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Research Article

COMPARATIVE EVALUATION OF EFFECTIVENESS OF ORAL HEALTH EDUCATION METHODS ON ORAL HEALTH KNOWLEDGE, ATTITUDE AND STATUS OF 7-10 YEAR OLDS: A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Objective: To assess and compare the effectiveness of oral health education methods on oral hygiene knowledge, attitude and status of 7-10 year old school children.

Material and Methods: In this experimental study 150 children from different schools participated in the study. Each group of 50 randomly selected children were included in three groups: random allocation of each group was done. Group A: educated with conventional (flash card method) Group B: educated with flash card and game based (connect the dots) method; Group C: Video demonstration method. The oral health interventions were done for three consecutive days. An interviewer based questionnaire was administered to assess their baseline level of knowledge and attitude regarding oral hygiene. The oral hygiene status of children was evaluated using the OHI(S) at baseline and at an interval of 1 week, 2 week, 3 week and a month after the intervention using various oral hygiene aids. Comparison between the oral health status was done for all the three groups. The same questionnaire was administered after the intervention to test the change in knowledge and attitude among school children. Paired t-test was applied to compare pre and post intervention knowledge and attitude scores. ANOVA and Tukey's Post hoc test were done to compare the OHI-S scores between the weeks.

Results: There was a significant difference seen in the pre and post knowledge and attitude scores in all the three groups. A decline in the OHI-S scores seen from baseline to one month in all the three different groups with the Video demonstration group showing highly significant increase in oral hygiene scores ($p<0.05$) and decrease in debris and calculus scores($p<0.05$).

Conclusion: The cartoon video animation method and connect the dots game method which includes oral health guidelines including good oral hygiene and dietary habits was an effective and sustainable intervention aids in delivering oral health education messages compared to the traditional flash cards method.

INTRODUCTION

Oral health is an integral part of general health and its maintainance is of prime importance[1].It is recognized that good oral health practices are necessary from a young age to ensure positive long term dental health and hygiene[2]. Knowledge, attitude and behaviors of children towards sustainable good oral health depends upon an integrated health education and health promotion approach[3]. Theories of behaviour change such as Social learning Theory[4] and the Health Belief Model[5] suggests that changes in the knowledge, attitude and behaviour may be brought about by combined approaches using mass media, community and individual interactions.[6]

The key aspect in maintaining good oral health is the knowledge of proper oral hygiene practices. Knowledge given in the formative years remains with the child for a lifetime[7]. School children are an important target group for imparting various health education activities with the aim of inculcating healthy lifestyle practices to last for a lifetime[8]. School years are the formative years of a child transforming mentally and physically transforming him into a promising adult[7]. School based oral health education and preventive programs aim at improving the oral hygiene status of the children[2]. Education imparted to the school going children must inspire them to lead a healthy life rather than filling their minds with facts. Education is a three fold process of imparting knowledge,

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developing skills and interests, attitudes and life values[9]. These goals can be achieved by integrating education and entertainment[10]. Nowadays electronic gadgets, media, television and cartoons have a greater impact on the lives of the school going children. Games develop the visual alertness, increases attention span and assist with memory strategies and reasoning as well as it facilitates and reinforces child's learning in a stimulated and dynamic way[11]. Cartoon animations can also be used as a teaching aid as it increases the understanding of the subject learned in a fun and innovative way.[12]

A rise in the dental problems in the country makes such innovative preventive programs for the school children the need of the hour. The present study was undertaken to compare the effectiveness of conventional flashcards, game based teaching (connect the dots) and video animation on the level of oral health knowledge, attitude and oral health status of 7-10 year old school children.

