EFFECTIVENESS OF ORAL HYGIENE INSTRUCTION MEDIA ON PERIODONTAL HEALTH AMONG HEARING IMPAIRED CHILDREN

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Abstract. The objective of this study was to evaluate the effectiveness of oral hygiene instruction media on periodontal health in hearing impaired children over a period of three months. The study was carried out among 66 hearing impaired children (aged 6-10 years). The children were randomly divided into 4 groups by oral hygiene instruction media type: video presentation group, illustrated book group, both video presentation and illustrated book group, and control group. The gingival index (GI), gingival bleeding index (BI), and plaque index (PI) were recorded at baseline and at 3 months follow-up. After three months, there was a significant reduction from baseline in the mean values for GI, BI, and PI in all groups including the control group ($p < 0.001$). Further studies to determine what factors resulted in this reduction are accessary.

Keywords: hearing impaired children, oral hygiene instruction media, tooth brushing, illustrated book, video presentation

INTRODUCTION

Hearing impairment refers to a condition in which individuals are fully or partially unable to detect some frequencies of sound that are heard by normal people. The incidence of hearing impairment worldwide is 1 - 2 per 1,000 newborns (WHO, 2007). In Thailand, the prevalence of hearing impairment, from mild hearing loss to total deafness, is 13%. In a recent national oral health survey 55, 29, and 76% of deaf Thai students had periodontal disease, dental caries in deciduous teeth and dental caries in permanent teeth, respectively (Phondeeyeam, 2002).

Dental plaque, or oral biofilm, is an accumulation of microorganisms in a unique complex community on tooth surfaces. It is a cause of two important oral diseases: dental caries and periodontitis (Löe *et al*, 1965; Axelsson and Lindhe, 1977). Gingivitis develops within 7 to 21 days after abstaining from regular oral hygiene, such as brushing and other plaque control methods. The composition of mature biofilm involves a bacterial shift to gram-negative organisms, which is associated with gingival inflammation. However, it is reversible within a few days if regular oral hygiene is resumed (Löe *et al*, 1965).

Previous studies have found hearing

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impaired children have poorer oral hygiene than non-hearing impaired children (Barnett and Franks, 2002; Oredugba and Sote, 2002). Plaque and gingival indices in disabled children after a mechanical plaque control were significantly different compared with those of non-disable children (Reynolds and Blick, 1974). Although numerous plaque control methods have been purposed, tooth brushing using a correct technique is effective in controlling plaque is safe, easy to use and cost effective, especially in developing countries.

A hearing impaired child's ability to learn, socialize, communicate and develop cognitively may be delayed or blunted when compared to normal children. Aids specifically designed for the population, such as books in Braille for visually impaired children, clear picture instructions for autistic children and oral hygiene instructions using sign language for hearing impaired children improve oral hygiene care (Tintukasiri *et al*, 1996; Dizon *et al*, 2000). One study (Dizon *et al*, 2000) found hearing impaired children who used oral hygiene instruction kits using sign language, had improved oral hygiene after 1 year, compared with a control group which did not receive the kit.

In this study, the effectiveness of an oral hygiene instruction media kit containing an illustrated book and an instruction video using sign language developed by the Department of Pediatric Dentistry, Mahidol University, was evaluated for effectiveness by examining plaque and gingival indices.

MATERIALS AND METHODS

Study design and study population

We conducted a cross sectional study at Nonthaburi School for the Deaf, Thungmahamek School for the Deaf and Nakhon Pathom School for the Deaf. Ethical approval for the study was given by the Mahidol University ethics committee. Eighty hearing impaired students, aged 6 - 10 years were randomly divided into four groups: 1) a video (VDO) presentation group, 2) an illustrated book group, 3) both the illustrated book and VDO group and 4) a control group which did not receive any oral hygiene instruction media. All subjects were examined by one operator. Gingival index (GI), gingival bleeding index (BI) and plaque index (PI) were recorded for each subject before seeing the instructional materials and 3 months later. All subjects received an oral hygiene instruction review and professional prophylaxis and fluoride application (1.23% acidurated phosphate fluoride gel Professional®) until the plaque score reached zero. After that, the subjects were divided into the groups mentioned above and given the instructional material. All subjects were instructed to brush their teeth twice a day (in the morning and before bedtime) for at least two minutes each time.

