

# EFFECTIVENESS OF ORAL HEALTH EDUCATION INTERVENTION AMONG ADULT POPULATION VISITING PRIVATE DENTAL COLLEGE

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## Abstract

*Oral hygiene is very important in maintaining good oral health. Lack of patient education is the main cause for bad oral hygiene and leads to multiple oral problems the most common being caries and periodontal diseases. Therefore health literacy is a vital part of every dental appointment not only to educate but also reinforce good oral habits and prevent further advancement of a disease. The main aim of the study is to examine the effectiveness of oral health education intervention among the adult population visiting Private dental college. This is a record based study with a sample size of 618, irrespective of the gender. The study was conducted at the institution and the data was collected from the patient records. The data was categorised into age groups, gender and plaque index scores recorded before and after oral health education. Assessment of Plaque using Plaque Index (Silness and Loe; 1964). Plaque index was recorded for the Indexed teeth (16, 12, 24, 36, 32, 44) prior to oral prophylaxis with the help of plaque test disclosing solution. The coding was done in MS excel. The data was transferred to a host computer and processed using SPSS software version 21.0 (SPSS Inc., Chicago, IL, USA) by tabulation and graphical illustration. Plaque index scores were continuous variables. Hence, it was presented as mean and standard deviation values. Paired T test was used to compare the mean differences of Plaque Index (Before and after health education Mean Plaque scores). One way ANOVA was used to find the difference between the different age groups with respect to mean pre-plaque index. Independent T test was used to find the difference between the gender with respect to the mean pre-plaque index. The plaque index score before and after the oral health education intervention were compared using one way Paired T -Test. The average plaque index score before health education was 1.4 with standard deviation of 0.36 and the average plaque index score after health education was 0.5 with standard deviation of 0.14. The results obtained were highly statistically significant (P value = 0.001).Based on the results of the present study, we can conclude that the mean Plaque Index score has been significantly reduced after oral health education intervention among the study subjects enrolled in the research.*

**Keywords:** Oral Health education; oral hygiene status; plaque index; Patient education.

## Introduction

Oral health is now recognized as equally important in relation to general health. Dental caries and periodontal diseases are the two foremost oral pathologies that remain widely prevalent and affect all populations throughout the lifespan. Various factors like nutritional status, tobacco smoking, alcohol, hygiene, stress, etc. are linked to a wide range of oral diseases forming the fundamental basis of the common risk factor approach to prevent the oral diseases[1]. Among these, oral hygiene is the most significant factor in terms of prevention of oral diseases. The oral health concern of an individual is dependent on the attitude of a person. These attitudes naturally reflect their own experiences, cultural perceptions, familial beliefs, and other life situations and strongly influence the oral health behaviour [2].

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Oral health education is the passing on of the oral health information to the common man in order to apply the principles of oral hygiene to everyday living. It promotes desirable dental health attitudes and favourable habits to maintain good. Reliable dental health information from dental professionals aid the patient in maintaining good oral hygiene. Health literacy consists of elements that promote staying healthy everyday, helps persons recuperating from illness and aims on augmenting health-related quality-of-life [3].

A common reason for misunderstanding health instructions may be the patient's low health literacy skills[4]. Another study also reflects the accomplishment of upgrading oral health knowledge, attitude, practices and oral hygiene through oral health education programmes [5]. Effective educational interventions with motivation contribute to positive behavior change. Oral health education created desirable behavior for healthy oral cavities [6].

Oral health education is easy-to-organize and inexpensive patient education tool. It is effective in improving the knowledge and oral health status of individuals. Oral health education helps individuals to prevent oral disorders and helps in diagnosis and care. A number of well-planned preventive/educational programs, based on the mechanical control of dental biofilm and on the motivation of individuals, have obtained favourable results in reducing dental biofilm [7].

The goal of oral health education is to improve knowledge, which may lead to adoption of favourable oral health behaviours that contribute to better oral health. Hence the objective of the present study is to assess the effectiveness of oral health education on oral health knowledge, attitude, practices and the aim of this study is to examine the effectiveness of oral health education intervention oral hygiene status while creating awareness and promoting better oral health behaviour

## **MATERIALS AND METHODS:**

### **Study setting:**

Case sheets of all the Patients of OP Department of the institution were reviewed for a period of 6 months [June 2019 and December 2019]. Simple Random Sampling was carried out to select a total of 501 patients.

### **Ethical clearance and Informed consent**

The study was commenced after approval from the Institutional Review Board. The ethical approval number for the study was SDC/SIHEC/2020/DIASDATA/0619-0320. A written informed consent was obtained from all the study subjects.

