

Evaluation of Pit and Fissure Sealant With and Without Topical Fluoride Application

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Abstract: *The majority of the detected increment in dental caries is confined to pit and fissure surfaces of teeth. Application of pit and fissure sealants and topical fluorides are widely used procedures in the prevention of decay. The purpose of this study was to evaluate the effectiveness of pit and fissure sealant with and without topical fluoride application in the prevention of dental caries on the occlusal surfaces of teeth in children. 93 healthy cooperative children of both sexes with an average age (7-9 years) were included in this study, accordingly, 120 permanent first molars that were caries-free and fully erupted divided into two groups: sealant group (sealant applied on 60 permanent first molars) and sealant with fluoride group (sealant plus fluoride gel applied*

topically every three months intervals for 24 months on 60 permanent first molars). All children were recalled for assessment of fissure sealant and the presence or absent of dental caries at intervals of 6, 12, 18 and 24 months. The statistical analysis shows that there was no significant differences in the presence and absent of dental caries on the occlusal surfaces of the teeth between sealant group and sealant with fluoride group at baseline time and at 6, 12, 18 and 24 months intervals of recall assessment. There was some evidence about the superiority of pit and fissure sealant over topical fluoride application in the prevention of occlusal decay. However, it remained unclear to what extent there is differences between the effectiveness of pit and fissure sealant with and without topical fluoride application. No recommendation for the clinical practice could be given and the benefit of pit and fissure sealant with and without topical fluoride application should be considered locally and individually.

Key words: pit and fissure sealant, caries prevention, topical fluoride, clinical trial.

1. Introduction

Despite great advancement in oral health globally, the problem of dental caries which is a chronic disease remains in many communities around the world and continues to be a major public health problem, particularly among socially and economically deprived groups in developed and developing countries [1], these dental problems result in pain, infection and lost school days and work days each year [2,3].

Effective caries-preventive methods for use by dental professionals in caring for their patients, by individuals or by public health practitioners in communities and other population-based program sites have been developed and refined since the introduction of community water fluoridation in the 1940's [4].

Application of pit and fissure sealants and topical fluorides are widely used procedures in the prevention of decay. Pit and fissure sealants are used to prevent the impaction of food and growth of bacteria which promote decay [5]. Since the 1960s the development of pit and fissure sealants has progressed from the first generation (activated with ultraviolet light), through second (autopolymerized) and third (activated by visible light), to fourth generation (contains fluoride), and the effectiveness of dental sealants in preventing occlusal decay have been supported by numerous studies [6,7,8], but described significant heterogeneity and indicated the need for further studies .

Treatment of the hard tooth surfaces in such a way that caries is arrested or reversed is the aim of topical fluoride application, and the American dental Association (ADA) council on Scientific affairs commented that periodic fluoride treatment should be considered for both children and adults who are at moderate or high risk of developing caries [9].

Although the overall caries rate in terms of DMF-index values has fallen in industrialized countries, the rate of caries lesions in pits and fissures has not decreased at the same time [10]. Almost 90% of all dental caries occurs on occlusal, buccal and lingual tooth

surfaces with pits and grooves, making these surfaces most susceptible to decay in children and adolescents [5].

The aim of this study was to evaluate the effectiveness of pit and fissure sealants with and without topical fluoride application in the prevention of dental caries on occlusal surfaces of teeth in children.

2. Materials and Methods

❖ Sample selection and sealant application:

This study was conducted from October 2010 to October 2012, 93 healthy cooperative children of both sexes with an average age (7-9 years) were included in this study, they attended to private dental clinic in Al-Yarmok city for routine oral examination and treatment, and they had at least one fully erupted and caries-free first permanent molar. Any child with hypoplastic permanent first molar or other developmental anomalies was excluded from the study. All children had satisfactory oral hygiene. Upon parental consent, the parents and the children were informed about the purpose and the procedure of the study. Accordingly, 120 permanent first molars that were caries-free and fully erupted divided into two groups: sealant group (sealant applied on 60 permanent first molars) and sealant with fluoride group (sealant plus fluoride gel applied topically every three months intervals for 24 months on 60 permanent first molars). Sealant (Delton light-polymerized opaque fissure sealant: Johnson & Johnson Dental products Co. USA) was applied to all caries-free, fully erupted permanent first molars at baseline (for both groups 120 teeth), the material was used according to manufactured instructions.

