

Oral Health Module for Prevention of Dental Caries in School children

A GOI-WHO-India Biennium Project

Final Report



शरीरमाद्यं स्वस्तु धर्मसाधनम्

**Centre for Dental Education and Research
All India Institute of Medical Sciences, New Delhi, INDIA**

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INTRODUCTION

Oral Health is an integral component of general health. It has also become clear that causative and risk factors in oral diseases are often the same as those implicated in the major general diseases (WHO, 2003)¹. The overall health, well being, education and development of children, families and communities can be affected by oral health. Though there has been considerable improvement in the oral health of children in the last few decades, dental caries (tooth decay) still remains one of the most commonly occurring oral health problems in the children all over the globe. A considerable population of children in the developing nations is being affected by tooth decay and most of the time their proper treatment is given the last priority owing to limited access to oral health services². The lack of availability and affordability of oral health services not only results in aggravation of the disease but also enhances the cost of treatment and care. There is no single country that claims to have caries free children³. Adverse experience during childhood may lead dental phobia, impacting on attitudes to oral health and self care as well as availing oral health care services for life. Poor oral health in childhood often continues into adulthood, effecting economic productivity and quality of life.

In many countries, a large number of children and parents have limited knowledge of the causes and prevention of the most common oral diseases. Similarly, the schoolteacher's oral health knowledge has also not been satisfactory⁴. It is evident that cultural beliefs and social taboos play an important role in the perception of the causes of dental decay and gum diseases. In India, a very less percentage of mothers have received proper advice on oral care of the children from dentists or health care workers. In many countries, the number of children brushing

their teeth is very unsatisfactory including India. A small proportion of children do not clean their teeth at all, some may not have access to a toothbrush and many are using the traditional cleaning aids like datun, salt and oil, coal ash and locally made powders etc⁵.

This high prevalence of dental caries has also caused increase in the absenteeism of school hours and loss of working hours and economy for the parents. Apart from this, the treatment of dental caries is not available to all due to lack of facilities in their areas. This has further caused an increase in tooth loss before time, resulting in malocclusion and other problems.

The availability, affordability and quality of Fluoride tooth paste remains a major problem in many developing countries⁶. Only a small proportion of population is using fluoridated toothpaste and moreover because of high concentration of fluoride in drinking water in certain parts of India, also has a prohibiting effect as use of fluoride toothpaste⁷.

The high prevalence of Dental Caries has been brought under control in many developed countries during the last three decades. This was possible only through community or school based organized primary preventive programmes essentially composed of generation of oral health awareness through education of the public and school children at large. Presently India is also passing through the same phase where Sweden, Norway Denmark, USA and UK were in 1970's. Parkash et al (1993) did a study in 10-15 year old School children using WHO (1987) criteria and reported an average DMFT of 2.61 for the effected children⁸. The point prevalence for dental caries was found to be 57, 52, 36, 33, 33 and 26 percent in 10, 11, 12, 13, 14 and 15 years old respectively. We have high prevalence of dental caries which can be attributed to shift

in diet pattern towards more refined food, lack of appropriate knowledge about oral hygiene and causation and prevention of common oro-dental problems. Moreover, the dental professionals are unequally distributed and catering to mainly curative/restorative needs of the urban areas. Health education and prevention is almost non-existent in the country.

Time and again it has been proven that schools can provide an ideal platform for the promotion of oral health. At the global level, approximately 80% of children attend primary schools and 60% complete at least four years of education, with wide variation between countries and gender. Children spend considerable period of their lifetime in the school right from their childhood to adolescence. This period has a special importance in their growing age as they are particularly receptive during this phase⁹. They can be nurtured well for their general and oral health and the saying “catch them young” can very well be implemented. Equally important is the reinforcement of message on health which can be implemented and executed through the school years of the children^{10,11}. The proper guidance can help in the development of correct beliefs and attitudes regarding oral health. Schools can provide a supportive environment for promoting oral health and they can also be extremely helpful in spreading the right message to the local community. The school personnel and School children can pass the oral health promotion messages to the family members which can be beneficial in health promotion activities.

According to the literature, different authors (Acs et al 1992, Axelsson et al 1993, Laloo and Solanki 1994, Stephan et al 1996, Booth et al 1997, Petersen et al 1998, Petersen et al 1999, PINE et al 2000, Armfield et al 2001, Friel et al 2002) have evaluated and reported the services of special oral health workers, dental hygienists, school

teachers, parents for oral health education of the school children as effective method for prevention of various oro-dental problems¹²⁻²¹.

School is a place of learning for the children and is in fact microcosms of the larger community. Schools are the ideal setting for integrating oral health instructions in the curriculum. At the school age, children are receptive to guidance and familiar with the learning environment and culture. School teachers can effectively influence student's knowledge, attitude and practices regarding oral health and can bring change in behavior. It is very important to target oral health education to the children since the lifestyle and hygiene practices once established at an early age can go a long way in spending rest of the life in a healthy way²². They should be empowered to take control of their own health early in their lives and encouraged to develop positive attitude towards preventive measures.

Oral health educational programmes implemented through schools have the additional advantage of imparting primordial and primary preventive instructions to all the children of all socio-economic status. Based on this background, an attempt has been made to develop an accessible and sustainable module for prevention of dental caries among school children using existing educational infrastructure and to find out the feasibility of such a primary preventive module for prevention of dental caries in school children of Delhi.

OBJECTIVES

1. a) To evaluate the oral health status (dental caries and oral hygiene practices) of school going children aged 6- 8 years and 12-14 years.

b) To evaluate the knowledge, attitude and practice regarding oral health in the school going children in 12-14 years age group.
2. To implement oral health primary preventive module in school children by training the school teachers (Science/Health Education/Physical training) on oral health aimed mainly at preventing dental caries
3. To evaluate the post training change in oral health status with respect to dental caries and oral hygiene practices for school children.
4. To evaluate the post training change in the knowledge, attitude and practice with regards to oral health for school children in 12-14 years age group.
5. To study the feasibility of implementation of oral health primary preventive module in school children by training the school teachers on oral health.
6. To recommend the best and the most feasible method of oral health education in school children to bring about reduction in prevalence in dental caries.

MATERIAL AND METHODOLOGY

This Project was planned to evaluate the feasibility of Primary Preventive Oral Health Module for prevention of Dental Caries in School Children by training the schoolteachers and subsequent oral health education to the children by the schoolteachers during their day to day activities.

Material

1. School Selection

List of various schools of Delhi were obtained after meeting the Director of Education, Govt. of NCT of Delhi. Keeping in mind the demographic and socio-economic status, eight schools were randomly selected for the study.

2. Age group and sample selection

A total of 3000 school children in the age group of 6-8 years (Junior age group) and 12-14 years (Senior age group) were included in this study out of the eight selected schools. ([Table I](#))

In order to cover up the expected attrition during the one year follow up period, additional 550 children were evaluated in both the groups at baseline.

3. Oral health assessment form (based on WHO-Oral Health Assessment form 1997)

Oral Health Assessment Form 1997 (WHO, Oral Health Survey: basic Methods) was modified keeping in mind the objectives of study, having components on recording of following components. (Annexure I)

- 1) Dentition Status and Dental Caries
- 2) Plaque Index (modification of Silness and Loe 1967)

4. Knowledge, Attitude and Practice (KAP) Questionnaire

In order to assess Knowledge, Attitude and Practice regarding oral health, a questionnaire having 24 questions was prepared for School children (12-14 years). (Annexure II)

5. Armamentarium used for the study

1. Calibrated Periodontal Probes
2. Mouth Mirrors
3. Tweezers
4. Stainless Steel Trays
5. Disinfectant solutions
6. Gloves and Masks etc.
7. Portable Autoclave

Methodology

The study was divided into four phases.

1. Phase one - Preparatory phase

During this phase, advocacy meetings and background preparations were undertaken.

A. Advocacy meetings

After taking prior consent from the Director of Education, Govt. of NCT of Delhi, the school authorities of the selected 8 schools were approached and the need and methodology of this project were discussed with the Principal and School Teachers of the school. The expected cooperation was explained and assessed before finalizing the inclusion of the school in the project.

B. Training of the Dental Surgeons and Field Assistants

In order to have a uniform assessment criteria and minimum variability during the clinical examination, the Dental Surgeons and Assistants were trained by the Investigators of this project.

They were made familiar to the prescribed oral health assessment form by giving hypothetical situations to have an understanding of different conditions involving oral health expected in the school children.

Field Assistants were trained to record findings in the prescribed forms as per the codes decided for the respective columns.

To eliminate the inter-examiner variability for recording clinical examination (dental caries & plaque index) and KAP questionnaire KAPPA statistic exercises were performed between different examiners. On achieving KAPPA score of more than 95% only, the examiners were allowed to perform the clinical examination.

C. Information, Education and Communication aids

Various educational materials were designed in both Hindi and English languages which included: (copies enclosed as Annexure III,IV, V)

- 1. Posters exhibiting Oro-dental Diseases in Children (Annexure III)**
- 2. Oral Health Information Pamphlets for Parents (Annexure IV)**
- 3. Oral Health Promotion manual for Teachers (Annexure V)**

Posters were designed in English and Hindi for displaying on the school notice boards to further reinforce oral health instructions among the School children. The posters contained information on plaque, dental caries, nursing bottle caries and malocclusion along with a picture of a schoolchild so that children may relate themselves with the contents of the poster.

An Oral Health Promotion Booklet for Parents in Hindi and English was printed which highlighted the commonly found oro-dental problems among the children and how they can be prevented.

A pictorial Oral Health Promotion Training Manual for the schoolteachers was prepared to give them detailed information regarding causation, identification and prevention of various oro-dental problems. Apart from

this, methods of oral hygiene maintenance were also covered with the help of pictures for the reference.

2. Pre- Training (Baseline) Survey

A consent form was designed requesting the parents to allow the dental surgeon to examine their ward in the school premises (Annexure VI). These consent forms were given one day prior to clinical examination in that school. The oral health survey on school children was performed by a team of trained Dental Surgeons and Field Assistants in the presence of their teachers. To familiarize the children with the instruments, the school children were explained in detail regarding the purpose and method of clinical examination.

The senior age group school children were distributed KAP forms and were familiarized with the contents and how to fill it. Instructions were given, not to ask or consult a colleague while answering the questionnaire.

The Dental Surgeons carried out the clinical examination of the children using mouth mirrors and calibrated probes under standard aseptic conditions in broad day light. For information of parents, an oral health check up card was also given to the children for any possible dental treatment (Annexure VII). Further, cross checking of the sample was undertaken by the investigators randomly.

A total of 3550 children in Junior age group (6-8 years) (n=1752) and Senior age group (12-14 years) (n=1798) were examined as a part of the study.

3. Implementation Phase

During this phase, training of School Teachers and subsequent reinforcement of imparting oral health education to the children by the schoolteachers were monitored.