### **Data collection and / tabulation:**

To fulfil the inclusion criteria, patients who underwent oral health intervention and above the age of 18 were included in the study. The pre plaque index and the post plaque index were measured using a disclosing solution to measure the plaque index of the patient before and after the health education intervention. Patients who did not receive oral health education intervention, did not come back for review after 1 week and those unwilling for the study have been excluded from the study. Cross verification of data for errors was done photographically.

### **Sampling:**

Data were collected from June 2019 to December 2019 for 501 patients who had undergone health education intervention. The following data were retrieved from the dental records: patient age, gender, plaque index

recorded before and after the oral health education intervention. The data collected was analysed for changes in the plaque score before and after the health education intervention.

### **Application of disclosing agent and assessment of Plaque using Plaque Index (Silness and Loe, 1964)**

Application of plaque disclosing solution- Two tone Plaque disclosing solution was applied to the surfaces of the teeth with the help of applicator brush. The study participants were instructed to rinse the mouth. The newer thin plaque stains red and older plaque stains blue.

Assessment of Plaque using Plaque Index (Silness and Loe; 1964). Plaque index was recorded for the Indexed teeth (16, 12, 24, 36, 32, 44) prior to oral prophylaxis with the help of plaque test disclosing solution.

### **Scores and criteria for Plaque Index**

Score 0 means no plaque is present, score 1 means a film of plaque adhering to the free gingival margin and adjacent area of the tooth. The plaque may be seen only by running a probe across the tooth surface. Score 2 means moderate accumulation of soft deposits within the gingival pocket, on the gingival margin and/or adjacent tooth surface, which can be seen by naked eye. Score 3 means abundance of soft matter within the gingival pocket and/or on the gingival margin and adjacent tooth surface.

### **Oral Health Education Intervention.**

Oral hygiene instructions and tooth brushing technique- A standardized toothbrush and the toothpastes were allocated according to the group. Oral hygiene instructions with an emphasis on the appropriate brushing technique were given.

The following Instructions were given to all study subjects:

- To use the given soft bristled toothbrush and anti-cavity toothpaste .
- To take a pea sized toothpaste or ½ of the length of the head of the brush sized paste should be taken.
- To brush teeth for a minimum of 2 minutes twice a day

Brushing techniques:

- To place the bristles at a 45-degree angle to the teeth. Slide the tips of brush under the gums.
- To jiggle the bristles very gently, so that any plaque growing under the gum will be removed.
- To be sure to brush the outside, the tongue side and the chewing surfaces of the teeth.
- For the front teeth, to brush the inside surfaces of the upper and lower jaws by tilting the brush and making several up and down strokes.

### **Statistical analysis:**

- Data was entered in Microsoft excel spread sheet and analysed using IBM SPSS software version 20.0(Armonk, NY: IBM. Corp).
- Numerical data were presented as mean and standard deviation values. For test, a p value of <0.05 is to be considered statistically significant.
- Shapiro Wilks test used to test the normality of the data set.
- Plaque index scores were continuous variables. Hence, it was presented as mean and standard deviation values. Paired T test was used to compare the mean differences of Plaque Index (Before and after health education Mean Plaque scores)

- One way ANOVA was used to find the difference between the different age groups with respect to mean pre-plaque index.
- Independent T test was used to find the difference between the gender with respect to the mean pre-plaque index

## RESULTS:

The data collected was analysed using IBM SPSS software. The results are as follows. Table 1 and 2 depicts the Shapiro-Wilks test used to test the normality of the data set between the age and gender with the mean plaque index score. The test was found to be statistically not significant which signifies the data follows the normal distribution (Bell curve). The plaque index score before was calculated for each patient before and after the oral health education intervention. The values were assessed using paired T test and the p value was 0.000 which is highly significant.

The total number of participants in the study were 501 of which the maximum participants 52% was between 21-30 years, followed by 39% between 31-40 years of age and only 9% between 10-20 years (Figure 1). The gender wise distribution of the population showed male dominance of 65% and 35% female participants (Figure 2).

The age of the participants and the Plaque Index scores measured before the oral health education was given was analysed using one way ANOVA. The results obtained were statistically insignificant. The mean score for 10-20 years age group was 1.3 and the standard deviation was 0.35, for 21-30 years age group the mean was 1.5 and the standard deviation was 0.37 and the mean score for the 31-40 years age group was 1.4 with standard deviation of 0.33 (Table 3, Figure 3)

The gender of the participants and the Plaque Index scores calculated before the oral health education intervention was analysed using Independent T test. The mean plaque index score before health education for males were 1.4 with standard deviation of 0.34 and for females the mean score was 1.5 with standard deviation of 0.38. The results obtained were statistically insignificant (Table 4, Figure 4).