MATERIAL AND METHODS

The reporting of the study has been done according to CONSORT (Consolidated Reporting of Randomized Controlled Trials) guidelines. The study protocol was analyzed and approved by the Institutional Review Board and the Ethical Committee of Sinhgad Dental College and Hospital, Pune and the principles of Helsinki Declaration have been addressed. Three schools with no previous history of school based dental health education program were selected for the study. The school authorities of the selected schools were contacted and were explained about the purpose, aim and nature of the study. Fifty children between the age group of 7-10 years having fully erupted index teeth required for Simplified Oral Hygiene Index were chosen from each school through simple random sampling (lottery method). Each school in the study formed one group so as to avoid spillage of information from one group to another i.e Group A: Oral Health education through flashcard method [1] (n=50). Group B: Oral health education through flashcards and connect the dots game [1] (n=50). Group C: Oral health education through Video animation method [12] (n=50). Clinical examination was carried out for all the participants prior of the health education in the school under natural day light. This included recording of the Oral Hygiene Index-Simplified (OHI-S). Pre-intervention structured questionnaires on knowledge and attitude were administered before imparting oral health intervention. The questionnaires were pilot tested for their content and construct validity on 15 students who were excluded from the main study. Each correct answer was given a score of 1 and the wrong answer a score of 0.Knowledge scores ranged from minimum 0 to maximum 10. The questionnaire on oral health knowledge consisted of ten questions and was interviewer administered whereas the questionnaire on attitude consisted of six questions which was self administered to the children. Both the questionnaires contained closed ended questions. The questionnaire on attitude consisted of three options: 1) Agree 2) Disagree and 3) Don't know. If the child answered as agree it was considered right attitude and a score of 1 was given whereas if they answered disagree or don't know it was considered as wrong attitude and a score of zero was given. The intervention was started after the pretest evaluation of their knowledge and attitudes and estimation of OHI-S.

Flashcard Group: Flashcards were used because children relate to pictures well. Pictures can help in understanding and improve recall in oral health education. Game group: A connect the dots game was used with the anagram "BRIGHT SMILE" where each alphabet represented a specific oral hygiene instructions. It was in the form of tooth structure .The children were told to connect the dots and read out the oral hygiene instructions. This made them realise that following instructions would give them a bright smile[1]. Video group: Cartoon animation method enables integration and manipulation of messages into video, audio, graphic, text and animation which attracts children's attention. Crest Dental Defenders video was used in this group.

The children in group A were imparted oral health education using flashcards, children in Group B along with the flashcards instructions were asked to complete a connect the dots game with oral hygiene instructions given on them and a happy tooth was formed after connecting all the dots. In group C video cartoon animations were developed and were shown to the children using audio-visual aid. In all the three groups care was taken to keep the oral health messages same which focused on the importance of proper nutrition and diet, development of caries process, importance of tooth brushing, brushing technique, visiting a dentist, other oral hygiene aids. The oral health interventions in all the three groups were imparted on three consecutive days. The effectiveness of oral health education on the knowledge and attitude of the children were evaluated at baseline and one month after the interventions were given. The oral health status using the OHI-S was evaluated at baseline, one week, two week, three week and four weeks interval. Statistical analysis of data was done using SPSS software (version 21, SPSSInc, Chicago III,USA). Descriptive statistics was done to find the means of OHI-S scores. Paired t-test was used to compare the knowledge and attitude scores at baseline and four weeks interval. ANOVA and Tukey's Post-hoc tests were done to compare the oral hygiene status of the children between the three groups. $p<0.05$ was considered statistically significant.

RESULTS

It was found that the oral hygiene status based on the OHI-S scores showed significant improvements in all the three groups one month after the interventions were imparted. There was increase in the mean knowledge scores seen in the video animation group from 3.96($\pm$1.14) to 8.56($\pm$0.99)($p<0.05$). The flashcard group showed an increase of 8.18($\pm$ 1.11) from 4.06($\pm$1.23) ($p<0.05$) as seen during pre-intervention and the video animation group showed mean knowledge scores of 8.22($\pm$0.13) post intervention as compared to 3.9($\pm$0.18) ($p<0.05$) seen during pre-intervention (Table 1). All the three groups showed an increase in the knowledge levels of students with video group showing a rise in the knowledge scores more than the other two groups. The mean attitude scores in all the three groups was increased post intervention with the maximum mean attitude score seen in the flashcard group of 5.52($\pm$0.61) as compared to 3.1($\pm$1.1) seen pre intervention.