A. Training of School Teachers

A training programme was conducted for the School Teachers by means of :

- 1) Slide show**
- 2) Film on oral health**
- 3) Demonstration**
- 4) Open discussion sessions**

During this training, the teachers were also explained about importance of oral health, its relation with general health and how they can integrate oral health instructions in their day to day practice. They were advised on their role in the prevention of oro -dental problems of the school children. The teachers were asked to educate the children on oral health at least once in a month along with other general health related activities being conducted in the school.

B. Monitoring and Implementation

It was expected from the Principals and School Teachers that they will impart knowledge regarding oral health and [motivate the children](#) to adopt good oral hygiene practices and healthy food behaviour. The suggestions offered to the teachers were:

- During the school assembly, the [Principal/ school teachers were asked to stress upon the importance of oral health.](#)
- The physical/sports teachers [were asked to play an important role](#) in making the children understand the usefulness of good oral hygiene practices.
- The class [teachers were asked to guide](#) the children to adopt healthy food behaviour and discourage them for bringing sweets or junk food. They should rather be advised to bring Roti Dal, Subzi, fruits etc which are nutritious and at the same time less cariogenic.

There used to be regular visits (every two months) to the schools Principals and Teachers by the investigators so as to know the oral health education programmes being conducted by the teachers. The visit was also used for knowing the progress and to reinforce the instructions to the teachers. Reinforcement in forms of discussion and demonstration was undertaken to remind the teachers of what they had learnt in the training. The Oral Health Promotion Training manual for teachers was especially beneficial as the teachers could know about different oral diseases as ready reference.

4. *Post -Training (Final) Survey*

Before the start of post motivation final survey, repeated sessions of calibrations between the examiners and the investigators were conducted for revision.

After one year of implementation phase, the same children in the selected eight schools after taking the consent were re-evaluated. The post motivation final clinical examination and KAP questionnaire recording was performed in the same manner as pre-motivation survey was carried out.

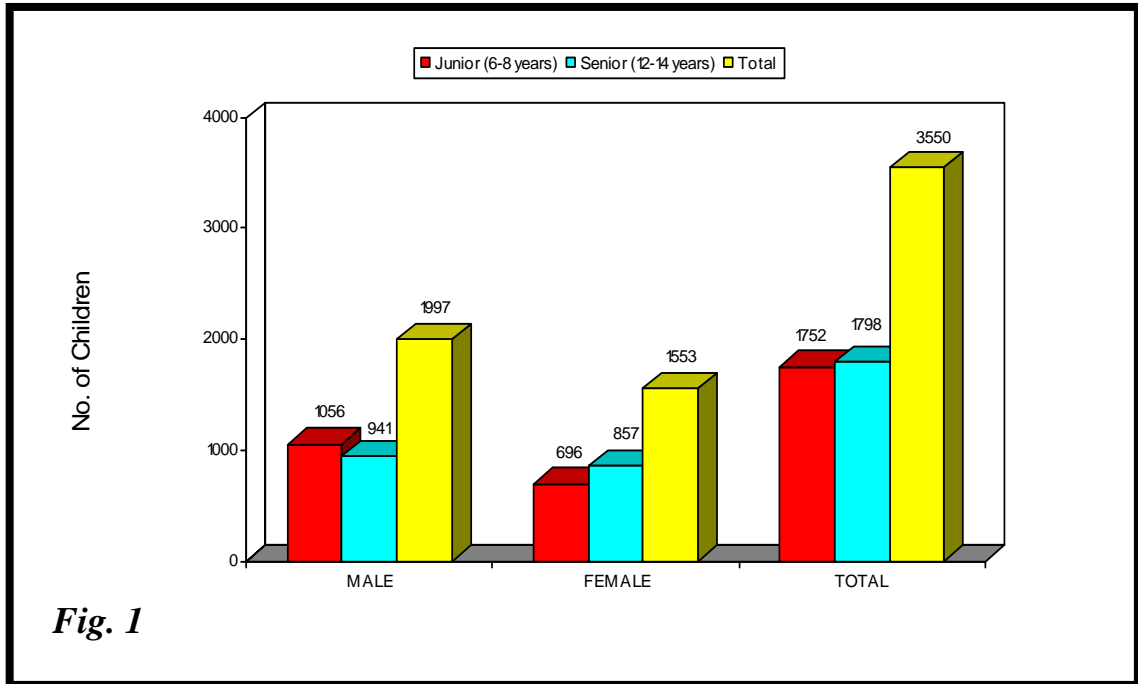
A total of 2962 children including 1491 children from junior age group (6-8 years) and 1471 children from senior age group (12-14 years) were evaluated for the study (Table 1). The attrition of 261 (14.89%) children in the Junior age group and 327 (18.13%) children in the Senior age group was observed during the post motivation final survey. This attrition could be attributed to shifting of temporary house clusters near one of the school in the low socio-economic strata during the one year study period. Apart from this particular school, the drop out from the other schools was very marginal.

5. *Data Recording and Analysis*

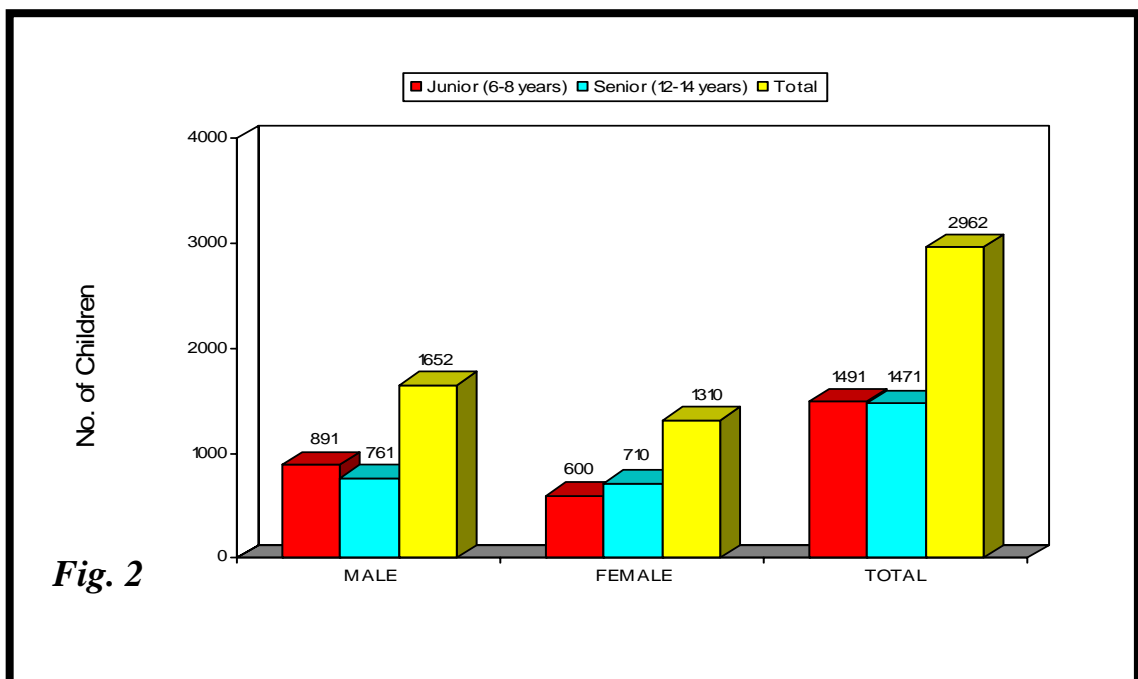
The data thus obtained was entered into computer using MICROSOFT EXCEL (windows MS Office Xp professional version). The data was analyzed using SAS (ver 8.0). Chi-square test was used to find out the statistical significance of the changes occurred during the one year period, the comparisons were made only for those children who were present at both baseline and final examinations.

RESULTS

A total of 3550 children including Junior age group (n=1752) and Senior age group (n=1798) were evaluated for the study at the baseline examination ([Tables - 2, 4, 5](#); Fig. 1).



A total of 2962 children including 1491 children from Junior age group and 1471 children from Senior age group were evaluated for the study at the final examination ([Tables - 3, 6,7](#); Fig. 2).



As per the original proposal 3000 school children were to be included in the study from which 1500 in junior age group i.e. 6-8 years and 1500 in senior age group i.e. 12-14 years. However in the baseline examination 3550 children were examined (1752 - junior and 1798 - senior) with an anticipation of having attrition of children due to migration, failure or shifting of the schools. There was a total attrition of 588 subjects out of which 261 (14.89%) children were in the Junior age group and 327 (18.13%) children in the Senior age group during the final survey but as per the proposal the attrition was only 0.8% in junior age group and 2% in the senior age group. This attrition could be attributed to shifting of temporary house clusters near one of the school in the low socio-economic strata during the one year study period. Apart from this, the drop out from the other schools was very marginal.

The baseline and final examination data thus collected was compared for dental caries, plaque index and KAP for only those subjects who were present at both baseline and final examination. Therefore, the data compared will be named as Baseline (Corrected) and Final Data.

1. Analysis of decayed, missing and filled teeth (dmft and DMFT)

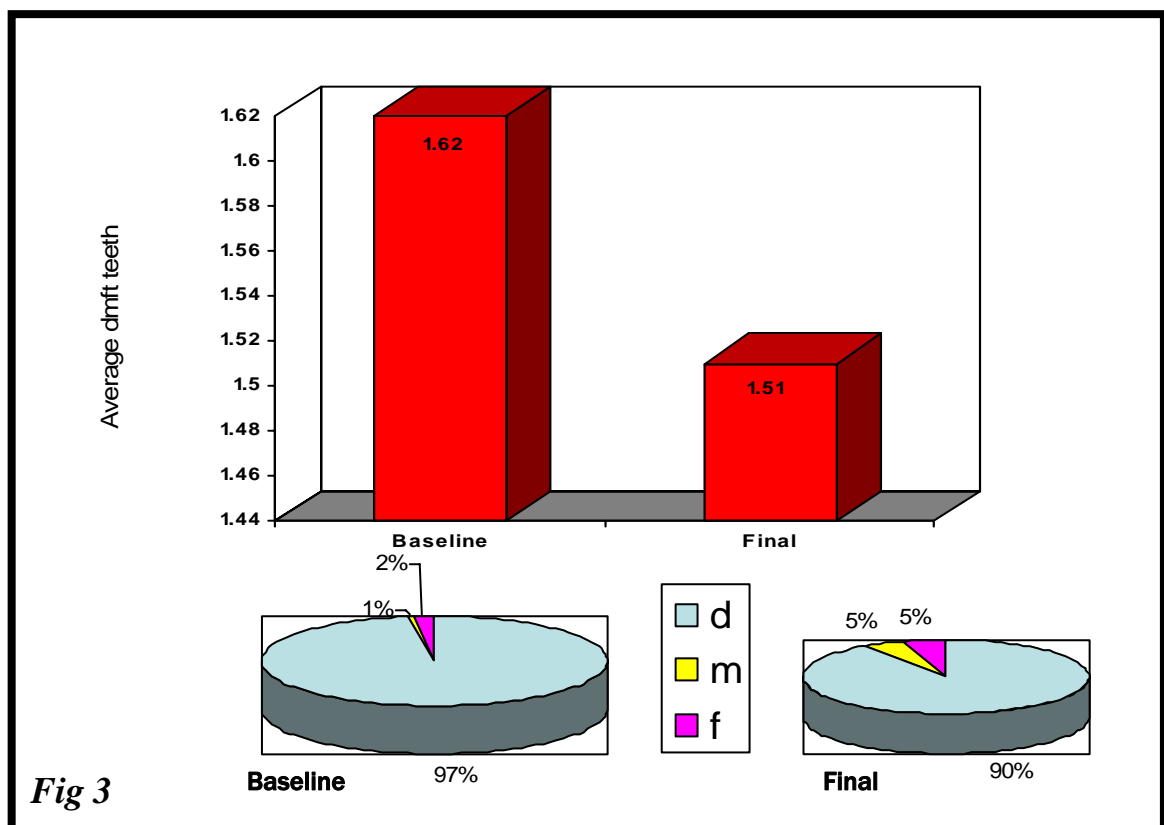
a. Junior age group ([Tables 8,9,12](#) and [13](#))

A total of 1491 children (baseline corrected and Final examination) were evaluated in the junior age group (Table 6) in which total decayed primary teeth at baseline were 2361 with an average of 1.58 decayed primary teeth per child and at final examination, it reduced to 2052 with an average of 1.37 decayed primary teeth per child (Table 8).