The plaque index score before and after the oral health education intervention were compared using one way Paired T -Test. The average plaque index score before health education was 1.4 with standard deviation of 0.36 and the average plaque index score after health education was 0.5 with standard deviation of 0.14. The results obtained were highly statistically significant (P value = 0.001\*\*) (Table 5, Figure 5).

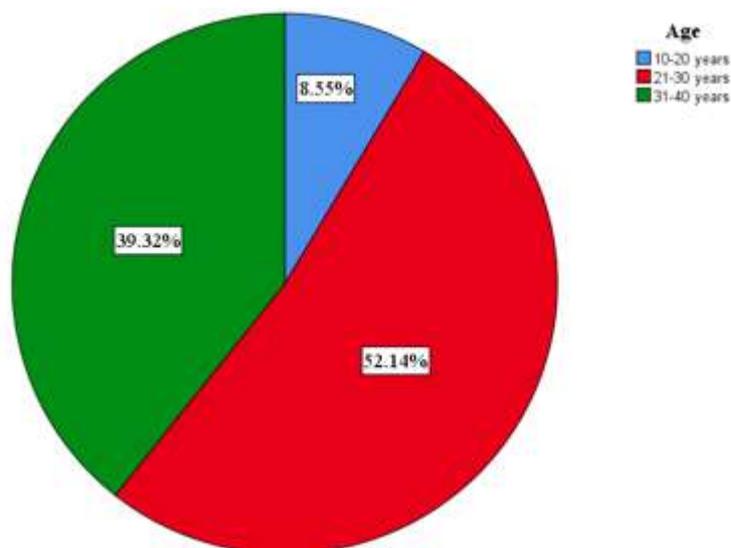


Figure 1: Pie chart representing the distribution of study subjects according to age. The percentage distribution shows 8.5% were 10-20 years (blue), 52.1% were between 21-30 years (red), 39.3% were between 31- 40 years (green).

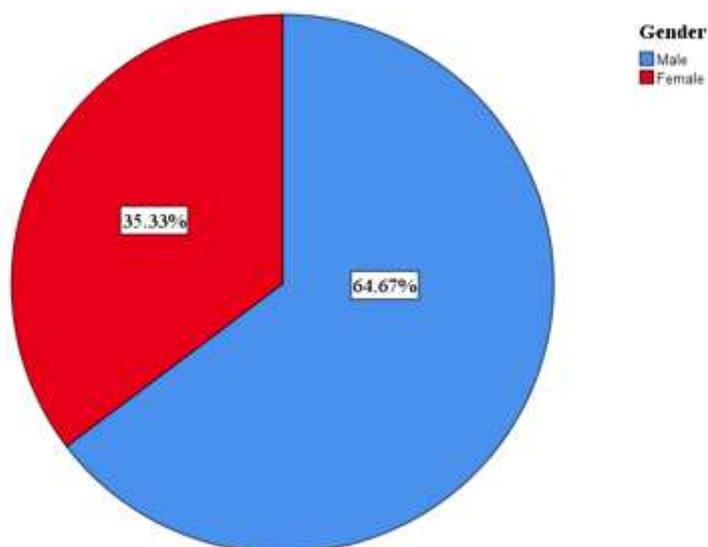


Figure 2: Pie chart representing the distribution of study subjects according to Gender. It shows 35.33% were females (Red) and the remaining 64.67% were males (Blue).

Tests of normality	Age	Shapiro - Wilk Test	
		Statistic	Sig.
Mean Plaque index score	10-20 years	0.73	0.07
	21-30 years	0.55	0.06
	31-40 years	0.63	0.07

Table 1 depicts the Shapiro-Wilks test used to test the normality of the data set between the age group and the mean plaque index score. The test was found to be statistically not significant which signifies the data follows the normal distribution (Bell curve).

Tests of normality	Gender	Shapiro - Wilk Test

		Statistic	Sig.
Mean Plaque index score	Male	0.63	0.07
	Female	0.41	0.08

Table 2 depicts the Shapiro-Wilks test used to test the normality of the data set between the gender and the mean plaque index score. The test was found to be statistically not significant which signifies the data follows the normal distribution (Bell curve).