The first step in sealant placement, was cleaning the occlusal surface of the selected teeth using a rotating brush and non-fluoridated pumice paste to ensure the removal of all deposits and debris from the pits and fissures. After prophylaxis, the teeth were washed with a water spray for 20-30 seconds and re-evaluated for residual debris or loosened pumice paste, then the area needs to be

isolated to provide a dry working field that will enhance retention, therefore, rubber dams was used to isolate the area, once isolated, the teeth were dried thoroughly with compressed air. Any moisture on the surface during the placement of the sealant will interfere with the bonding of the material to the tooth and compromise retention. The next step was acid etching of the teeth surfaces, 37% orthophosphoric acid was applied to the occlusal surface for about 20-30 seconds, this will permit mechanical retention of the sealant material, then acid etch was rinsed from surfaces and the area thoroughly dried. Then the teeth surfaces were dried and isolated prior to placement of the sealant material which was the most critical aspect of the placement process [20, 28].

The fissure sealant material then was applied with the disposable syringe provided by the manufacture and light-cured for 20–30 seconds, when polymerization was completed, the sealant was evaluated for over filling (checking the occlusion with articulating paper), discontinuity and retention. Irregularities (bubbles into the fissure) were corrected immediately with adding of a material or by adjusting high spots.

The last step of sealant application involved educating the patient about the importance of periodic reevaluation of the sealants [11]. In the 2nd group (sealant with fluoride), all children were seen at 3 months intervals for 24 months with a preventive program including regular topical fluoride application, after cotton roll isolation, the teeth dried with compressed air and Acidulated phosphate fluoride gel (Care 4 from Sultan chemists {ADA} Apf 23 %) was applied in properly selected flexible disposable trays and retained for 4 minutes. Children were asked to bend their head forward during the application period; the patients were allowed to expectorate freely after application. They were advised not to eat, drink, or rinse at least for 30 minutes following the application, and the children were instructed to brush their teeth only the next morning (Knutson technique) [13,14,15].

❖ **Evaluation criteria:**

The clinical criteria for detecting new caries lesions included: caries present and caries absent [16].

❖ **Follow up examinations:**

All children were recalled for assessment of fissure sealant and the presence or absent of dental caries at intervals of 6, 12, 18 and 24 months. During routine recall examinations, it is necessary to re-evaluate the sealed tooth surface both visually and tactually for loss of material, exposure of voids or bubbles in the material and caries development by using a dental mirror and explorer [14], The fissure sealant were not reapplied if they had been lost between examinations [17,18].

3. Results

Table (1) shows the number and percentage of caries present and absent in the 60 teeth of the sealant group, after 24 months of sealant application, dental caries was present on the occlusal surface of (6) teeth (10%) and absent in 54 teeth (90%) of the total 60 teeth in the sealant group, while at baseline time caries was absent in all the 60 teeth of the sealant group.

Figure (1) shows the percentage of caries present and absent of the sealant group at baseline time and at 6, 12,18 and 24 months intervals of recall assessment.

Table (2) shows that at baseline time and after 6months of fluoride application caries was absent in all the 60 teeth of the sealant with fluoride group, while after 24 months caries was present on the occlusal surface of (5) teeth (8.3%) and absent in (55) teeth (91.7%) of the total 60 teeth of the sealant with fluoride group.

Figure (2) shows the percentage of caries present and absent in the 60 teeth of the sealant with fluoride group at baseline time and at 6, 12, 18 and 24months intervals of recall assessment. As shown in figure(3) no statistically significant differences was found between the sealant group and sealant with fluoride group at

baseline time and at 6, 12, 18 and 24 months intervals of recall assessment for the presence of dental caries on the occlusal surfaces of the 120 teeth.