Total missing primary teeth were 17 at the baseline with an average of 0.01 which increased to 106 with an average of 0.07 per child at the final examination (Table 8).

The total filled primary teeth were only 51 at the baseline examination, average 0.03, while at the final examination it increased to 107 with an average 0.07 filled primary teeth per child (Table 8).

The average dmft per child was 1.62 at baseline with total 2429 decayed, missing/extracted and filled primary teeth while average dmft at final examination was found to be 1.51 with total of 2265 dmf teeth. The differences in the dmft score between baseline and final examination was found to be statistically highly significant ($p < 0.001$). However the proportion of filled primary teeth increased significantly in the total dmft (Table 8, Figure - 3).

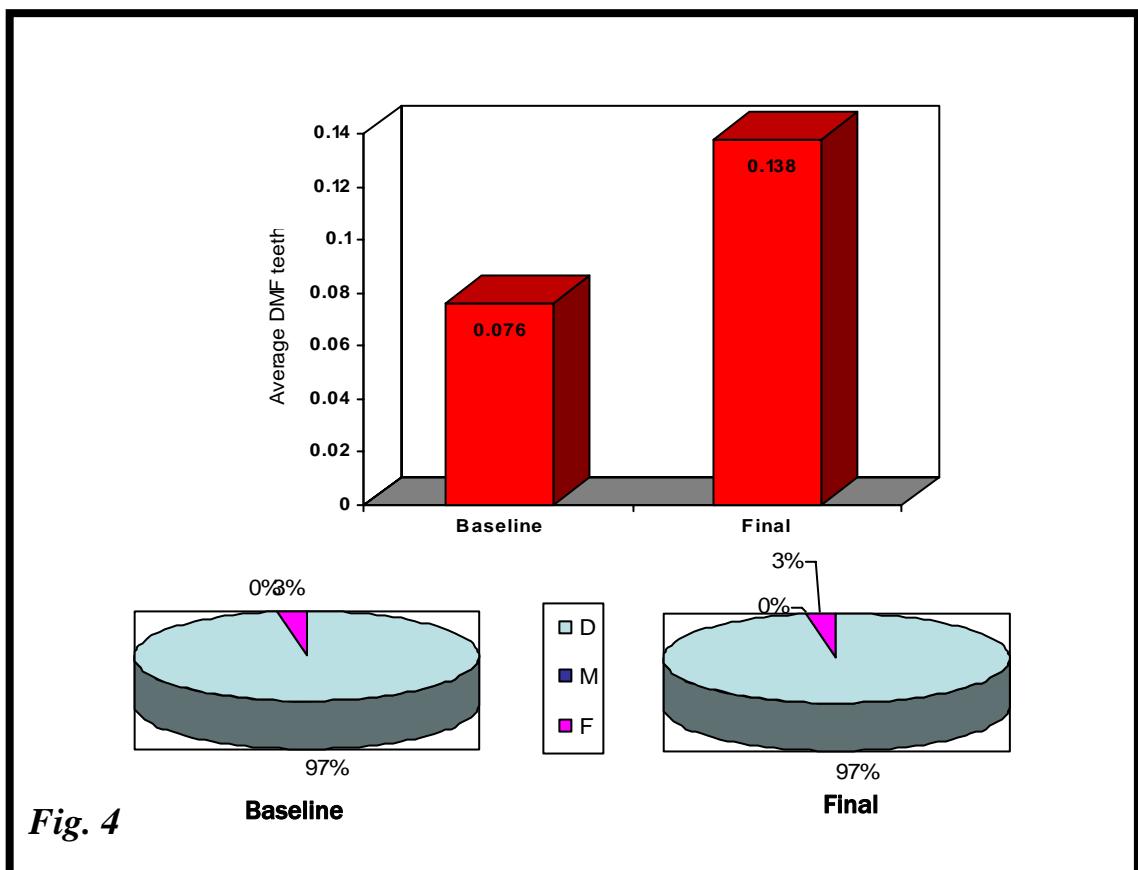


Among the junior children total decayed permanent teeth at baseline were 110 with an average of 0.07 per child and at final examination; it increased to 200 with an average of 0.13 decayed permanent teeth per child (Table 9, Fig. 4)

Total missing permanent teeth were found to be 0 at the baseline and at final examination (Table 9, Fig. 4).

The total filled permanent teeth were only 4 at the baseline examination (average 0.002) while at the final examination it increased to 6 with an average 0.004 filled permanent teeth per child (Table 9, Fig. 4).

Similarly the average DMFT at baseline was 0.076 (total 114) whereas at final examination it increased to 0.138 DMFT per child (total 206). The difference between DMFT score between baseline and final examination was found to be highly significant (Table 9, Fig. 4).



The care index (proportion of filled teeth) for Primary and Permanent Teeth increased from 2.16% to 4.57% during the 1 year of implementation phase (Table 12).

The number of caries free children in the junior age group at baseline were 747 (50.1%) and 771 (51.7%) at the final examination (Table 13).

On analyzing the dmft and DMFT in Junior School children from all 5 participating schools, it was found that all schools were having similar trends with respect to dental caries status and the differences between the schools were found to be statistically non significant.

b. **Senior age group** ([Tables - 10, 11, 12 & 13](#), Fig. 5,6)

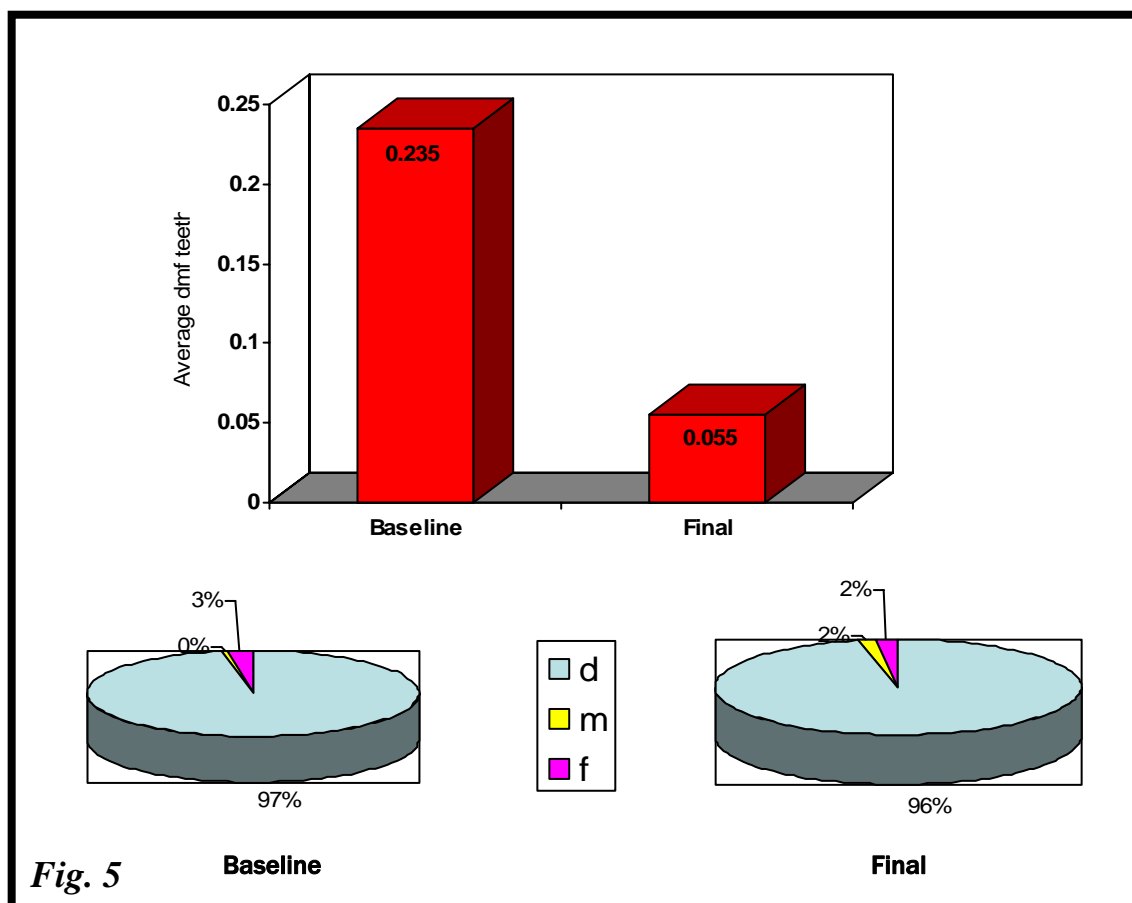
A total of 1471 children (Baseline corrected and Final examination) were evaluated in the senior age group (Table 7) in which total decayed primary teeth at baseline were 336 with an average of 0.22 per child and at final examination, it reduced to 78 with an average of 0.05 decayed primary teeth per child (Table 10).

Total missing primary teeth were found to be only 1 at the baseline which increased to 2 at the final examination (Table 10).

The total filled primary teeth were 9 at the baseline examination while at the final examination it reduced to only 1 (Table 10).