Table 1 Evaluation of mean knowledge pre and post intervention in flashcard, game group and video animation group

Groups		Mean(±SD)	*p* value
Flashcard Group	Pre intervention (Baseline)	4.06(±1.236)	<0.05*
	Post Intervention (4 week)	8.18(±1.119)	
Game Group	Pre intervention (Baseline)	3.90(±1.329)	<0.05*
	Post Intervention (4 week)	8.22(±0.135)	
Video Animation Group	Pre intervention(Baseline)	3.96(±1.142)	<0.05*
	Post intervention (4 week)	8.56(±0.993)	

(*p*<0.05-significant)

Video animation group showed the mean attitude score of 5.38(±0.75) post intervention as compared to 2.64(±1.05) seen pre intervention and the game group showed a rise from 1.86 (±1.23) to 5.22(±0.97)(p<0.05) (Table 2).

Table 2 Evaluation of mean attitude pre and post intervention in flashcard, game group and video animation group

Groups		Mean(±SD)	*p* value
Flashcard Group	Pre intervention (Baseline)	3.1(±1.136)	<0.05*
	Post Intervention (4 week)	5.52(±0.613)	
Game Group	Pre intervention (Baseline)	1.88(±1.233)	<0.05*
	Post Intervention (4 week)	5.22(±0.976)	
Video Animation Group	Pre intervention (Baseline)	2.64(±1.051)	<0.05*
	Post intervention (4 week)	5.38(±0.753)	

(*p*<0.05-significant)

Comparative evaluation of OHI-S scores in all the three groups indicate a maximum fall in the mean OHI-S scores from 2.46(±0.59) to 1.11(±0.27) in the video animation group whereas flashcard group showed a fall from 2.16(±0.63) to 1.55(±0.48) and connect the dots game group showed a mean OHI-S score of 1.67(±0.41) post intervention as compared to 2.38(±0.47) seen pre intervention (p<0.05) (Table 3).

Table 3 Comparison of mean OHI-S scores in flashcard, game and video animation group at baseline, one week, two weeks, three weeks and four weeks interval

Groups	Baseline	Four weeks	*p* value
	Mean (±SD)		
Flashcard Group	2.168(0.634)	1.552(0.487)	<0.05*
Game Group	2.380(0.473)	1.670(0.418)	<0.05*
Video Animation group	2.466(0.596)	1.118(0.277)	<0.05*

(*p*<0.05 significant)

Statistically significant difference was found in the fourth week between the video group and the flashcard (p<0.000001) and between the video group and game group (p<0.05) (Table 4).

Table 4 Comparison of mean difference in the OHI-S scores at fourth week interval between the groups

	Flashcard	Video	Game
Flashcard	-	0.000001*	0.313
Video	0.000001*	-	<0.05*
Game	0.313	<0.05*	-

(*p*value <0.05 significant)

DISCUSSION

Oral health education may modify children's oral health knowledge and consequently change children's oral health behaviour though this assumption might be controversial. Yet oral health education as a tool of prevention should not be neglected. Children must be taught not only the causes of oral diseases but also the current preventive measures to avoid them. Childhood is a significant time for intellectual growth and personality development. Young children are particularly receptive during this phase of growth. It is also important to understand differences in the mental cognitive ability of the children at different ages and the need to develop different intervention programs for different age groups. Castillo et al (2001)[13] conducted an interventional study to determine the effectiveness of an educational strategy based on children's games (snake and ladder) for teaching the basic health concepts to school-age children and concluded that using games that include health and hygiene messages can be an alternative for teaching basic health concepts. A study was conducted to assess the effectiveness of the snake and ladder game on knowledge of common ailments among school children and the study revealed that there was a significant difference in the knowledge scores after administrating the intervention. This game was originally used by religious leaders to teach children about the difference between good and evil-climbing up the ladders representing good, and sliding down the snakes representing evil. Sinor MZ showed that cartoon animations enhances oral health education delivery to preschool children than the conventional methods[12]. John *et al* showed that drama can be used for better impact on oral health attitude and practices in preschool children[2]. Ahire *et al* described a technique in which a robot (ROBOTUTOR) was used to demonstrate Bass tooth brushing technique to adults and concluded that it can save clinician's chair side time as well as help in effective demonstration of the brushing technique[14].The present study is an attempt to put forth the oral health intervention concept and also reinforcement of messages on oral health through conventional flashcards, play way and video demonstration method.