Figure(4) shows that there was no statistically significant differences in the absent of dental caries on the occlusal surfaces of the teeth between the sealant group and sealant with fluoride group at baseline time and at 6, 12, 18 and 24 months intervals of recall assessment.

4. Discussion

Pit and fissure sealant used to seal off minor grooves and fissures on tooth, these grooves and fissures are potential food traps that causes tooth decay; Sealing them makes the tooth surface smoother and reduce tendency for food to be trapped within the crevasses [29]. Pits and fissure sealants are indicated for children and adolescent who are at a moderate or high risk of developing dental caries or have incipient caries in pits and fissures. Moderate and high risk levels for caries in children and adolescents take into account the history of new, incipient or recurrent caries, salivary flow, regularity of dental visits and fluoride exposure, among other factors [19].

Sealant restorations are indicated for carious lesions that have not advanced into the dentin in occlusal surfaces of permanent molars, pre-molars and primary molars [20]. 95% of all carious lesions occur on the occlusal surfaces of teeth. The occlusal surfaces of teeth comprise 12% of the total number of tooth surfaces, which means the pit and fissures of the occlusal surfaces of teeth are more susceptible to decay as the smooth surfaces of the teeth [21]. The teeth at highest risk for carious lesions are the first and second molars, and 90% of all dental caries in school children occurs in pits and fissures of the occlusal surface of the molars [22].

The role of topical fluoride application in the prevention of caries initiation and progression has been well established [30, 31]. Although researches have shown that other agents such as

fluoridated varnishes, dentifrices and mouth rinses can reduce the prevalence of caries, but topical fluoride application plays a promising role in caries prevention [32, 33,34].

One of the major problems when considering the success rates of sealant restorations is the variation in techniques and materials used. Short term studies indicate a high degree of success for sealant restorations [23-24], this is in agreement with the present study. However, longer term studies appear to indicate that success is less predictable [25-26], so that the present study needed to be extended for a longer period of time to evaluate the success rate. For direct comparison of sealant restoration studies it is necessary to define success as 100% retention and no caries present in the tooth. The present study conducted over duration of (2 years) showed a success rate ranging from (100%) caries absent at baseline time and at 6 months intervals for both groups (sealant group and sealant with fluoride group), to (10%) caries present at 24months intervals for the sealant group and (8.3%) caries present at 24 months interval for the sealant with fluoride group.

In this study the effect of sealant placement alone were compared with the effect of sealant placement with topical fluoride application program, after 24months period, the teeth in the sealant group and sealant with fluoride group were found to be caries-free with rates of (90%) and (91.7%) respectively indicating a statistically non significant differences, this result is in agreement with results obtained by Yildiz et al, 2004 and Avinas et al, 2010 [18, 27].

5. Conclusion

There was some evidence about the superiority of pit and fissure sealant over topical fluoride application in the prevention of occlusal decay. However, it remained unclear to what extent there are differences between the effectiveness of pit and fissure sealant with and without topical fluoride application. No recommendation for the clinical practice could be given and the benefit of pit and

fissure sealant with and without topical fluoride application should be considered locally and individually.

References:

- [1] Petersen PE. *"Challenges to improvement of oral health in the 21st century – the approach of the WHO Global Oral Health programmed"*. Inter Dental Journal 2004; 54: 329–343.
- [2] Petersen PE. *"The world oral health report: continuous improvement of oral health in the 21th century- the approaches of the WHO global oral health programme"*. Community Dent., Oral Epidemiology 2003; 31:3-24.
- [3] United States GAO, Oral health: *"Dental disease is a chronic problem among low income population"*, Report to Congressional Requesters, April, 2000.
- [4] U.S. Department of Health and Human Services. *"Oral health in America: a report of the Surgeon General. Rockville, MD: U.S. Department of Health and Human Services"*, National Institute of Dental and Craniofacial Research, National Institutes of Health, 2000.
- [5] Ripa LW., *"Sealants revisited: an update of the effectiveness of pit-and-fissure sealants"* Caries Res 1993; 27:77–82.
- [6] Liodra JC, Bravo M, Delgado-Rodriguez M, Baca P, Galvez R., *"Factors influencing the effectiveness of sealants- a meta- analysis"*, Community dent Oral Epidemiol 1993; 21: 261-268.
- [7] Mejare I, Lingstrom P, Petersson LG, Holm AK, Twetman S, Kallestal C., *"Caries preventive effect of fissure sealants: a systematic review"*, Acta Odontol Scand 2003; 61:321-330.
- [8] Ahovuo-Saloranata A, Hiiri A, Norblad A, Worthington H, Makela M., *"Pit and fissure sealants for preventing dental*

- decay in the permanent teeth of children and adolescents 2004;(Cochrane Review)", Coharance Library, Issue 3. Chichester, UK: John Wiley & Sons, Ltd.*
- [9] American Dental Association Council on Scientific Affairs *"Professionally applied topical fluoride: evidence-based clinical recommendations"*, J. Am Dent Assoc 2006;137:1151-1159.
- [10] Marthaler TM., *"Changes in dental caries 1953–2003"*. Caries Res 2004;38:173-181.
- [11] Donna Lesser, *"RDH, BS 1-8 special supplemental issue-Access"*, July 2001An Overview of Dental Sealants.
- [12] World Health Organization (1997), *"Oral health surveys: basic methods"*, 4th ed , WHO, Geneva.
- [13] Horowitz HS, Doyle J., *"The effect on dental caries of topically applied acidulated phosphate-fluoride: results after three years"*, J Am Dent Assoc 1971;82:359--65.
- [14] Johnston DW, Lewis DW., *"Three-year randomized trial of professionally applied topical fluoride gel comparing annual and biannual application with/without prior prophylaxis"*, Caries Res 1995; 29:331-336.
- [15] Stookey GK, Beiswanger BB., *"Topical fluoride therapy. In: Harris NO, Christen AG, eds. Primary preventive dentistry"*, 4th ed. Stamford, CT: Appleton & Lang, 1995:193--233.
- [16] Kargul B, Tanboga I, Gulman N., *"A comparative evaluation of fissure sealant 3 years results"*, European Academy of Pediatric Dentistry 2009; 10(4): 1818-1826.
- [17] Dennison JB, Straffon LH, More FG., *"Evaluating tooth eruption on sealant efficacy"*, JADA 1990;121:610-4.
- [18] Avinas J, Mary CM, Dhingras S, Gupta P., *"Pit and fissure sealant: An unused caries prevention tool"*, J Oral Health Comm Dent 2010; 4(1):1-6.

- [19] Rethman, J., *"Trends in preventive care: caries risk assessment and indications for sealants"*, J Am Dent Assoc, 2000; 131(suppl_1): p. 8S-12.
- [20] Dental Product Spotlight, *"Pit and fissure sealants"*. J Am Dent Assoc, 2002; 133(9): p. 1274-1275.
- [21] Bohannon H., *"Caries Distribution and the case for sealants"*, J Public Health Dentistry 1983;33:200-204.
- [22] Harris N, Godoy-Garcia F., *"Primary Preventive Dentistry"*, 5th ed. Stanford, Connecticut: Appleton and Lange, 1999.
- [23] Simonsen RJ, Stallard RE., *"Sealant restorations utilizing a dilute filled composite resin: one year results"*, Quintessence Int. 1977;23:307-315.
- [24] Houpt M, Eidelman E, Shey EZ., *"Occlusal restoration using fissure sealant instead of 'extension for prevention"*, ASCD J Dent Child 1984;51:270-273.
- [25] Houpt M, Eidelman E, Shey EZ., *"Occlusal composite restorations: 4 year results"*, J Am Dent Assoc 1985;110:351-353.
- [26] Mertz-Fairhurst EJ, Adair SM, Sams DR, et al., *"Cariostatic and ultraconservative sealed restorations: Nine-year results among children and adults"*, J Dent Child 1995;62:97-107.
- [27] Yildiz E, Dorter C, Efes B, Koray F., *"A comparative study of two fissure sealants: a 2-year clinical follow up"*, J Oral Rehab 2004 Oct; 31(10): 979-84.
- [28] Beauchamp J, et al. *"Evidence-Based Clinical Recommendations for the use of pit and fissure sealants. A report of the American Dental Association Council on Scientific Affairs"*, J Am Dent Assoc 2008; 139(3): 257-268.
- [29] Joon M. *"Pit and fissure sealant with fluoride application"*, J Det Clin 2008; 10(3): 116-118.