The average dmft in the Senior age group was 0.235 at baseline and 0.055 at final examination (Table 10). There was a significant reduction

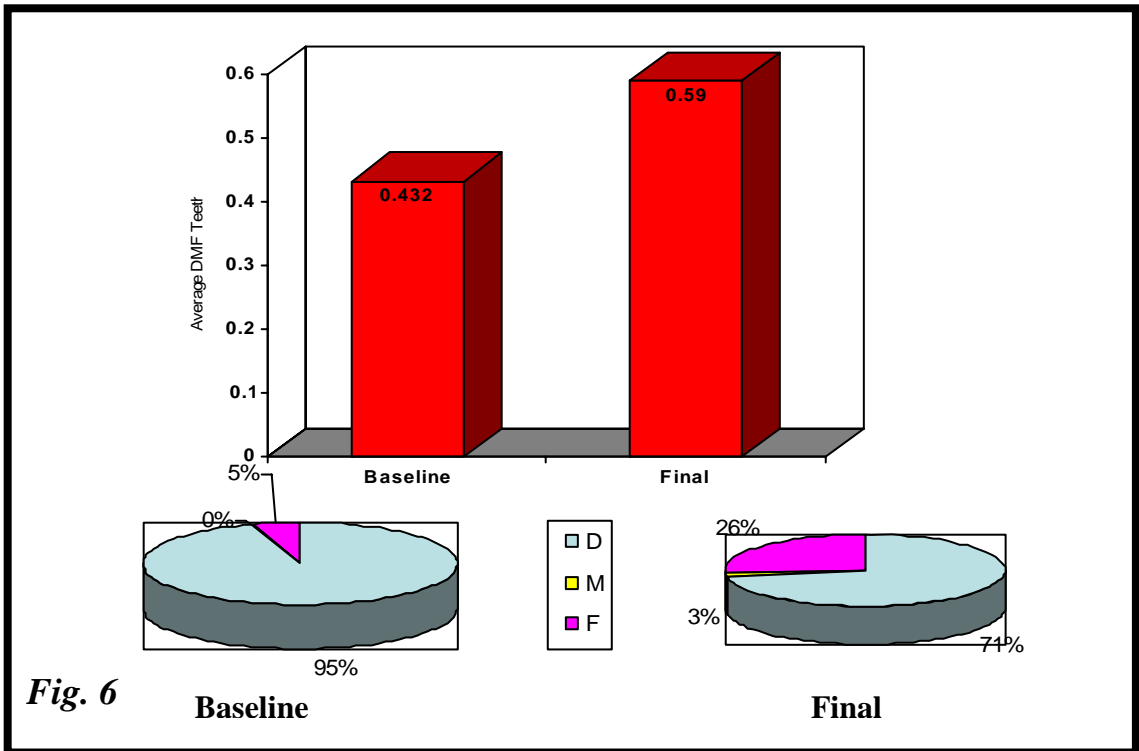
in dmft during the one year implementation phase but the number of filled primary teeth reduced probably due to exfoliation of these teeth.



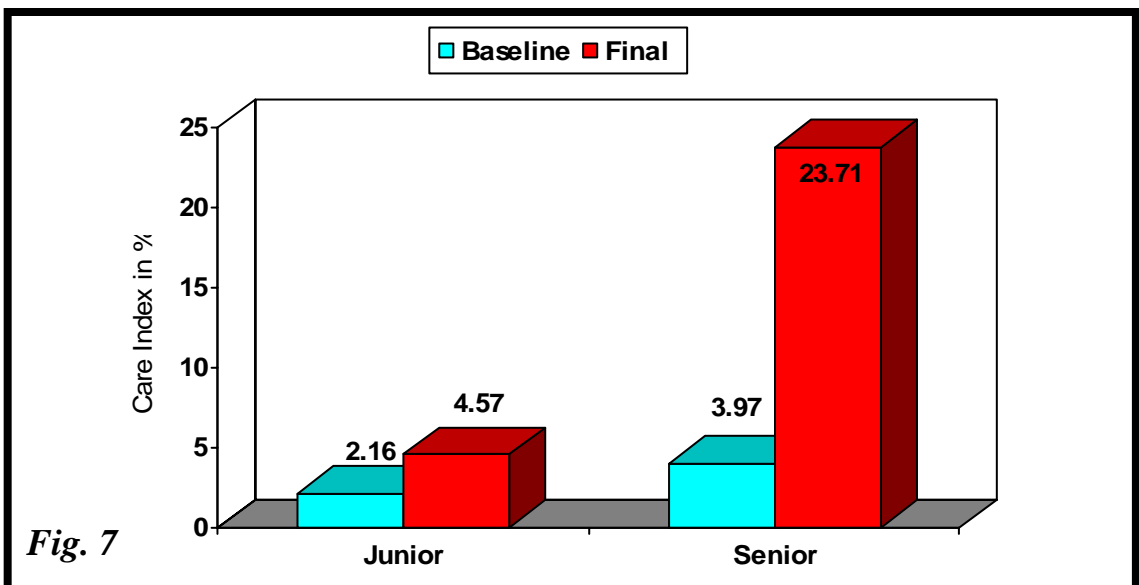
Among the senior children total decayed permanent teeth at baseline were 604 with an average of 0.41 per child and at final examination; it marginally increased to 621 with an average of 0.422 decayed permanent teeth per child (Table 11).

Total missing permanent teeth were found to be 2 (0.001) at the baseline and which increased to 23 (0.015) at final examination (Table 11).

The total filled permanent teeth were 30 at the baseline examination (average 0.02) while at the final examination it increased to 224 with an average 0.152 filled permanent teeth per child (Table 11).



The total DMFT score was 0.432 at baseline which increased to 0.590 at the final examination (Table 11). The change in DMFT and dmft between baseline and final examination was found to be highly significant ($p < 0.001$). Moreover the number of filled permanent teeth increased from 30 (care index 3.97%) only to 224 (care index 25.7%) indicating that care index has also increased significantly during the one year study period (Table 12, Fig. 7).



The number of caries free children in the senior age group at baseline were 1134 (77.1%) and 1046 (71.1%) at the final examination (Table 13).

On analyzing the dmft and DMFT in Senior School children from all 8 participating schools, it was found that all schools were having similar trends with respect to dental caries status and the differences between the schools were found to be statistically non significant.

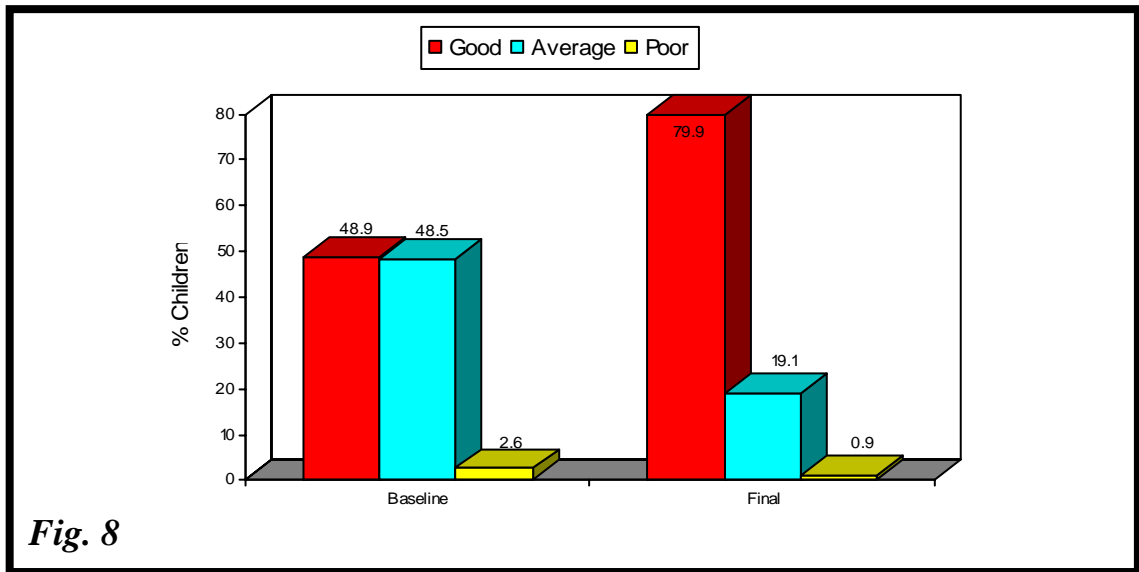
2. Analysis of Oral Hygiene Efficiency

a. Junior age group (6-8years) (Table 14, Fig. 8)

The oral hygiene efficiency was assessed by plaque index (Silness & Loe 1967) among the school children. According to the grades given, the PI score of 0-0.9 was ranked as good, the score of 1-1.9 was ranked average and score above 2 was ranked as poor oral hygiene efficiency.

There were 48.9% children in the good score at baseline which significantly increased to 79.9% at the final examination. In the average category there were 48.5% children at baseline and 19.1% at final examination, however poor oral hygiene efficiency was seen in 2.6% children at baseline and 0.9% at the final examination (Table 14, Fig. 8).

The difference between oral hygiene scores at baseline and final examination was found to be highly significant. ($p < 0.001$)

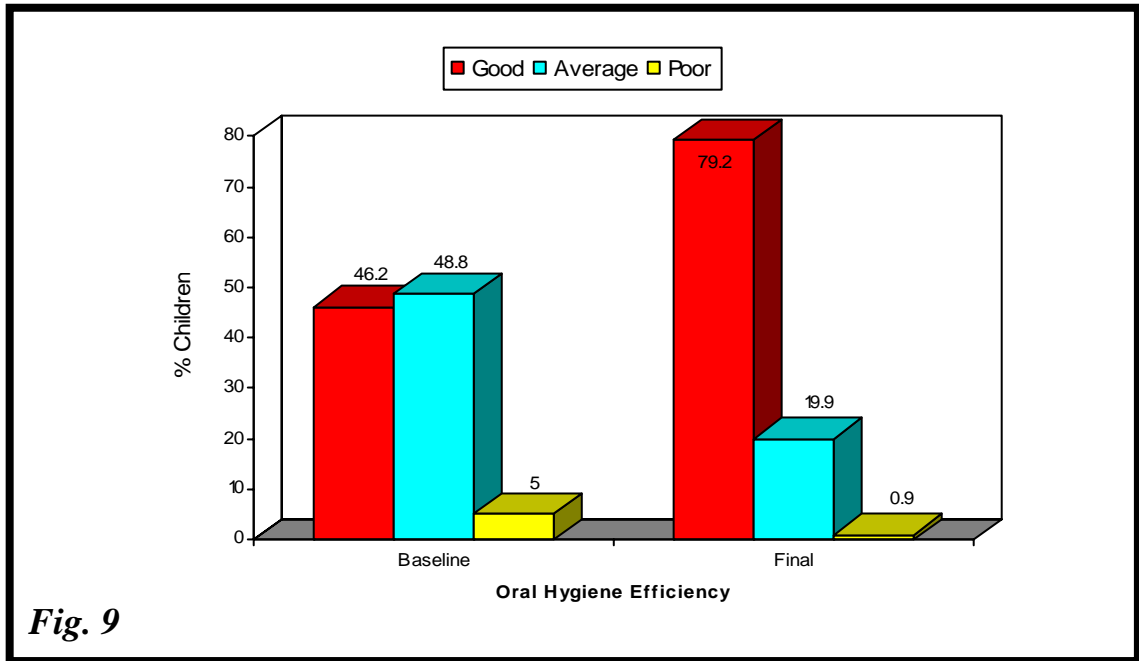


b. Senior age group (12-14years) ([Table 15](#), Fig. 9)

There were 46.2% children in the good score at baseline which significantly increased to 79.2% at the final examination. In the average category there were 48.8% children at baseline and 19.9% at final examination, however poor oral hygiene efficiency was seen in 5.0% children at baseline and decreased to 0.9% at the final examination ([Table 15](#), Fig. 8). The difference between oral hygiene scores at baseline and final examination was found to be highly statically significant ($p < 0.001$).

