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EVALUATION OF PIT & FISSURE SEALANT RETENTION STATUS IN PERMANENT MOLARS OF 6-14 YEARS OLD SCHOOL CHILDREN IN RURAL AREAS.

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Abstract:

Background*:* Indian studies have stated that, out of every 10 children 8 suffer from some or the other dental problem and 2 out of 3 kids are ill with dental caries. The children from the low socioeconomic status are the major victims of dental problems due to little awareness on importance of oral health and lack of accessibility to oral health care services. Pit and fissure sealants are used to prevent dental caries. A pilot project was executed in rural areas of Lucknow to seal pit and fissures of 5181 molars in 6-14 years old school children. The success of Pit and Fissure sealants is assessed by its retention. Henceforth, evaluation of the sealant was done 3 months after placement.

Materials and Methods: After training and calibration of doctors, a total of 5181 molars were sealed with resin based, pit and fissure sealant, in 1188 children of the age group 6–14 years from various schools situated at different villages at Lucknow Kanpur road. After 3 months of sealant placement, its evaluation was done for retention and sealant was reapplied where the evaluation status of sealant was found to be partially or completely removed.

Results: The total number ofdecayed teeth in oral cavity of 1188 children was found to be 1312, in which 642 were permanent while 670 were deciduous teeth and out of 642 permanent decayed teeth, 636 were molars. Out of 5181 molars which were sealed, 3391 molars were evaluated for retention; the remaining 1790 molars could not be evaluated due to large number of absentees on the day of evaluation. On assessment it was found that 89.1% of the molars were caries free with completely retained sealant whereas 9.6% of the molars were caries free with partial loss of sealant. Moreover, 1.09% of molars had complete loss of sealant with/without caries and 0.3% of molars had developed secondary caries.

Conclusion: Resin based pit and fissure sealant has good retention property and is effective in prevention of caries in children. Moreover, second molars except mandibular left second molar has better retention rate than first molars.

Keywords: Pit and Fissure sealants, Sealant retention, Resin, caries prevention, School Children.

Introduction:

Oral health is indispensable for overall health, well being and good quality of life of an individual. Poor oral health negatively affects growth, development, learning, nutrition, communication, self-esteem, and various general health conditions. Dental caries and periodontal disease are the two most prevalent dental diseases of Indian population. Dental caries affects 50-60% of children between 5-14 years age group and about 80-90% of the carious lesions begins on the occlusal surface of the molars. The deep grooves of pit and fissures are difficult to clean as they cannot be accessed by tooth brush bristles making them susceptible to tooth decay. Hence, at all ages, the prevention of these pits and fissures is of utmost importance.[1]

There is variety of sealants used for this purpose. Firstly, is the resin type, which when placed in proper isolation have been found most effective by most of the clinical trials.[2] Secondly, are the Glass-ionomer (GI) based sealants which are placed where complete moisture control is problematic.[3] GI has added benefit of fluoride releasing property. In 1990, novel material called compomers were invented, which had benefits of both resin and Glass-ionomer sealants.[4]

The key factor which determines the success of the sealant is its penetration into the depths of pit and fissure and its adaption to lateral walls.[5] This treatment modality of sealing pit and fissures of molars have been proven to be cost effective and decreases the risk of dental caries up to nine times.[6] Because of superior resistance to wear and retention rate, resins are the choice of material for sealing pit and fissures today.[7]

India is a developing country where most of the population lives in rural areas. People living there are not well educated and mostly have poor oral health. Modern preventive treatment like

pit and fissure sealant is usually available in urban areas and most of the scientific literature provides evidence on same population. In our study we selected children in schools from rural parts of Lucknow as they are usually underprivileged to receive proper dental care.

Objectives:

1. To evaluate the retention status of sealant after 3 months.
2. To prevent dental caries by sealing permanent molars of 6-14 years school going children in rural arrears of Lucknow.
3. To promote good oral health through oral health education.

Materials & Method:

Screening: A schedule of the visits to all the 19 participating school was prepared. The total number of 1901 schools was screened in which 1343 students were selected for sealant placement. The children selected for the program were of the age group 6-14 years, had fully erupted first and/or second molars with deep and intact retentive fissures. Those who were physically or mentally challenged or had deleterious oral habits which would affect the occlusion were excluded from the study.