Three different schools were taken for the study so as to prevent contamination and ensured that the responses obtained were due to intervention, in contrast to studies with all the groups from a single school. Direct measure of knowledge and attitude on effectiveness of oral health education is impossible since there is lack of homogeneity and non-standardized method of delivery, message contents, and technique of delivery, calibration issues and others. In this study, in all the three methods dental health messages given in all three formats were kept standard and homogenous. Flashcards, game based learning and cartoon animation in audio video format gives the opportunity to minimize and control the possible confounders that can be present.

Results from this study show that game based learning and video animation method can increase the knowledge and attitude scores more than the conventional flashcard method. The ability to absorb information among children of age 7-10 years old is hugely influenced by the medium that has been used. Studies show that connect the dots game and cartoon animations will help in teaching and learning process for school children more effectively[2,15,16,17].This medium enable

integration and manipulation of messages into video, audio, graphic, text and animation which will attract children's attention significantly.[18,19,20.]

All the three groups showed a significant improvement between the pre and post intervention groups which is in contrast to the study conducted by Greenberg where there was no statistically significant difference among the different teaching modes.[21] Games have proved to be a useful teaching strategy in education thus promoting self-learning and participation. Games appear to increase retention and application by allowing repetition of important points to be inculcated. According to cognitive psychology connect the dots game test (trail test) is used to provide information about visual search, speed, scanning, speed of processing, mental flexibility as well as executive functioning. It consists of two parts in which the child is instructed to connect a set of dots as fast as possible while still maintaining accuracy. The auditory and visual working memory reaches functional maturity earlier than the corresponding auditory system. Thus young children rely on visual codes to remember[1]. In the present study, a game based intervention program that relied on visual coding increased the visual alertness among children in group B which helped them understand oral health instructions imparted to them easily.

Video animation is a practical and rational method to draw childrens attention during teaching process [22].Studies show that multimedia or cartoon animation will help in the teaching learning process of children more effectively[15]. Findings from this study show that the level of knowledge was significantly increased in the video animation group than the other two groups which is in conjunction with the findings from the study conducted by Sinor MZ (2011) where they found the level of KAP among the intervention group (cartoon animation) was higher than the control group (oral health talk and oral hygiene instruction by staff nurses) whereas the attitude scores in our study were found to be higher in the flashcard group which is in contrast with the above mentioned study [12]. This shows that cartoon animation as a medium of health education can increase children's acceptance towards messages that were delivered. Cartoon animations can the process of learning a fun and enjoyable one for the children in school and can prove as a good distraction from the hectic school curriculum. Children are more interested if the teaching-learning process in the form of graphic form and moving as in animation[12]. The current generation of children is attracted by the cartoon animations as they spend more time watching television and cartoon serials. The OHI-S scores showed a significant decline from baseline to one month interval in all the three intervention groups. The increase in knowledge and attitude scores were seen in all the three groups irrespective of the intervention messages imparted. These findings are similar to the study conducted by Kumar Y et al wherein they showed significant increase in oral hygiene scores and decrease in the debris scores[1]. In their study they stated that game based method showed highly significant difference and knowledge scores showed significant increase in mean percentage whereas in our study the video cartoon animation group showed significant decline in the OHI-S scores and increase in the attitude scores. These findings may be due to the home care oral hygiene practices, parents education and attitude which were not considered in the study. These methods of delivering oral health education messages have a greater impact on the childrens' mind and these methods can be routinely used for providing oral health education to school children.

Our study has certain limitations, limited Follow-up of 1 month may not allow maturation of dental health messages.IQ levels of children were not considered before conducting the interviews. Memory recall bias, response bias and social desirability bias might have occurred in conducting the interviews with the children.

CONCLUSION

These innovative oral health education strategies can be used on a large scale in outreach programs. Further studies of longer duration are recommended on children of different age groups and of different socio-economic status. Other than the conventional flashcard method, the play-way method and video animation method can be used for greater impact and response, cost effectiveness and ease of implementation in routine outreach programmes and in schools for imparting oral health education.

Conflict of Interest: No conflict of interest.

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