- [30] Tanaka M, Ono H, Kadoma Y, Imai Y., "*Incorporation into human enamel of fluoride slowly released from a sealant in vivo*", J Dent Res 1987; 66: 1591-1593.
- [31] Forsten L., "*Short and long term fluoride release from glass ionomer and other fluorid containing filling materials in vitro*", Scand J Dent Res 1990; 98:179-185.
- [32] Marinelli CB, Donly KJ, Wefel JS, Jakobsen JR, Denehy GE., "*An in vitro comparison of three fluoride regimens on enamel remineralization*", Caries Res 1997; 31: 418-422.
- [33] Hicks MJ, Flaitz CM., "*Caries-like lesion formation around fluoride-releasing sealant and glass ionomer*". Am J Dent 1992; 5: 329-334.
- [34] Hicks MJ, Flaitz CM, Garcia-Godoy F., "*Fluoride-releasing sealant and caries-like enamel lesion formation in vitro*", J Clin Pediatr Dent 2000; 24: 215-219.

Table (1)
Number and percentage of caries present and absent in sealant group

| | Number | Percentage % |
|------------------------------|--------|--------------|
| Total 60 | | |
| <u>Baseline time:</u> | | |
| Caries present | 0 | 0 % |
| Caries absent | 60 | 100 % |
| <u>6 months:</u> | | |
| Caries present | 0 | 0 % |
| Caries absent | 60 | 100 % |
| <u>12 months:</u> | | |
| Caries present | 3 | 5 % |
| Caries absent | 57 | 95 % |
| <u>18 months:</u> | | |
| Caries present | 5 | 8.3 % |
| Caries absent | 55 | 91.7 % |
| <u>24 months:</u> | | |
| Caries present | 6 | 10 % |
| Caries absent | 54 | 90 % |

$\chi^2 = 6.37$, DF = 3, P-Value = 0.095, NS: Non Significant at level P > 0.05.

Table (2)
**Number and percentage of caries present and absent in sealant
with fluoride group**

| | Number | Percentage |
|------------------------------|--------|------------|
| Total 60 | | |
| <u>Baseline time:</u> | | |
| Caries present | 0 | 0 % |
| Caries absent | 60 | 100 % |
| <u>6 months:</u> | | |
| Caries present | 0 | 0 % |
| Caries absent | 60 | 100 % |
| <u>12 months:</u> | | |
| Caries present | 2 | 3.3 % |
| Caries absent | 58 | 96.7 % |
| <u>18 months:</u> | | |
| Caries present | 3 | 5 % |
| Caries absent | 57 | 95 % |
| <u>24 months:</u> | | |
| Caries present | 5 | 8.3 % |
| Caries absent | 55 | 91.7 % |

$\chi^2 = 5.43$, DF = 3, P-Value = 0.143, NS: Non significant at level P > 0.05.