Variable	Age	Mean	Std. Deviation	One way ANOVA F value	P value
Plaque index score before health education	10-20 years	1.73	0.35	1.918	0.149
	21-30 years	2.06	0.37		
	31-40 years	2.15	0.33		

Table 3 - One way ANOVA was used to find the difference between the different age groups with respect to mean pre-plaque index and was found to be statistically not significant (F value 1.918,  $p=0.149$ ,  $p>0.05$ ). Even though the test is statistically not significant, it was found that the 31-40 years age group was found to have a higher mean pre-plaque index score of  $2.15\pm0.33$  than 21-30 years ( $2.06\pm0.37$ ) and 10-20 years ( $1.73\pm0.35$ ).

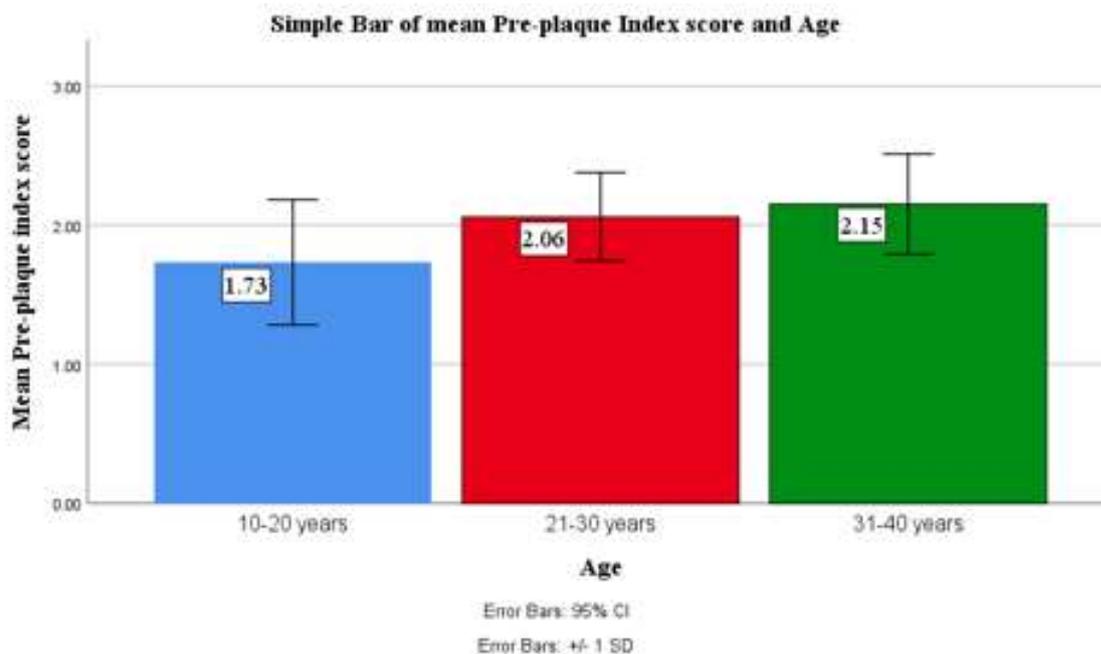


Figure 3: Bar diagram representing the comparison between the age distribution of study subjects and the mean pre-plaque index score of patients who underwent oral health education. X-Axis represents the age group and Y

axis represents the mean pre-plaque index score. One way ANOVA was used to find the difference between the different age groups with respect to mean pre-plaque index and was found to be statistically not significant (F value 1.918,  $p=0.149$ ,  $p>0.05$ ). Even though it is statistically not significant, it was found that the 31-40 years age group was found to have a higher mean pre-plaque index score of  $2.15\pm 0.33$  than 21-30 years ( $2.06\pm 0.37$ ) and 10-20 years ( $1.73\pm 0.35$ ).

Variable	Gender	Mean	Std. Deviation	Independent T test	P value
Plaque index score before health education	Males	1.48	0.34	2.37	0.124
	Females	1.51	0.38		

Table 4 - Independent T test was used to find the difference between the different gender with respect to the mean pre-plaque index and was found to be statistically not significant (t value= 2.375,  $p=0.124$ ,  $p>0.05$ ). Even though it is statistically not significant, females were found to have a higher mean pre-plaque index score of  $1.51\pm 0.38$  than males which was found to be  $1.48\pm 0.34$ .