It can be inferred from the above that the oral hygiene efficiency of the school children improved significantly due to the oral health education imparted to the children.

The differences between the schools with regards to plaque index for both senior and junior age group were found to be statistically non significant.



3. Analysis of Knowledge, Attitude and Practice (KAP) in the Senior age group.

a. Knowledge regarding Oral Health (Tables 16.1 – 16.8; Fig.10 and 11)

The children were asked a total of 8 questions based on their knowledge regarding number and characteristics of primary and permanent teeth and various dental problems.

The overall knowledge regarding teeth and oral problems improved marginally in the senior children between baseline and final examination.

3.1) Knowledge of Children regarding milk Teeth ([Table 16.1](#))

The children were asked about what are milk teeth. At baseline, 1164 Children (92.7%) knew that milk teeth are the ones which erupt before permanent teeth. However, at Final Examination the number of children

with correct knowledge about milk teeth increased to 1418 (96.3%). The difference in the number of children having right knowledge about milk teeth was found to be statistically non significant.

3.2) Knowledge of Children regarding number of milk teeth ([Table 16.2](#))

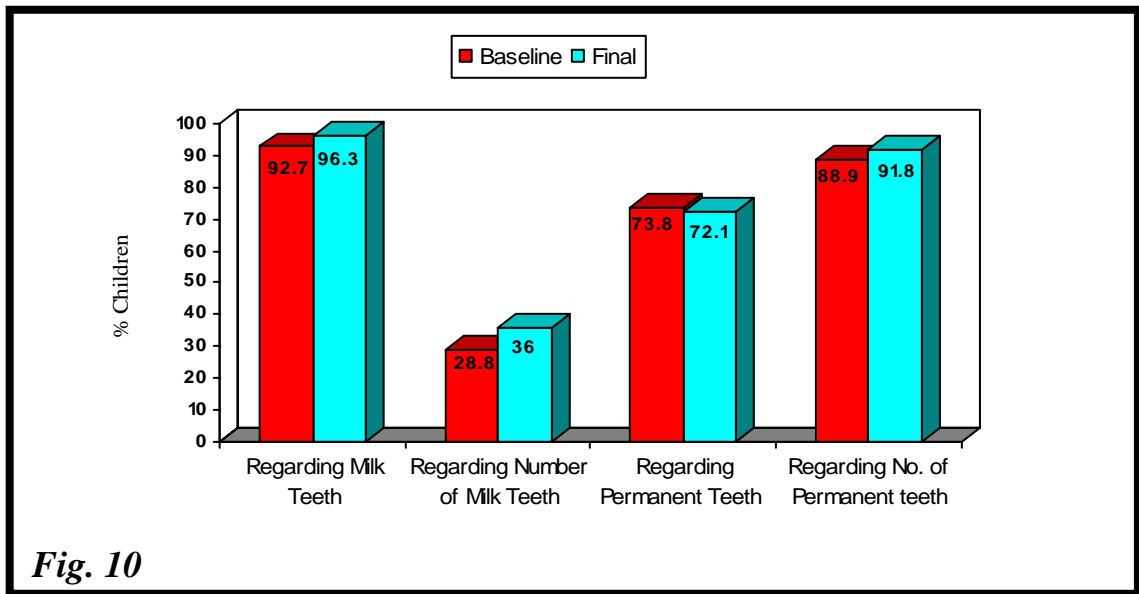
When children were asked about number of milk teeth, only 424 (28.8%) children replied right answer i.e. 20 while at final examination 530 (36%) children knew about the number of milk teeth. The difference at baseline and final examination was found to be statistically non significant.

3.3) Knowledge of children regarding permanent teeth ([Table 16.3](#))

Out of 1471 Senior School children 1086 (73.8%) children at baseline had right knowledge about permanent teeth whereas at final examination only 1060 (72.1%) children showed right knowledge. The difference between baseline and final examination was found to be statistically non significant.

3.4) Knowledge of children regarding number of permanent teeth ([Table 16.4](#))

At the baseline examination 1307 (88.9%) of the children knew that there are 32 teeth in permanent dentition while at final examination the number of children with right knowledge increased to 1350 (91.8%) out of a total of 1471 children examined. The difference was found to be highly significant statistically. ($p < 0.001$)



3.5) Knowledge of School children regarding various dental problems [\(Table 16.5\)](#)

The children were asked if they have any knowledge about loosening of teeth, dental decay, dental abscess, mottling of teeth or ulcers in the mouth but 144 (9.8%) children at baseline and 143 (9.7%) of the children at final examination could not show their knowledge regarding these conditions. The difference was found to be statistically non significant.

3.6) Knowledge of School children regarding dental caries [\(Table 16.6\)](#)

Out of 1471 children asked regarding knowledge on dental caries , 1182 (80.4%) children had right knowledge at baseline and 1191 (81.0%) had right knowledge at final examination. The difference was found to be statistically highly significant. ($p < 0.001$)

3.7) Knowledge of School children regarding colour of healthy gums (Table 16.7)

A total of 775 (52.7%) children at baseline had right knowledge about colour of healthy gums i.e. light pink whereas at final examination 857 (58.3%) children showed right knowledge. The difference between baseline and final examination was found to be statistically highly significant. ($p < 0.001$)

3.8) Knowledge of School children regarding appearance of infected gums (Table 16.8)

Out of 1471 Senior School children, 1043 (70.9%) children at baseline had right knowledge about inflamed gums i.e. red, swollen and bleeding gums whereas at final examination 1011 (68.7%) children showed right knowledge. The difference between baseline and final examination was found to be statistically significant. ($p < 0.01$)

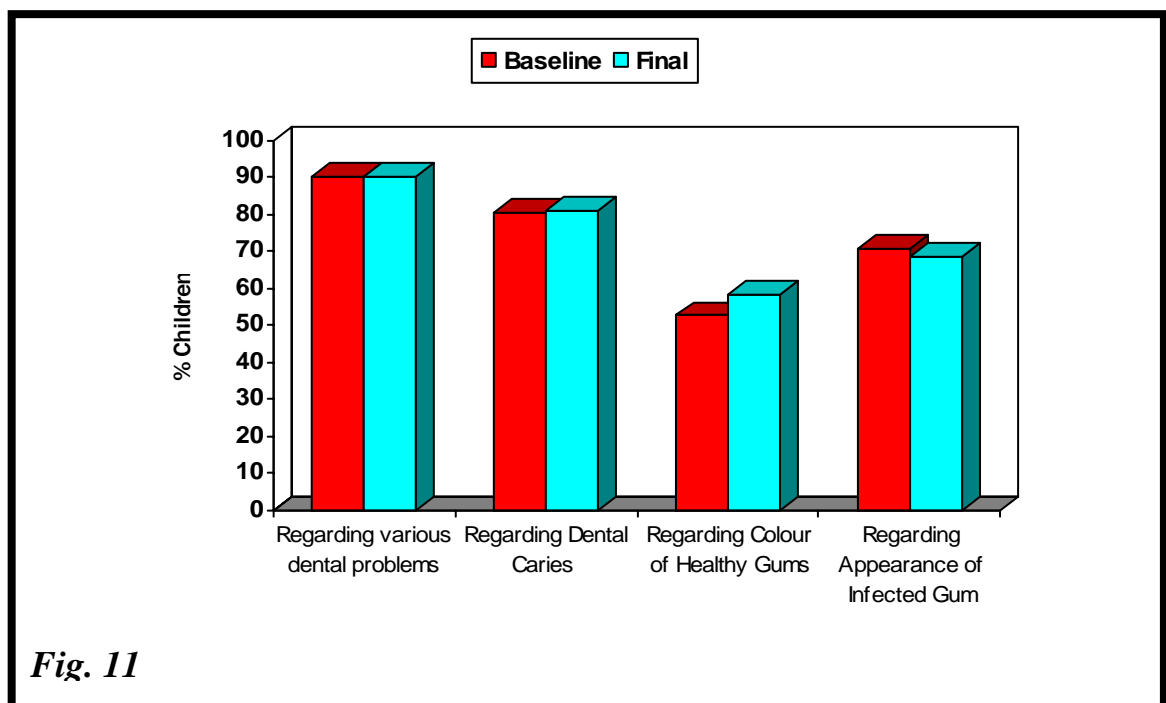


Fig. 11

**b. Practice regarding Oral Health and Diet
(Tables 17.1 – 17.8; Fig. 12, 13)**

There were 8 questions on oral hygiene practices and eating habits of the children in the KAP questionnaire. The oral hygiene practices included brushing aids, frequency of brushing, rinsing etc. These improved marginally during the one year study period. However frequency of eating sweets and bad oral habits did not show any change between baseline and final examination.

4.1) Practice of children regarding cleaning of teeth ([Table 17.1](#))

When children were asked about whether they are cleaning their teeth, out of 1471 children, 1454 (98.8%) children showed the correct practice i.e brushing at baseline while at final examination 1434 (97.5%) children showed correct practices. The difference at baseline and final examination was found to be statistically non significant.