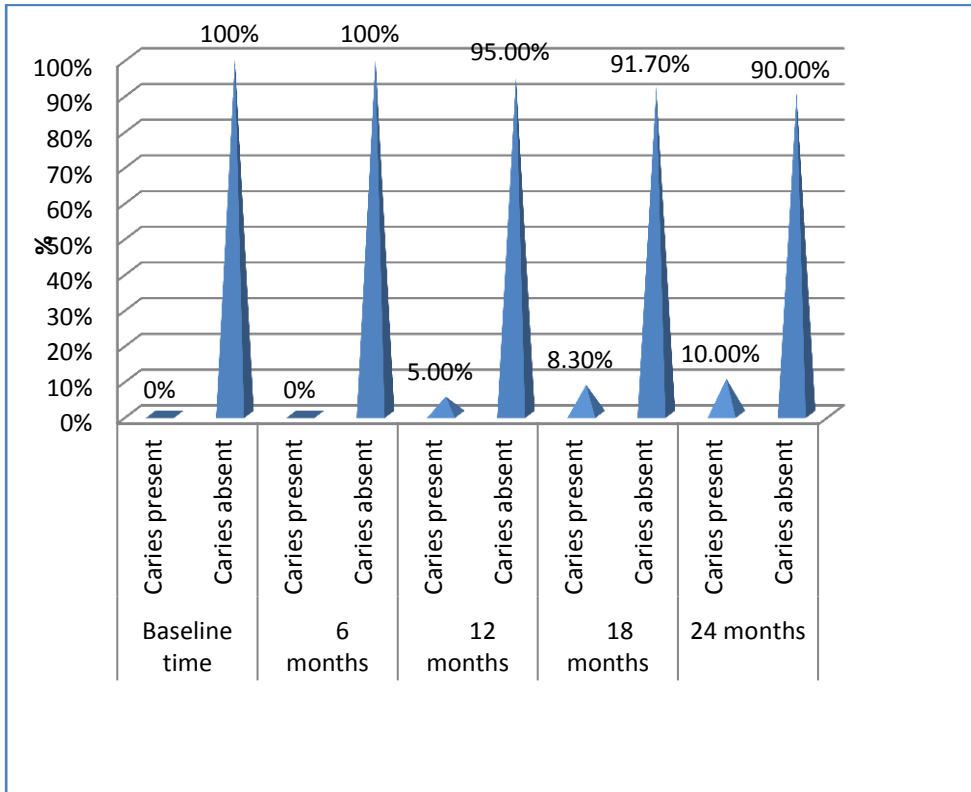


Figure (1)
Percentage of caries present and absent of sealant group

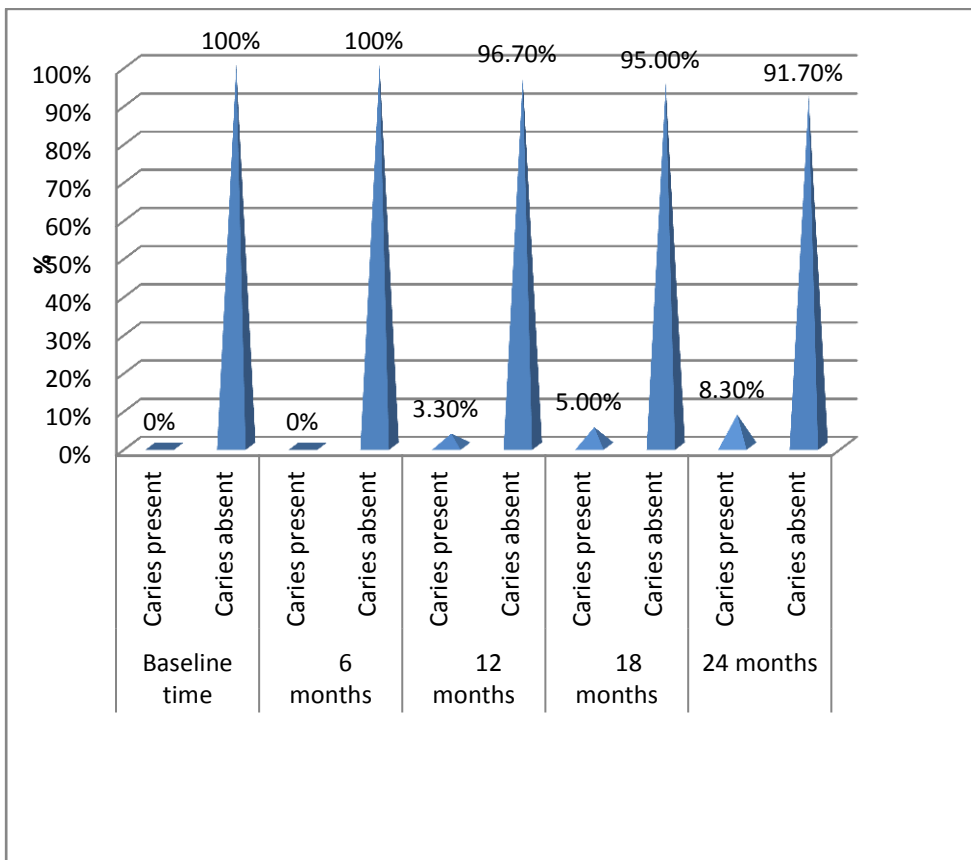


Figure (2)