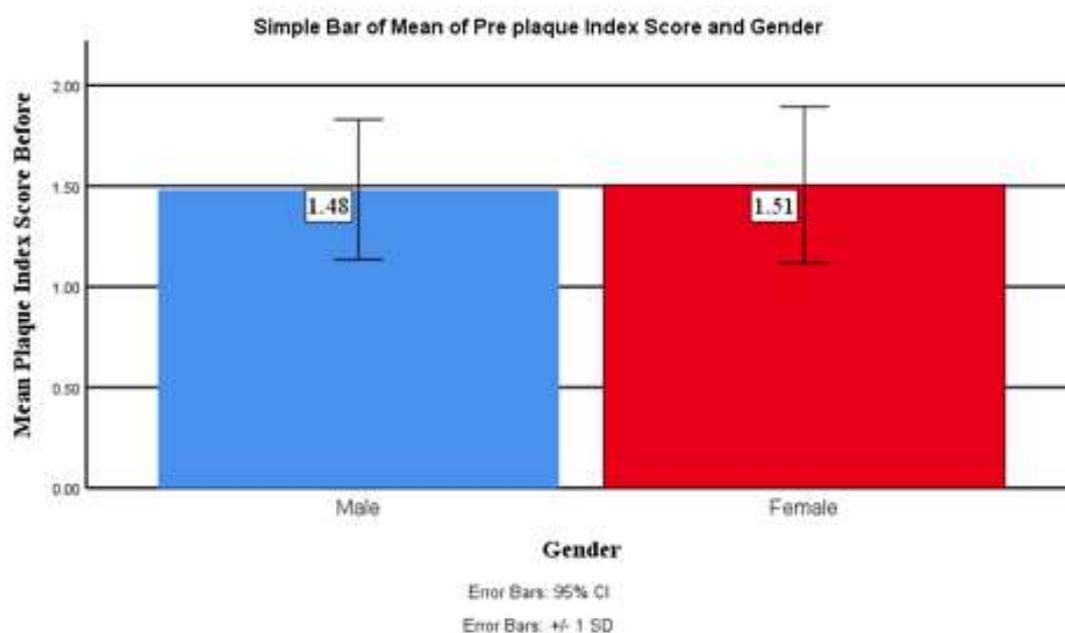


Figure 4: Bar diagram representing the comparison between the gender distribution of study subjects and the mean pre-plaque index score of patients who underwent oral health education. X-Axis represents the gender and Y axis represents the mean pre-plaque index score. Independent T test was used to find the difference between the different gender with respect to the mean pre-plaque index and was found to be statistically not significant (t value= 2.375,  $p=0.124$ ,  $p>0.05$ ). Even though it is statistically not significant, females were found to have a higher mean pre-plaque index score of  $1.51\pm 0.38$  than males which was found to be  $1.48\pm 0.34$ .

Variable	Groups	Mean	Std. Deviation	Paired T test	P value
Plaque index score	Before health education intervention	1.49	0.36	55.97	0.001**

After health education intervention	0.55	0.14		
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Table 5 - Paired samples T -Test was used to find the difference between the mean plaque index scores before and after health education and was found to be statistically highly significant (t value =55.970, p=0.000, p<0.05). This shows that there was a significant reduction in mean plaque index scores after health education, where the mean value before health education was 1.49±0.36 and has been reduced significantly to a mean value of 0.55±0.14.