Gingival bleeding index

The BI was assessed on labial and lingual surfaces for all teeth (Ainamo and Bay, 1975). The presence or absence of gingival bleeding was determined by gentle probing of the gingival crevices with a periodontal probe and given a score: 0 for no bleeding and 1 for bleeding.

Gingival index

The GI was based on the clinical characteristics of the different grades of gingival inflammation (Sillness-Löe Index, 1964). Four gingival surfaces, buccal, lingual, mesial, and distal, were assessed and given a score: 0 meant normal, healthy gingiva, 1 meant mild inflammation with

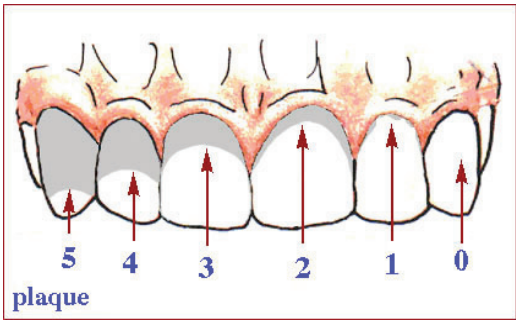

Fig 1–The Turesky modification of Quigley Hein plaque scoring system.

a slight change in color and mild edema of the gingiva with a slight change in texture but no bleeding, 2 meant moderate inflammation with mild redness, hypertrophy, edema and glazing with bleeding on probing/pressure and 3 meant severe inflammation with marked redness, hypertrophy, edema, ulcerations or spontaneous bleeding.

Plaque index

The PI evaluates the plaque area on the crown of the tooth without addressing plaque thickness (The Turesky modification of the Quigley Hein plaque index, 1970). A score of 0 to 5 was assigned to each facial and lingual non-restored surface of the tooth as shown in Fig 1: 0 meant no plaque, 1 meant separate flecks or a discontinuous band of plaque at the gingival margin, 2 meant a thin (up to 1 mm) continuous band of plaque at the gingival margin, 3 meant a band of plaque wider than 1 mm but covering less than 1/3 of the gingival third of the tooth surface, 4 meant plaque covering more than 1/3 but less than 2/3 of the tooth surface and 5 meant plaque covering 2/3 or more of the tooth surface. An index for the entire mouth was determined by dividing the total score by the number of surfaces examined.

Statistical analysis

The Kruskal-Wallis test was used to determine differences between gingival indices, gingival bleeding and plaque indices among the groups ($p<0.05$). The data were analyzed with SPSS, version 11.5 (SPSS, Chicago, IL).

RESULTS

Eighty children were seen during the first examination and 66 children were seen during the second examination (17.5% dropped out). The sex distribution and mean ages of the subjects are shown in Table 1.

Table 1
The number, sex and mean ages of the hearing impaired children by study group.

Group	Baseline			3 months		
	No. of children	Sex M/F	Mean age	No. of children	Sex M/F	Mean age
Video presentation	20	15/5	8 yr 6 mo	17	12/5	8 yr 6 mo
Illustrated book	20	13/7	8 yr 7 mo	16	9/7	8 yr 6 mo
Video+illustrated book	20	13/7	8 yr 5 mo	17	11/6	8 yr 4 mo
Control group	20	10/10	8 yr 4 mo	16	10/6	8 yr 5 mo

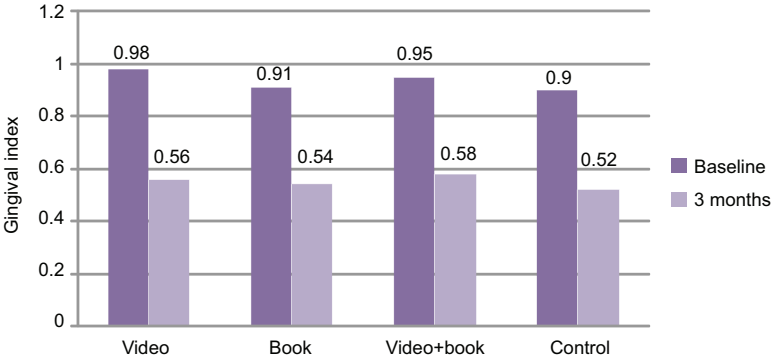

Fig 2–Mean gingival index by type of educational material at baseline and 3 months.

