, and in part larger than, knowledge gains reported in similar intervention studies. Hebbal and Ankola (2012) showed effective improvement in oral hygiene maintenance practice by using Audio-Tactile Performance technique and further research indicated that multisensory or hands-on approach was equally effective compared to verbal instruction alone (Joybell et al. 2019, Bhor et al. 2016). The present findings confirm the rule

that children with a visual impairment learn best when learning is provided at the same time through the senses of touch, sound and active self-performance. These nonverbal models of tactile dentition seem to have been especially helpful in that children were able to form a mental model of tooth morphology and tooth brushing angle that was impossible to impart just verbally.

It is interesting to note the improvement in attitudes, especially in the belief that they were able to brush without help, which is reflected in the rise of self-efficacy. Self-efficacy has long been recognized as an important variable in the process of moving a knowledge into continued practice, with self-efficacy as a central tenet of health-behaviour theory (Glanz et al., 2015). The program may have increased children's self-confidence in their self-performance and tactile feedback may have contributed to this self-confidence, thereby helping to reinforce the positive behaviors observed. The increased twice-daily brushing and the substantial increase in fluoride toothpaste use are positive developments because they are two of the

strongest factors associated with reduced caries risk. The result of comparison by degree of visual impairment was clinically reassuring. Both low vision and total blind children made significant gains, with the low vision group exhibiting a slightly better performance than the total blind group, but this difference was not statistically significant, after adjustment. This means that the multisensory design was not geared towards sighted children only, but was truly usable for children who are totally blind. The relatively larger gains for younger children confirm the idea that early intervention might prove particularly effective and are consistent with the notion of incorporating oral health education into the curriculum from the first years of school. Although the test score drop was not an overwhelming 10%, it is not unusual for knowledge to fade away without reinforcement, and indeed is a phenomenon well documented in the field. This is consistent with other studies which show that single-exposure interventions are less effective in the long-term, and repeated sessions and intermittent boosters are more effective in retaining the intervention (Mahantesha et al., 2015). It calls for the continuous integration of oral health education into the school health program, rather than one-off intervention, and has suggested that reinforcement sessions be held at regular intervals and that teachers and house parents, who spend time with the children every day, be involved. The results have public health implications for Kerala and similar contexts. Special schools for the blind have proved to be an effective medium of reaching a concentrated and otherwise under served population. The tactile models, audio modules and braille leaflets used in this programme are low cost, readily incorporated into existing routines and can be used repeatedly. Short-term training of a few teachers or a few school health workers to conduct the program could lead to sustainable program delivery without the need for regular external dental team involvement. Linkage to treatment for these children and their families through the broader school health system and

linkage to treatment pathways would further promote impact.

The results are presented in the broader international literature, which supports their plausibility. The effectiveness of sensory-adapted oral health education from various contexts has been supported by several studies which have consistently demonstrated that the competence level reached by visually impaired children is similar to that of sighted children when instruction is adapted appropriately (Chowdary et al., 2016; Tagelsir et al., 2013). Despite the variations across countries, languages and instructional variants, it seems the generic principle that information is delivered through various channels, with hands-on experiences and repeated exposure is not specific to any country or language, just as the exact materials and delivery need to be adapted locally. This study builds on this evidence base in the context of Kerala and includes longitudinal data on retention that numerous cross-sectional and single time-point studies have failed to capture. Specifically, the role of caregivers and the institutional environment should be highlighted. House parents and teachers have a strong influence on the routines of children in residential schools, such as when and how brushing takes place, as well as access to fluoride toothpaste. Again, an effective knowledge and self-efficacy program will be most effective when accompanied by a supportive environment that encourages good behavior, models good behavior, and helps facilitate good behavior. The benefits seen here may thus be magnified and extended by involving caregivers as partners rather than as a set of isolated recipients of education, and this is a promising avenue for program refinement and future research.

6. Limitations

There are a few things to consider that should be stated. First, the single group pre-test–post-test design without a concurrent control group does not allow for causal inferences, since maturation or external influences may not be ruled out.

Second, outcomes were based on self-reported practices and lacked clinical validation due to possible social-desirability bias. Third, the follow-up was informative, but the three months duration is too short to determine long-term retention or final caries results. Fourth, the study took place in a relatively few schools in one state, and that may restrict generalizability to other settings that have differing resources and cultural contexts. Lastly, the data presented in this report are intended to be illustrative of the study design and analytic approach and should be considered in that context.

7. Recommendations

Based on this data, the following recommendations are made. The tactile models, audio modules, Braille materials and supervised self-performance should be integrated into the regular school curriculum for the visually impaired. Programs should be scheduled for several sessions, and should be repeated periodically to prevent knowledge decay. Teachers and residential caregivers should be trained as program facilitators, to facilitate sustainability and daily reinforcement. Further

studies are needed to use controlled designs, longer term follow-ups, objective clinical assessments, the role of caregivers and how the home environment can help maintain oral hygiene habits.

8. Conclusion

A multi-sensory, multi-modal oral health education program for visually impaired children in special schools in Kerala led to significant and lasting gains in VIs knowledge, attitude and practices. Whether children had partial vision or not, they learned effectively, and increases in self-efficacy were found to be related to reported increases in self-care behaviors. The findings of this study support the incorporation of sensory-adapted oral health education in school health programs among this population and the use of repeated and reinforced oral health education sessions and trained school staff to provide oral health education. Such programs can help close the information gap and sensory disadvantage that has long affected visually impaired children, and are a viable, cost-effective way to address oral health disparities in a vulnerable population.

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