The team visiting the school for screening consisted of one three dental professionals and two assistants. While planning a visit to school for case selection the team member considered the following:

a) Introducing the examining team to the school principal and class teachers.
b) Choosing an appropriate place to carry out the screening in each school, and setting up equipment.
c) Short listing the individuals meeting the selection criteria for pit and fissure sealant placement.
d) Brief the principal before leaving the school.

e) Giving the consent form to the principal for signature of parents.

f) Schedule the next visit for application of sealants among the selected students.

g) Those students requiring any dental or emergency treatment were referred to our nearest primary health centre or King George's Medical College.

Examination Performa: The participant information sheet contained instructions for parents about the proper brushing technique. The child was instructed to refrain from having sweet and sticky food after brushing and before sealant placement.

Training and calibration: The doctors were trained and calibrated in the clinical set up. To standardize the sealant application. Each participating doctor applied at least 5-10 sealants under direct supervision of an expert in the clinical set up before application in the field. They were trained and calibrated for proper sealant placement. It was made sure that they do not place extra amount of sealant which would create high points.

Ethical Clearance: After having Permission from District education officer and Discussion with State Nodal Officer, Ethical approval was taken from Research cell, King George's Medical University. A year'sexperimental study was conductedat Primary school children of age group 6-14 years, in government schools at the rural areas of Lucknow.

Consent: A blanket written consent was obtained from all the selected government school authorities. The school schedule pertaining to examination and available space for the proposed work in the school premises was attained in advance. A written consent from the participating children and their parents was taken after screening and selection of the pupil.

Inclusion criteria: Children of 6-14 years who had permanent first and/or second molars were included in the study.

Exclusion Criteria: 1) Children who had caries free teeth, i.e. one who did not have even a single carious tooth at the age of 6-14 years. 2) Molars which did not have deep pits and fissures. 3) Deciduous molars were not included.

Sealant placement Visit: As per the plan, each school was visited for application of the Pit & Fissure sealanton molars amongst the selected school children. A total of 5181 molars were sealed in 1343 students present on the day of sealant application. Sterilized instruments were used in each patient. a. Proper isolation was done through suction tubes and cotton roles. The tooth was properly dried with the help of air syringe before initiating the treatment to ensure successful sealant retention. After curing, the occlusion was checked for any interference by the sealant placed. In case of high points, they were reduced using composite finishing bur.

Health Education: The students, teachers and the parents were provided IEC material and educated during screening and after sealant placement about:

a) The benefits of sealant placement.
b) Importance of brushing, brushing technique, role of diet in dental caries and importance of regular dental check-up etc.

Evaluation: After 3 months, 3391 molars were clinically evaluated for pit and fissure sealant retention status in 762 children present on the day of assessment. The evaluation results were categorized into 4 groups:

1=Intact- caries free(completely retained)

2=Partially intact- caries free/ Not intact (Partial Loss)

3= Failed- intact with caries(complete loss)

4 = Secondary Caries

Reapplication of sealant was done on the molars,where the evaluation status of the sealant was found to be partially or completely removed.

Analysis: The status of the pit and fissure sealant was evaluated on the sealed molars of those children who were present on the day of examination**.** The results of the study were obtained by using statistical software IBM SPSS Statistics for window version 21 (IBM Corp., Armonk, N.Y., USA).

Results

On calculation it was found that the mean age of the participating students was 10±2 years.

Diagram1.Pie chart illustrate that out of 1188 children who got their molars sealed, 607(51.1%) were boys and 581(48.9%) were girls.

Diagram 2. Pie chart showing 5181 molars was sealed out of 5195 sound molar teeth in 1188 children.

Diagram 3. The pie chart exemplifies, that the total number of decayed teeth in oral cavity of 1188 children was found to be 1312, in which 642 were permanent while 670 were deciduous teeth.

Diagram 1: Pie chart showing percentage of gender distribution in 1188 children

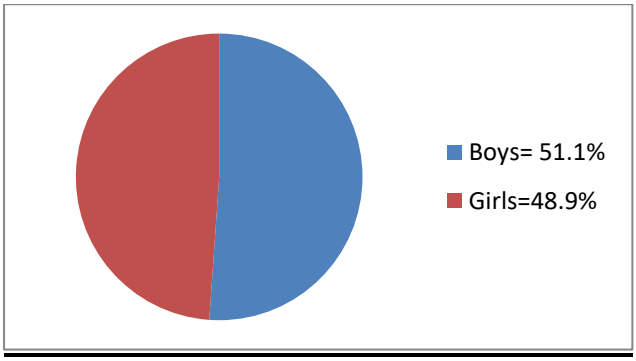


Diagram 2: Pie chart showing number of molars sealed with Pit & Fissure sealant, in 1188 children