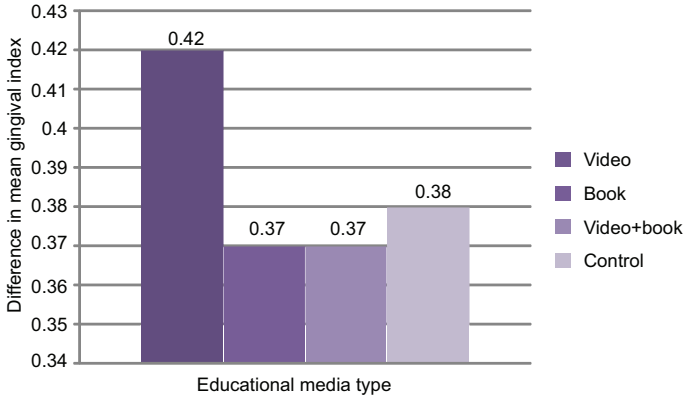

Fig 3–Mean differences in gingival index at baseline and 3 months by type of educational media.

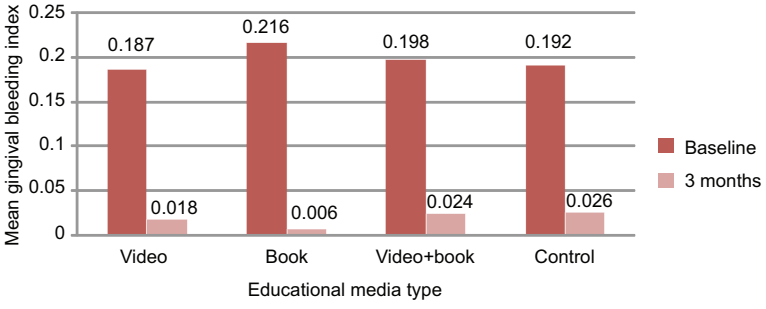

Fig 4–Mean gingival bleeding index by educational material type at baseline and 3 months.

Gingival index

There was a significant reduction in GI ($p < 0.01$) in all four groups at 3 months compared to baseline (Table 2, Fig 2).

Gingival index and educational media type

When comparing different methods for oral hygiene instruction among hearing impaired children, there were no significant differences among the groups, including the control group (Fig 3).

Gingival bleeding index

There was a significant reduction in the BI ($p < 0.01$) in all four groups at 3 months compared with baseline (Table 3 and Fig 4).

Gingival bleeding index and educational media type

When comparing the different methods of oral hygiene instruction among hearing impaired children groups, there were no significant differences among the 4 groups, including the control (Fig 5).

Plaque index

There was a significant ($p < 0.01$) reduction in PI in all groups, including the control group. The mean plaque indices at baseline and 3 months are shown in Table 4 and Fig 6.

Table 2
Mean and standard deviations for gingival index scores at baseline and 3 months.

Group	Baseline Mean ± SD	3 months Mean ± SD	*p*-value
Video presentation	0.98 ± 0.33	0.56 ± 0.22	$p < 0.01$
Illustrated book	0.91 ± 0.26	0.54 ± 0.14	$p < 0.01$
Video + illustrated book	0.95 ± 0.25	0.58 ± 0.27	$p < 0.01$
Control	0.90 ± 0.24	0.52 ± 0.15	$p < 0.01$

Table 3
Means and standard deviations for gingival bleeding index by group at baseline and 3 months.

Group	Baseline Mean ± SD	3 months Mean ± SD	*p*-value
Video presentation	0.187 ± 0.088	0.018 ± 0.025	$p < 0.01$
Illustrated book	0.216 ± 0.099	0.006 ± 0.014	$p < 0.01$
Video + illustrated book	0.198 ± 0.074	0.024 ± 0.046	$p < 0.01$
Control	0.192 ± 0.092	0.026 ± 0.042	$p < 0.01$

Table 4
Means and standard deviations for PI by educational media type at baseline and 3 months.