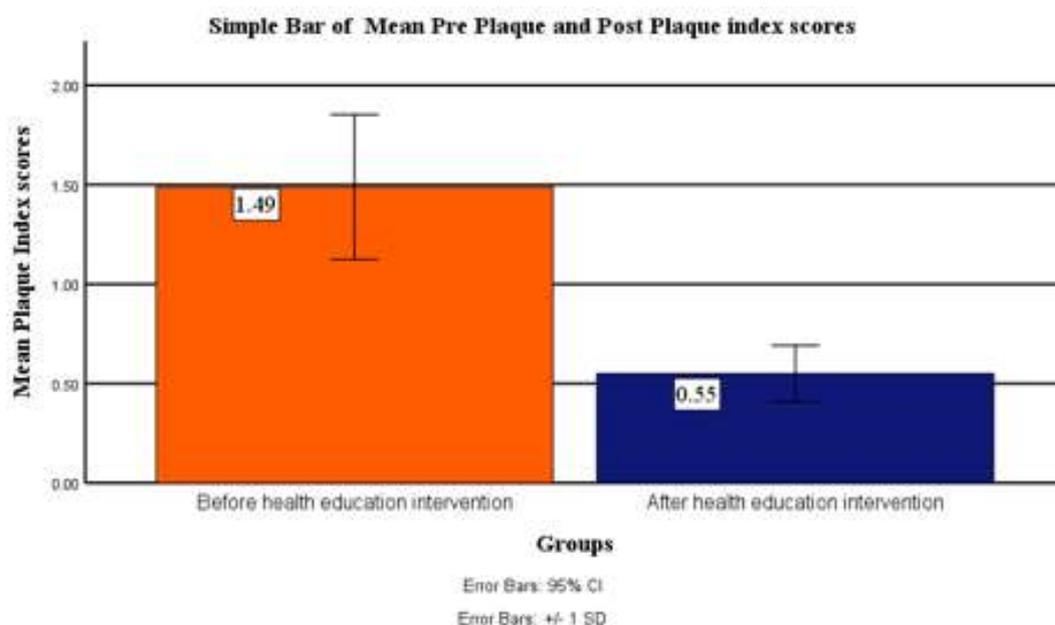


Figure 5: Bar diagram representing the comparison between the mean pre-plaque index score and mean post-plaque index score of patients who underwent oral health education. X-Axis represents the groups before and after health education intervention and Y axis represents the mean plaque index score of the two groups. This shows that there was a significant reduction in mean plaque index scores after health education where the mean value before health education was 1.49±0.36 and has been significantly to a mean value of 0.55±0.14.

## DISCUSSION:

Public health is an important aspect of dentistry and its concerns must be addressed [8]. Oral health education also includes awareness on brushing technique, anti - tobacco counselling [9], use of fluoride toothpaste [10], effect of drinking water with high fluoride content thereby leading to fluorosis [11, 12] and even nutrition counselling for patients [13]. Patients with high caries risk can be advised to use remineralizing toothpastes [14] to combat the dissolution of the tooth by acid released from bacterial by products. There are certain naturally occurring phytochemicals that help fight oral diseases [15]. Young patients with deep pits and fissures can be advised to use sealants to prevent caries[16]. Nowadays moisture resistant, hydrophilic, fluoride releasing sealants are available [17, 18] Carbonated drinks cause erosion of the enamel layer. This wear of enamel makes it easier for microorganisms to attack the tooth structure[19].

Plaque accumulation can lead to formation of a constant biofilm over the teeth. With time, this biofilm becomes a home to many microorganisms and becomes a substrate for attachment of new organisms. It's a complex system which provides both nutrition and nourishment to the colonies present. Streptococcus mutans is the most commonly associated microorganism with dental caries [20]. The plaque later undergoes calcification by absorbing the calcium ions found in the saliva [21]. This calcified mass is calculus and leads to periodontal deterioration leading to gingivitis with bleeding which progresses to periodontitis with loss of attachment, recession and furcal involvement and eventually mobility [22]. This a vicious chain which can be stopped with

appropriate health education and change in oral habits. This can change neglect and ignorance towards oral health care and helps patients seek care when they need it because they are aware of their needs[23].

Educated patients can identify a deviation from the healthy normal state making it easier to address the problems at the very start and by means of simpler treatment modalities[24, 25]. Since children are prone to caries and decay, oral health education must be implemented at school level itself [26, 27]. Therefore health literacy is a vital part of every dental appointment not only to educate but also reinforce good oral habits and prevent further advancement of a disease [3].

Geographic isolation and small sample size were one of the few limiting factors. The participants in the study were not asked about previous history of oral hygiene practices. The caries distribution in their dentition and their periodontal status was not recorded. This study highlights the future scope of oral health education intervention as a powerful patient education tool that is both inexpensive but has a powerful impact on the general population. This is evident in the significant decrease in plaque index scores which reflects in the decrease in the incidence of oral diseases

#### **AUTHOR CONTRIBUTIONS:**

Author 1 (Jerusha Santa Packyanathan) carried out the retrospective study by collecting data and drafted the manuscript after performing the necessary statistical analysis. Author 2 (Jayashri P) aided in the conception of the topic, participated in the study design, statistical analysis, supervised in the preparation of the manuscript and author 3 (Ganesh Jeevanandan) helped in study design and coordinated in developing the manuscript. All the authors have equally contributed in developing the manuscript.

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#### **CONFLICT OF INTEREST:**

The authors state no conflict of interest.

#### **CONCLUSIONS:**

Within the limitations of the study, we can conclude that the mean Plaque Index score has been significantly reduced after oral health education intervention among the study subjects enrolled in the research. This shows that oral health education is a powerful tool for dentists to increase patient knowledge and awareness towards various plaque induced oral diseases.

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