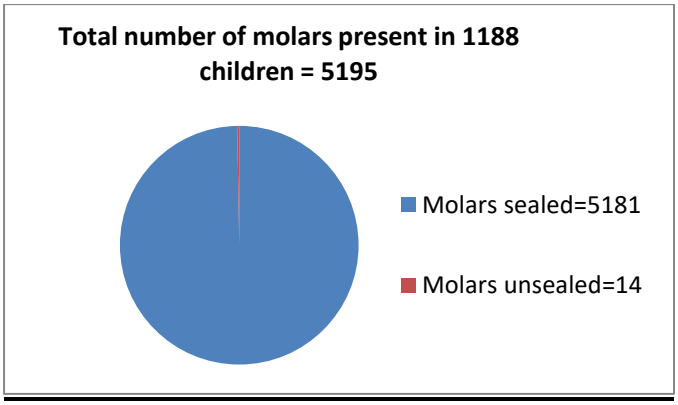
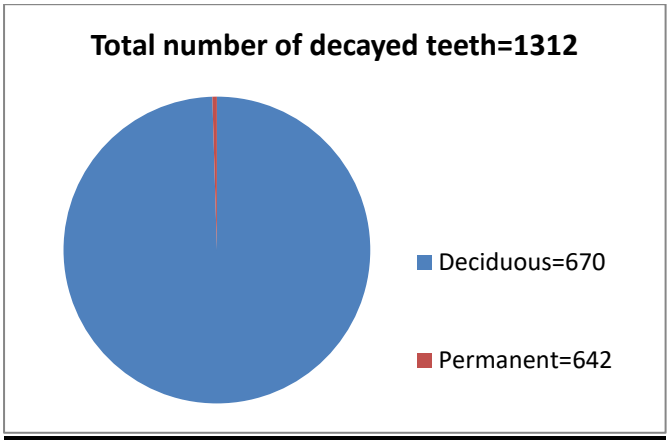


Diagram 3:Pie Chart showing decayed teeth in oral cavity of 1188 children



The Dentition Status of Permanent Molars, of all children who were selected for sealant placement is illustrated in Table 1. It highlights the fact that out of 642 permanent teeth which were found decayed, 636 were molars and the most commonly decayed tooth in selected group of students was 36 i.e. Mandibular Left First molar (n=152) followed by 46 i.e. Mandibular Right First molar (n=124).

Table 1: Dentition Status of Permanent Molars according to WHO Oral Health Assessment Form (1997).

Note: * On evaluation of the Dentition Status of the participating students ,only the above five enlisted tooth status were present. Hence in order to give a precise picture of the recorded data, the other status as mentioned in the WHO Oral Health Assessment Form are not mentioned here in this table.

		Tooth Number According To FDI Tooth Numbering System**								**Total**
		16	**26**	**36**	**46**	**17**	**27**	**37**	**47**	
Dentition Status of Tooth*	Sound	1065	1060	1018	1044	254	241	248	265	5195
	Decayed	92	91	152	124	27	34	63	53	636
	Missing due to any reason but not caries	0	0	0	0	1	2	1	1	5
	Unerrupted	19	21	7	9	846	846	829	822	3399
	Not Recorded	12	16	11	11	60	65	47	47	269

** According To FDI Tooth Numbering System , 16= Maxillary Right First molar ,26= Maxillary Left First molar , 36= Mandibular Left First molar, 46= Mandibular Right First molar, 17= Maxillary Right Second molar, , 27= Maxillary Left Second molar, 37= Mandibular Left Second molar, , 47= Mandibular Right Second molar.

Table 2. shows the Retention status of Pit and Fissure Sealant on 3396 molars after 3 months of sealant placement .On assessment it was found that 3024 (89.1%) of the molars were caries free with completely retained sealant whereas 328 (9.6%) of the molars were caries free with partial loss of sealant. Moreover, 32 (1.09%) of molars had complete loss of sealant with/without caries and 12 (0.3%) of molars had developed secondary caries. The table also tells that,theretention rate was more in second molars except 37 ie mandibular left second molar, which had retention rate similar to that of first molars.

Table 2: Retention Status of Pit and Fissure Sealant on 3396 Permanent Molars, after 3 months of sealant placement.

Note: *According To FDI Tooth Numbering System , 16= Maxillary Right First molar ,26= Maxillary Left First molar , 36= Mandibular Left First molar, 46= Mandibular Right First molar, 17= Maxillary Right Second molar, , 27= Maxillary Left Second molar, 37= Mandibular Left Second molar, , 47= Mandibular Right Second molar.