**4.2) Practice of children regarding timing of cleaning their teeth
([Table 17.2](#))**

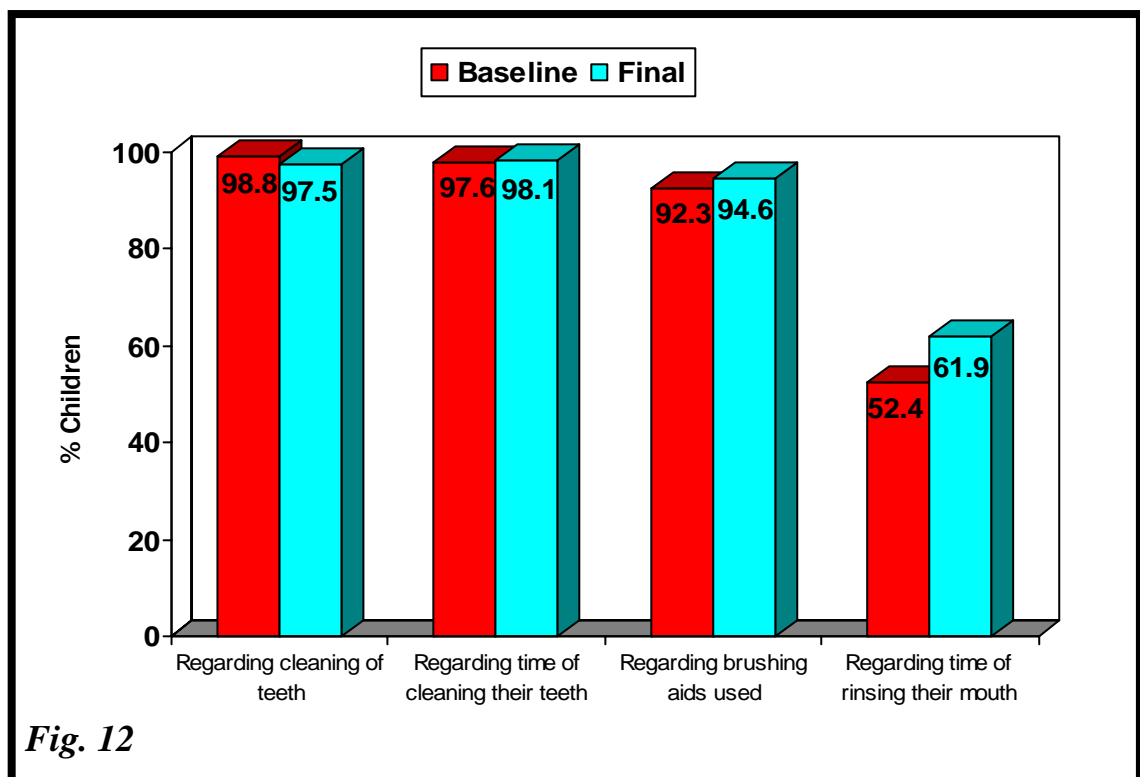
The children were asked about when do they clean their teeth, only 1435 (97.6%) children replied that they are cleaning teeth in morning and 17 children replied that they are brushing in noon, evening or night. Whereas, 1443 (98.1%) children at final examination said that they are cleaning teeth in morning and 15 children replied that they are cleaning the teeth in noon, evening or night. The difference at baseline and final examination was found to be statistically non significant.

4.3) Practice of Children regarding brushing aids [\(Table 17.3\)](#)

Out of 1471 Senior School children 1358 (92.3%) children at baseline were using brush and paste for cleaning their teeth (i.e. correct practices) whereas at final examination 1391 (94.6%) children said the same. The difference between baseline and final examination was found to be statistically non significant.

4.4) Practice of children regarding mouth rinsing [\(Table 17.4\)](#)

Among the senior School children 771 (52.4%) at baseline and 910 (61.9%) at final examination out of 1471 responded that they rinse their mouth after every meal (i.e. correct practice). The difference was found to be statistically highly significant. ($p < 0.001$)



4.5) Practice of children regarding frequency of brushing teeth ([Table 17.5](#))

Out of 1471 Senior School children, 1155 (78.5%) were brushing more than once daily (i.e. correct practice), however, at the final examination 1124 (76.4%) children were brushing their teeth more than once daily. The difference between baseline and final examination was found to be statistically non significant.

4.6) Practice of children regarding brushing method ([Table 17.6](#))

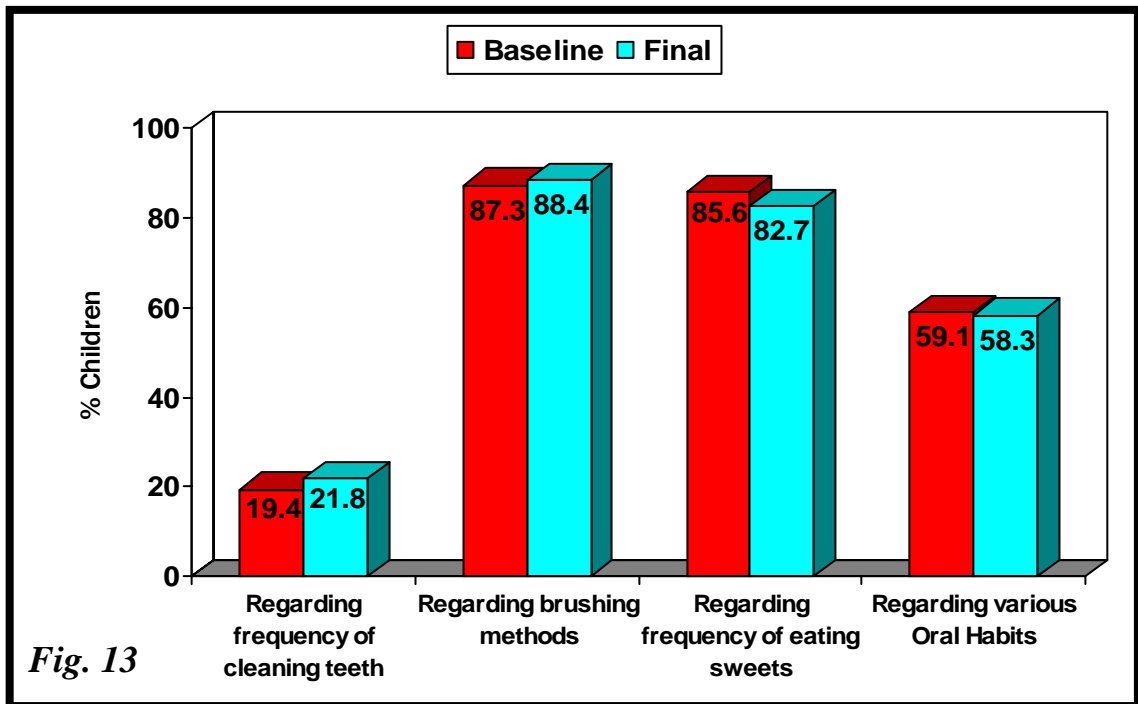
There were 1283 (87.3%) of children were using either up and down or round and round movement of brush for cleaning of teeth (correct method) and at final examination, 1301 (88.4%) children were using the correct method for cleaning their teeth. The difference between the baseline and final examination was found to be statistically non significant.

4.7) Practice of children regarding frequency of eating sweets. ([Table 17.7](#))

The children were asked at baseline regarding daily frequency of eating sweets, about 1259 (85.6%), children were having sweets less than 4 times a day (i.e correct practice). Whereas, at the final examination 1216 (82.7%) children were having sweets less than 4 times. The difference between baseline and final examination was found to be statistically highly significant ($p < 0.001$)

4.8) Practice of Children regarding Oral Habits ([Table 17.8](#))

At baseline examination 869 (59.1 %) reported that they do not have any bad oral habit. While 859 (58.3%) did not report with any such habits at final examination. The differences between baseline and final examination were found to be statistically non significant.



c. **Attitude of children regarding Oral Health (Tables 18.1 – 18.6, Fig. 14, 15)**

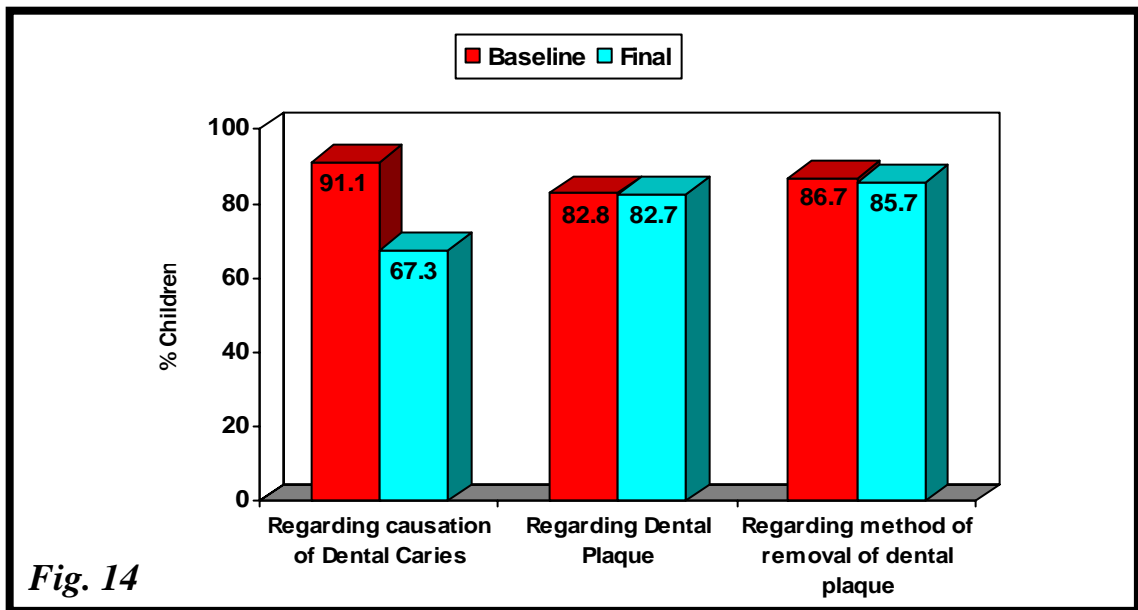
The children’s attitude regarding oral health was assessed with the help of six questions based on dental caries, plaque bad oral habits, brushing and consumption of sweets. On comparing the baseline and final examination, it was found out that there was a very little change in the attitude of the children regarding brushing, plaque etc. but a significant number of children reported that it is very difficult to control sweets.