Percentage of caries present and absent of sealant with fluoride group

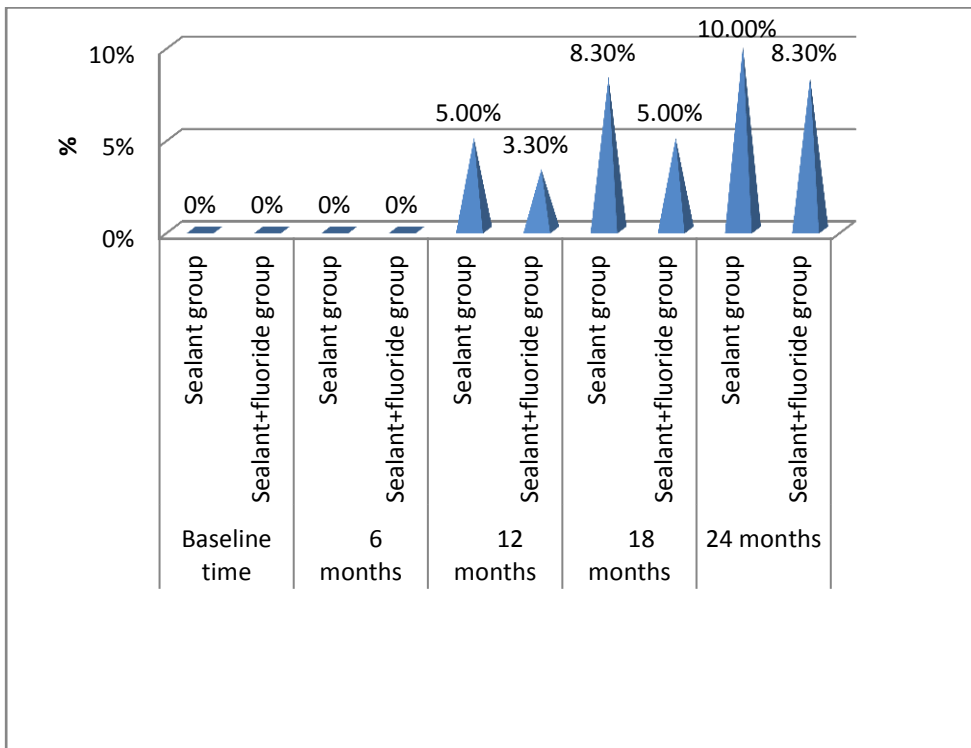


Figure (3)
Percentage of caries present of sealant group and sealant with fluoride group