Group	Baseline Mean ± SD	3 months Mean ± SD	*p*-value
Video presentation	3.50 ± 0.49	2.71 ± 0.44	$p < 0.01$
Ilustrated book	3.42 ± 0.58	2.67 ± 0.63	$p < 0.01$
Video + illustrated book	3.47 ± 0.32	2.60 ± 0.36	$p < 0.01$
Control	3.78 ± 0.47	3.14 ± 0.30	$p < 0.01$

Plaque index and educational media type

No significant differences in mean differences in PI were noted when comparing the various educational media types and control (Fig 7).

DISCUSSION

The effectiveness of oral hygiene instruction media was evaluated using a GI, BI, and PI. The subjects had a statistically significant reduction in GI, BI and PI at 3 months compared to baseline but this reduction was also seen in the control group. The fact that there was no difference in GI, BI and PI between subjects and the controls suggests either an error in study design or the influence of

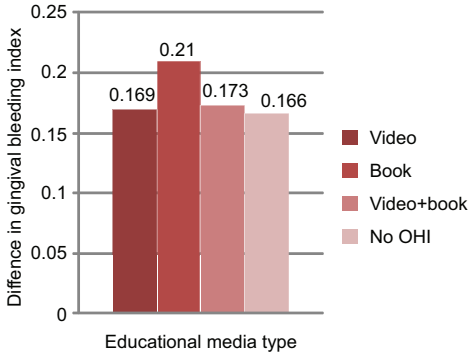

Fig 5–Mean difference in gingival bleeding index at the baseline and 3 months by educational media type.

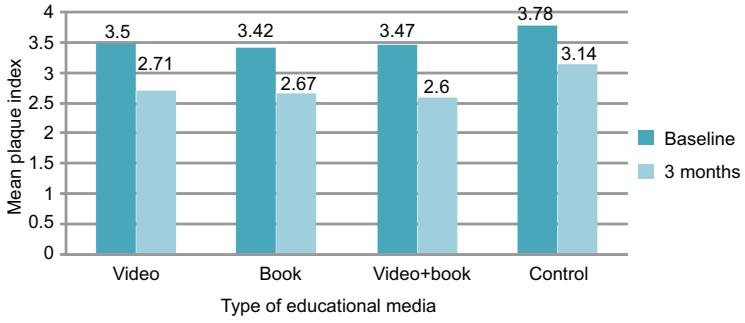

Fig 6–Mean plaque index by educational media type at baseline and 3 months.

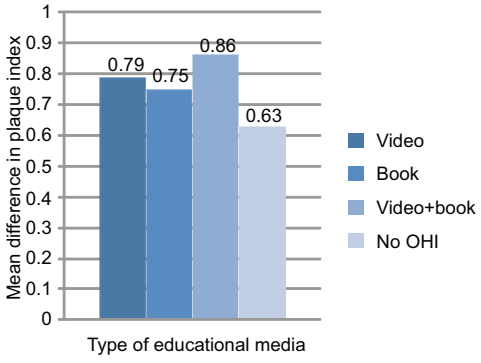

Fig 7–The mean difference in plaque index between baseline and 3 months by educational media type.

the study group subjects on the control subjects. Since there was no segregation of study groups, the children in the control group tended to follow the behavior of the children in the other groups.

Many studies (Sutton, 1962; Tsamtsouris, 1979; Ivanovic and Lekic, 1996) have shown supervision of tooth brushing in children results in significant reductions in PI and GI. Not only oral hygiene instructional media can improve a children's health, but close attention by teachers or parents can improve oral hygiene in children.

Further studies need to be performed using larger numbers of hearing impaired children, among children with moderate to severe gingival inflammation; the study groups should be segregated to prevent cross-contamination of results. We also recommend the children be exposed to the educational media at least twice a week for 3 months to ensure the effectiveness of the media.

In conclusion, all groups of educational media and the control group had significant improvement in periodontal health. Further studies are needed to determine what factors resulted in this improvement.

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