5.1) **Attitude of children regarding causation of Dental Caries (Table 18.1)**

At the baseline examination 1341 (91.1%) children showed correct attitude towards food causing dental caries whereas at final examination 990 (67.3%) children reported that sugary food can cause dental caries. The difference was found to be statistically highly significant ($p < 0.001$)

5.2) Attitude of children regarding Dental Plaque ([Table 18.2](#))

Out of 1471 children examined at baseline, 1218(82.8%) children had correct attitude regarding dental plaque whereas 1216 (82.7%) children showed correct attitude at final examination. The difference was found to be statistically highly significant. ($p<0.001$)



5.3) Attitude of children regarding method of removal of Dental Plaque ([Table 18.3](#))

At the baseline examination 1275 (86.7%) children had right attitude regarding plaque removal whereas at final examination 1262 (85.7%) children reported the correct method of plaque removal. The difference was found to be statistically significant ($p<0.01$)

5.4) Attitude of children regarding effect of oral habits on alignment of teeth ([Table 18.4](#))

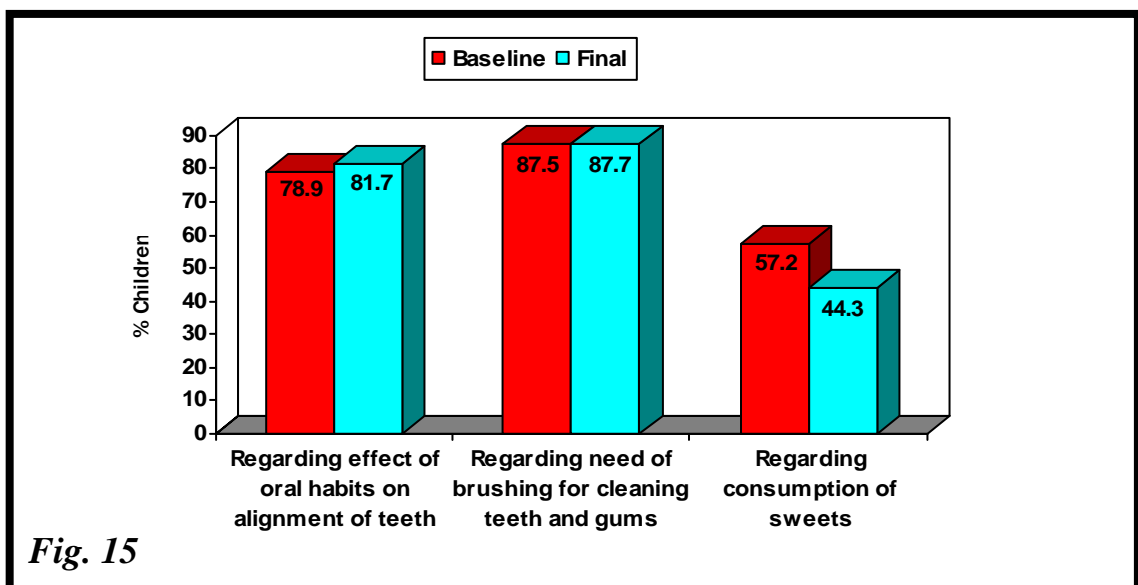
There were 1161 (78.9%) children with the attitude that bad oral habits can affect alignment of teeth at baseline which increased to 1202 (81.2%) at final examination. The difference was found to be statistically significant ($p<0.05$).

5.5) Attitude of children regarding need of brushing for cleaning teeth and gums ([Table 18.5](#))

Out of 1471 children examined at baseline, 1288 (87.5%) children had correct attitude about brushing of teeth whereas at final examination a marginally different number of children i.e. 1289 (87.6%) children showed correct attitude. The difference was found to be statistically non significant.

5.6) Attitude of Children regarding consumption of sweets ([Table 18.6](#))

At the baseline examination 841 (57.2%) children responded that frequent eating of sweets can help in causation of dental caries whereas at final examination 652 (44.3%) agreed upon the same. The difference between baseline and final examination was found to be statistically highly significant. ($p < 0.001$)



The overall KAP with respect to all 8 participating schools showed similar trends and the differences between the schools were found to be statistically non significant.

CRITICAL APPRAISAL

The present investigation was carried out to test the efficacy of a primary preventive programme specially developed for prevention of dental caries among school children using school teachers as persons to impart oral health education to the children.

The history of Dentistry has proved again and again that prevention through oral health education is a major factor in controlling oro-dental problems and related complications. In most of the industrialized countries, organised primary preventive oral health programmes have been proved to be effective using various personnel like dental health nurses, health care workers, school teachers and dental hygienist etc¹²⁻²⁴. However, development of infrastructure and employment of manpower seems to be unachievable task for the developing countries like India. Therefore these countries can use existing health and educational manpower and infrastructure for such primary preventive programmes.

Since the childhood is the age of learning and it is the time when a child start developing general hygiene practices and attitude towards health, it is very important to target the children for oral health awareness generation and demonstration of correct methods of oral hygiene maintenance.

School is considered as place for learning where children learn not only subjective knowledge but also life style practices and health seeking behaviours. It is important to start oral health education at school level in their regular curriculum so that it is taken as part of life. This will not

only help in generation oral health awareness among the children but also

help them in development of correct oral hygiene practices, thereby, to control oro-dental problems. The countries like Australia and New Zealand have a very well developed school oral health education programmes and have demonstrated decline in dental caries among school children in the last few decades²³.

1. Sample selection.

The programme was implemented in eight selected schools of Delhi. The area of Delhi was chosen for the study since it has people from various parts of country having different cultural background, eating habits and social thoughts. Apart from this, Delhi has a wide range of population with different socio-economic status. It has helped in testing the primary preventive module for the sample size having different eating habits and socio-economic status.

2. Selection of Schools

Various schools in Government, Public and Private Sector were included in the study so that children in the different socio economic status can be covered under the same project. There were three Government schools, two Private schools and three Public schools in the sample. The schools were located in areas which were inhabited by people from different socio-economic status.

3. Sample Size

As per the original proposal, 3000 school children were to be included in the study from which 1500 in junior age group i.e. 6-8 years and 1500 in senior age group i.e. 12-14 years. However, in the baseline examination 3550 children were examined (1752 - junior and 1798-senior) with an anticipation of having attrition of children due to migration, failure or shifting of the schools. At the final examination a total of 2962 children (1491 - junior and 1471 - senior) were examined in all the schools. There was an approximate attrition of 14% in junior age group 18% in senior age group but as per the proposal the attrition was only 0.8% in junior age group and 2% in the senior age group.

4. Selection of age group

There were two age groups included in the study i.e. junior (6-8 years) and senior (12-14 years). The junior age group was assessed for dental caries and plaque since at this age, the children are in early permanent dentition but with mature posterior primary teeth. At this age, normally the child starts learning to have autonomy. The children of this age are normally in the habit of brushing their teeth under parental guidance. During this age, mostly the children follow the same oral hygiene practices as are being followed in the family i.e. the external intervention and education on oral health is minimal. Therefore, it can be inferred that at this age the oral health assessment is basically the assessment of oral health habits learned at home.

The senior age group (12-14 years) is the age of understanding, self practices and attitude building. The level of understanding at this age is normally due to influence of school teachers and peer group. The

children in this age group raise doubts about anything being taught to them and they have curiosity to learn newer things. These children were involved in the study so that they can learn right practices, knowledge and attitude towards oral health care.

In this study design, control group was not included because of ethical issues, however, the baseline data of the same children worked as self control.

5. Methodology for Oral Health Assessment

The children were assessed for dental caries and oral hygiene efficacy using WHO index for dental caries²⁴ (1997) and Sillness and Loe index²⁵ (1965) for plaque deposition respectively. In the junior age group only oral health assessment was undertaken whereas in the senior age group, oral health assessment as well as a self administered KAP questionnaire was also used.

6. KAP questionnaire

The senior age group children were given a KAP questionnaire consisting of 22 questions regarding knowledge towards oral health, attitude and practices of oral health pertaining to respective maturity level. There were 8 questions on knowledge regarding dentition and causation of common oro-dental problems, 6 questions on attitude towards oral hygiene methods and dental problems and 8 questions on practices regarding oral health like brushing, rinsing and bad oral habits. The questions were designed in such a way that few questions were having multiple choices while few questions were open ended.

7. Training of Teachers

In each school after the baseline evaluation, a teachers training programme was conducted for a minimum of half working day i.e. 3 hours. The teachers were trained by Dental Surgeons using an educative film entitled “Kripaya Muskuraiye” on oral health and brushing models. During the screening of the film, questions were invited from the teachers and they were asked to raise their own queries to make the session more interesting. In order to initiate the thought provoking process, teachers from the audience were also invited to demonstrate their own experiences and attitudes towards oro-dental problems. At the end, brushing demonstrations were performed to explain the details of brushing movement and appropriate usage of paste and proper brush. Apart from this, discussion on dietary modification with respect to sugar exposure was also explained. Wherever the teachers raised query about use of fluoridated tooth paste, they were explained the appropriate use of the same. At the end of training session, they were given a Training Manual on Oral Health which can act as ready reference for the teachers. They were also given practical suggestions regarding how they can integrate oral health related instructions in their day to day practices. In order to strengthen the efforts of the teachers, oral health awareness posters and pamphlets were also distributed to the school authorities from time to time.

In order to monitor the continuity of the oral health education by the school teachers, one dental surgeon visited the schools on regular intervals to find out the activities related to oral health conducted by the teachers. The dental surgeons used to give them different IEC materials especially various types of oral health education posters during the visit. The schools were instructed to display the educative posters on oral

health at the school notice boards and in the classrooms. This was in accordance with the suggestions made by Frencken et al (2001) after studying effect of oral health education of school teachers and its effect on plaque index, caries and use of fluoride in Grade-II and Grade-IV school children²⁶.

8. Changes in the Decayed, Missing and Filled Teeth

In the present investigation, there was a reduction in dmft scores in both junior and senior age groups which may not be completely attributed to the success of oral health education by school teachers. However DMFT increased in both the age groups but the care index (filled teeth / dmft + DMFT x100) for the junior age group was found to be 2.16 at the baseline and 4.57 at the final examination. This means that the number of filled teeth increased and number of decayed teeth reduced during the one year study period. The care index for senior age group has significantly improved from 3.97 at the baseline to 23.7 at the final examination. It could be perceived from this, that the effect of oral health education on 6 to 8 year old school children could not bring about significant changes in the dental caries status but the number of filled teeth in the senior school children have increased significantly indicating that the oral health education of these children had an impact and they received treatment for their carious teeth.

Venobbergen et al (2004) in a similar investigation could not find significant differences in the DMFT/S after 6 year follow up in 3291 School children with an average age of 7.1 years²⁷. Petersen et al (2004) also evaluated school based oral health education programme in 3 experimental and 3 control schools after 3 years follow up in Wuhan city, PR of China and found that DMFT/DMFS increments were

comparable in both experimental and control groups but the F component was higher in experimental group. Francken et al (2001) also reported statistically non-significant difference in dental caries status among school children in Zimbabwe after oral health education programme through school teachers²⁶. However, Laloo and Solanki (1994) reported significant difference in DMFS scores of South African school children after 7 years of implementation of oral health education programme at a public dental health clinic in Cape Town¹⁴. Van Palenstein Helderma (1997) also evaluated the effectiveness of school based oral health education programme with the help of school teachers and found significant difference in dental caries in the 8 participating schools even after 36 months of implementation²⁹. Thus it may be concluded that the results of this present study are in correlation with already executed studies mentioned above.

9. Changes in Oral Hygiene Efficiency (Plaque Index)

The plaque index was recorded on six representative teeth in the oral cavity as recommended by Silness and Loe i.e tooth No. 16, 21, 26, 36, 41, 46 and the average was taken as Plaque score for that subject. On basis of Plaque score, the children were divided in three categories namely Good Oral Hygiene (score between 0 and 0.99), Average Oral Hygiene (score between 1.00- 1.99) and Poor oral hygiene (score of 2 and above). This was an indirect indicator of the oral hygiene efficiency of the children in both anterior and posterior teeth. In the present investigation, there was an increase in children with Good oral hygiene during the one year study period in both Junior and Senior age groups. This may be completely attributed to the success of oral health education by school teachers and motivation with the help of IEC materials.