Retention Status of Pit and Fissure Sealant	**Tooth Number According To FDI Tooth Numbering System***								**Total (3396)**
	16	**26**	**36**	**46**	**17**	**27**	**37**	**47**	
Intact without caries	611 (88.1%)	606 (88.3%)	585 (87.3%)	600 (89.3%)	157 (96.3%)	154 (93.3%)	142 (84.5%)	169 (92.3%)	3024 (89.1%)
Partially Intact without caries	74 (10.6%)	70 (10.2%)	72 (10.8%)	72 (10.7%)	6 (3.4%)	9 (5.5%)	12 (7.1%)	13 (7.1%)	328 (9.6%)
Total Loss with or without caries	5 (0.7%)	8 (1.1%)	8 (1.2%)	0 (0.0%)	0 (0.0%)	1 (0.6%)	9 (5.3%)	1 (0.5%)	32 (1.09%)
Secondary Caries with sealant	3 (0.4%)	2 (0.2%)	1 (0.1%)	0 (0.0%)	0 (0.0%)	1 (0.6%)	5 (2.9%)	0 (0.0%)	12 (0.3%)

Discussion

The National Oral Health survey 2002-2003, confirms the increase in dental caries prevalence in 5-15 year old Indian children from 51.9% to 63.1% correspondingly.[8] The Statistical report of children in India 2018 highlights that 74% of the children live in rural areas of the country.[9] Sambi et al stated that in India ,the prevalence of dental cares in rural area children is 60.4%.[10] Dental treatment is a costly affair therefore it's of uttermost importance to take preventive oral health care measure for this fraction of children who belong to low socioeconomic status. During our visits at schools, we encounter, that the total number of decayed teeth were 1312 in 1188 children who we referred to the nearest centre for further management. Additionally, we also noticed that there was high number of absentees. A systematic review on, "Oral health, academic performance, and school absenteeism in children and adolescents" concluded that dental caries and tooth pain had a negative impact on academic achievement and school absenteeism.[11]

Pit and Fissure sealants have been considered as one of the most effective ways to prevent dental caries in occlusal surfaces of molars and premolars. A Meta-analysis on the longevity

of commonly used pit and fissure sealant materials, winded up with a conclusion that Auto-polymerizing, light-polymerizing and fluoride-releasing sealants are considered the reference standards for pit and fissure sealants.[12] Another systematic review done by Salorenta et al also found that Resin-based sealants applied on occlusal surfaces of permanent molars are effective for preventing caries in children and adolescents by 11% and 51% compared to no sealant, when measured at 24 months.[13] Henceforth a flowable, resin based, light cure, fluoride releasing sealant was selected for treatment in this project.

For the success of pit and fissure sealant retention is very important. We did an evaluation of the sealants placed, after 3 months and found that 89.1% of the molars were caries free with completely retained sealant whereas 9.6% of the molars were caries free with partial loss of sealant. Moreover 1.09% of molars had complete loss of sealant with/without caries and 0.3% of molars had developed secondary caries.A comparative study done on seven types of sealants by Hassan et al which concluded that the group which were sealed with Helioseal F , showed 75% total retention, 20% partial retention and 5% Total loss after 3 months of evaluation.[14] Another study done in 5-15 year old children by Al-Sultani et al stated that the permanent teeth which were sealed by pit and fissure sealant showed complete retention in 59% partial retention in 23% and completely missing in 18 % after 3 months of followup.[15] Ifzan et al did a Comparative Evaluation of Three Different Pit and Fissure Sealants. At 3-month evaluation he found that 89.7% of retention was seen for conventional resin sealant, 72.7% retention for Helioseal F and 65.3% for Glass ionomer sealant.[16]

Our study also concluded that the highest retention of pit and fissure sealant was found in second molars than first molars. This can be due to the more complex anatomical morphology of second molars than first molars. This result, was contrary to the results found by Wendt et al who found similar retention rates in both first and second molars, after evaluation in 20 and 15 years respectively.[17] Bhushan et al. found that Maxillary molars had superior retention rate

than Mandibular molar and Reddy et al concluded that the rate of retention in mandibular molar was superior to maxillary molars.[18, 19]

As everystudy has a few limitations we too came across a number of them like all the students were unable to get the benefit of the program due to regular absentees, lack of awareness and attrition of subjects during sealant placement and evaluation time. We faced technical issues due to power cut off and lack of electricity supply in few schools. Additionally we also had to make frequent visits in every school because of time constrain of school hours.

Conclusion

After 3 months of clinical evaluation our results indicated that resin based pit and sealant has good retention rate, to protect molars against caries. And moreover, second molars except mandibular left second molarhas better retention rate than first molars.

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Conflict of Interest: Nil

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