A similar study by Venobbergen et al (2004) in Belgium could not find significant differences in the frequency of brushing in the children educated on oral health by teachers (experimental group) and not educated by teachers (control group)²⁷. Petersen et al (2004) also evaluated school based oral health education programme in the experimental schools and found that the Gingival bleeding score was significantly less than the control group schools²⁸. Francken et al (2001) investigated effect of one time education of schoolteachers and reported statistically non-significant difference in plaque scores among school children in Zimbabwe after yearly follow-up for 3 years²⁶. Van Palenstein Helderma (1997) in an investigation conducted on School children reported that there were no significant differences in the plaque, calculus and gingival bleeding scores after school based oral health education programme with the help of school teachers in the 8 participating schools after 36 months of implementation²⁹. Ivanovic and Lekic (1996) studied effect of short term education programme on plaque accumulation of School children in Yugoslavia and concluded that short term educational programmes have a short term effect on improvement of oral hygiene in terms of plaque, calculus and gingival bleeding³⁰. These findings can be compared with the present investigation and may be concluded that the results of this present study are better than other studies in terms of oral hygiene efficiency. The significant point is to recommend that such programmes should be self sustainable and continuous rather than one time and time bound.

10. Changes in the Knowledge, Attitude and Practice

On carefully studying the results of the KAP questionnaire in the baseline and final examination, it could be concluded that certain knowledge

regarding dental structures, problems and etiology improved in the senior School children between baseline and final evaluation but there were some information like what are milk teeth, number of milk teeth etc. did not show improvement during the study period. However, among the practices, there was a little improvement in terms of rinsing of mouth and method of brushing. The attitude regarding plaque, brushing, caries, oral habits and sweet intake showed significant results but many children honestly reported that it is very difficult to control sweets.

Most of the studies conducted in the past by various authors (Venobbergen et al (2004), Petersen et al (2004), Francken et al (2001), Van Palenstein Helderma (1997), Ivanovic and Lekic (1996), Lalloo and Solanki (1994)) have reported improvement in the Knowledge, Attitude and Practice being followed after oral health education programme using schoolteachers^{14,26-30}. The results of present study also show improvement in terms of Knowledge Attitude and Practice of Senior School children after one year of implementation of school oral health education programme.

SUMMARY

The present study was carried out in 3550 school children of 8 different schools of Delhi to assess the feasibility of the Oral Health Primary Preventive Module for the Prevention of Dental Caries. The children included in the study were from two age groups i.e. 6-8 years and 12-14 years. Before performing clinical examination and KAP questionnaire recording, the children were given a consent form to be filled up by the respective parents. After obtaining the consent only, the children were examined. Following this, pre motivation baseline oral health examination and KAP recording was done in the school premises under standard aseptic conditions in the broad day-light. A total of 1752 school children in Junior age group and 1798 school children were included in Senior age group.

After the survey, selected school teachers from these schools were trained regarding oral health. These schoolteachers were then made responsible to impart oral health education to the children during their day to day activities. The clinical assessment was undertaken for dental caries and plaque index in both the age groups while KAP questionnaire was filled only by senior age group children. The training of the teachers was performed with the help of slide show and film on oral health entitled "Smile Please", brushing demonstration and subsequently there were open discussion session on oro-dental problems. During this training, the teachers were also explained about importance of oral health, its relation with general health and how they can integrate oral health instructions in their day to day practice.

Information, Education and Communication material were also designed to re-enforce oral health instructions to the school children. Special

posters were designed with pictorial presentation of dental plaque, dental caries, nursing bottle caries and malocclusion for putting on the notice board in the participating schools. A special training Manual on oral health for school teachers was prepared to give detailed information about causation, identification and prevention of various oro-dental problems. This manual was given to the school teachers during the training so that they have a handy reference at all the times to impart oral health education to the children. Apart from this, the children were also given an information sheet for parents so that parents could read the oral health instructions for prevention of dental problems among the children.

During the one year implementation phase, the field dental surgeon used to visit the schools at bi-monthly interval to find out the feed back and number of activities performed regarding oral health education in the school. This time was also used for motivation of the school teachers and to offer help for very needy and poor children.

Following approximately one year of implementation phase, a post motivation final clinical examination and KAP questionnaire recording was undertaken for the same school children. During the follow-up, few of the children migrated to other schools. On finding out the exact number of attrition of the children it was estimated that about 14.89% children in 6-8 years age group and about 18.30% of the children in the 12-14 years age group were not attending due to various reasons. Thus, for an epidemiological follow-up study of such a magnitude, the attrition of 15-18% seems to be acceptable.

The complete data from the baseline and final survey was fed in to the computer and for analysing changes in the clinical status, oral hygiene efficiency (plaque index) and KAP using SPSS Software for Windows.

The average dmft per child was 1.62 at baseline with total 2429 decayed, missing/extracted and filled primary teeth while average dmft at final examination was found to be 1.51 with total of 2265 dmf teeth. Similarly the average DMFT at baseline was 0.076 (total 114) whereas at final examination it increased to 0.138 DMFT per child (total 206).

The total filled permanent teeth were 30 at the baseline examination (average 0.02) while at the final examination it increased to 224 with an average 0.152 filled permanent teeth per child. The average dmft in the Senior age group was 0.235 at baseline and 0.055 at final examination. whereas, among permanent teeth total DMFT score was 0.432 at baseline which marginally increased to 0.590 at the final examination.

There were 48.9% children in the Junior age group who had good oral hygiene score at baseline which significantly increased to 79.9% at the final examination, whereas there was relatively decrease in average and poor oral hygiene scores at the final examination.

In the Senior age group, 46.2% children were in the good score at baseline which significantly increased to 79.2% at the final examination. Similarly in the average and poor oral hygiene category the number of children decreased significantly.

The overall knowledge regarding teeth and oral problems improved marginally in the senior school children between baseline and final

examination. The oral hygiene practices and eating habits of the children including brushing aids, frequency of brushing and rinsing etc. improved marginally during the one year study period. However frequency of eating sweets and bad oral habits did not show any change between baseline and final examination. The children's attitude regarding oral health was compared between baseline and final examination, it was found out that there was a very little change in the attitude of the children regarding brushing and plaque etc. but a significant number of children reported that it is very difficult to control sweets.

CONCLUSIONS

- **The oral health module for prevention of dental caries in school children was effectively implemented with the help of school teachers in 8 schools of Delhi.**
- **The oral health education of the children by the school teachers could bring down the plaque scores in children and improve the knowledge, attitude and practice of the children regarding oral health.**
- **There was a significant increase in proportion of filled teeth in the senior age group after one year of implementation of the programme.**
- **Once trained, teachers can continue to impart oral health education to the children for many more coming years provided they are motivated regularly.**
- **School based oral health education programme can be an effective method for prevention and control of dental problems in developing countries.**

RECOMMENDATIONS

A. School Teachers

This particular project was based on the concept of teacher's important role in the education and motivation of school children for proper oral hygiene maintenance measures, change in their food behavior and referral to a dental surgeon for timely intervention. These three factors were thought, would bring awareness among School children regarding their oral health which would further help in decreasing the prevalence of oro-dental problems, particularly dental caries and gingivitis. As the teachers of different schools would be playing an important role in the execution of this or likewise projects, it is advisable that following points may be taken care of:

1. The target group in the teacher's community of any particular school should be identified. An ideal target group would comprise of the class teachers, teachers appointed for physical education, life sciences teachers and the Principal as they directly come in contact with the school children.
2. An effort should be made to interact with each teacher of the target group to know more details regarding their daily routine, prior engagements, their interest in the programme & their opinion regarding methodology of its execution. They should be made well aware of the fact that the success of this programme would depend upon their whole hearted participation and not merely the interest. Their level of cooperation should be assessed.

3. A pre training evaluation of the target group is must to assess their pre-conceived ideas and knowledge regarding oral health so as to orient the training process likewise. This assessment can be carried out by framing a set of relevant questions and answers regarding their knowledge, attitude and practice.
4. Proper training of the teachers comprising of lectures, film screening, slide shows, demonstrations, interaction and question answer session regarding commonly occurring oro-dental diseases in children is mandatory.
5. The teachers should be supplied with all possible IEC (Information, Education, Communication) material related to oral health which can be used by them for imparting proper knowledge and motivation to the School children.
6. After the proper training and supply of IEC material, the teachers should be advised regarding what is expected of them and how they should plan its execution in their own way and language.
7. The teachers should be advised to prepare and conduct a list of activities like essay writing on healthy smile, skits related to oral diseases, drawing competitions on beautiful smile and quiz competitions comprising of few questions on oral structures etc in which the students can participate and gain knowledge regarding oral health in the process.

8. The concerned teachers can be suggested to keep a log book which can reflect the various activities conducted by them and methods employed to bring awareness regarding oral health.
9. A constant and regular interaction with the concerned teachers is mandatory to assess and evaluate the progress regarding awareness of oral health, change in food behaviour and treatment needs.
10. If feasible, with the permission of school authorities, general questions, related to oral health can be asked in the class tests or unit tests which may enhance knowledge regarding oral health and generate awareness regarding oral health in turn.
11. The teacher's effort should be recognized, appreciated and certified as oral health ambassadors, for the particular school, where they are working.

B. Institutions carrying out the project

1. The institute or the investigators responsible for carrying out the project should plan and chalk out the schedule well in time regarding the course of action.
2. The timing for carrying out the project work especially the surveying part is crucial. It should be carried out at a time when the teachers and the School children are not engaged in the preparation of main examinations. The month of April/May or July/August are suitable to most of the school authorities as the

child gets promoted to a new class and has comparatively less burden regarding studies and teachers are also relatively free.

- 3. A prior consent from the parents of the School children is a must before conducting any survey. This is essential to avoid any controversy or legal complications. The parent should be made aware of clinical examination what is being planned for child and any relevant oral findings should be recorded in an oral health check up card for early management of such a problem.**
- 4. The team of dental surgeons appointed for carrying out the survey should be trained properly. The contents of the assessment form/recording form should be very well understood and hypothetical situations should be given to them to understand the subject well. The responsibilities of the dental surgeons and the data entry operator, should be clearly mentioned and explained.**
- 5. Properly autoclaved and calibrated instruments should be used for undertaking clinical examination and all possible precautions should be taken to conduct the oral health survey in hygienic and aseptic conditions.**
- 6. The investigating team or the dental surgeon specifically appointed for this work should constantly and regularly remain in touch with the school authorities and the teachers to assess and evaluate the progress of the project.**
- 7. The investigators should undertake periodic check up during the survey so as to look for any intra-examiner variability and for proper conduction of the whole programme.**

8. A longitudinal study related to dental caries and gum diseases is essential to find out the impact of school oral health education programmes involving school teachers. This can be possible by motivating the children to adopt positive attitude and correct practices towards better oral health which is an integral part of general health and healthy food behaviour.

ACKNOWLEDGEMENTS

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