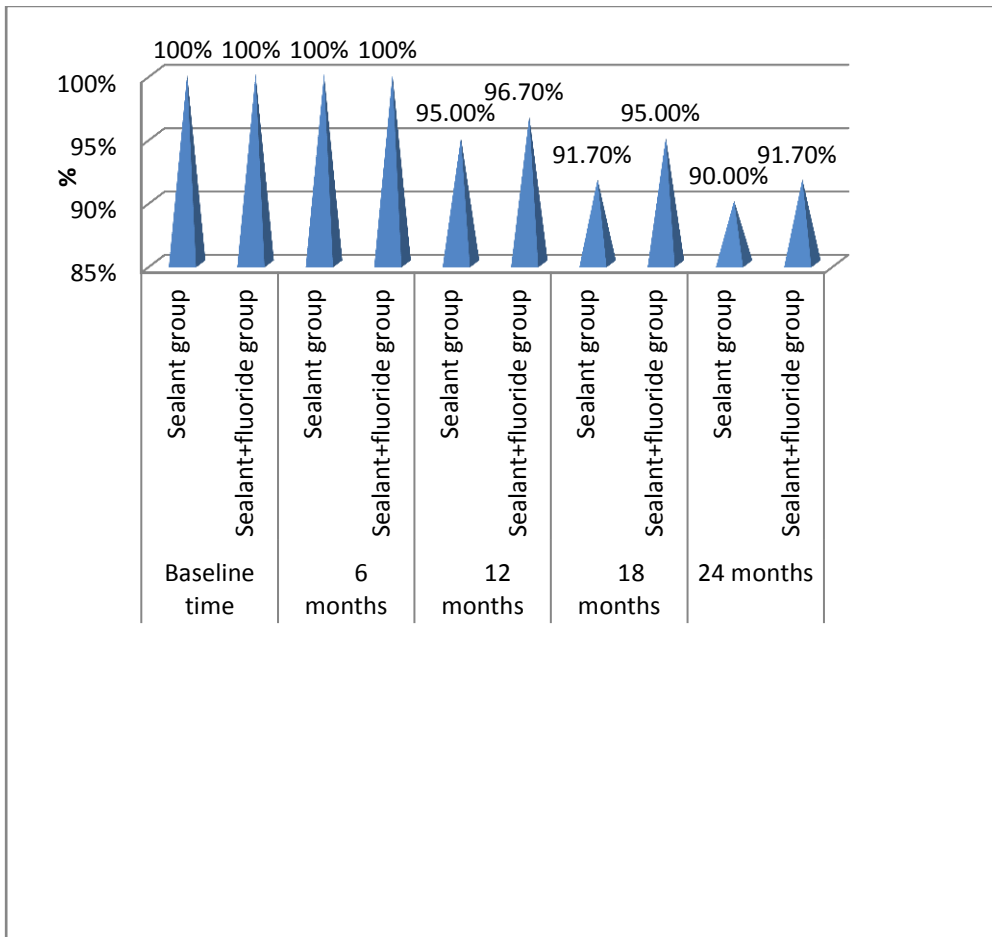


Figure (4)
Percentage of caries absent in sealant group and sealant with fluoride group

تقييم ختم التجويف والشق مع وبدون استعمال الفلورايد الموضعي

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المستخلص

غالبية الزيادة في الكشف عن تسوس الأسنان يقتصر على ختم تجويف وشق الأسنان. وتستخدم على نطاق واسع ختم التجويف والشقوق والفلورايد الموضعي للوقاية من التسوس.

كان الغرض من هذه الدراسة تقييم فعالية ختم التجويف والشقوق مع وبدون استعمال الفلورايد الموضعي في الوقاية من التسوس على سطوح الأسنان عند الأطفال. 93 طفلا متعاوننا وصحيا من كلا الجنسين يبلغ متوسط أعمارهم (6-9 سنوات) ادرجو في هذه الدراسة، وفقا لذلك، (120) من الأضرار الدائمة الأولى خالية من التسوس والتي بزغت بالكامل في الفم قسمت إلى مجموعتين: مجموعة الختم (60 ضرس دائمي أول) ومجموعة الختم مع الفلورايد (استعمال هلام الفلورايد موضعيا كل ثلاثة أشهر لمدة 24 شهر على 60 ضرس دائمي أول). جميع الأطفال استدعوا لتقييم ختم الشق وكذلك وجود أو غياب تسوس الأسنان على فترات 6، 12، 18 و 24 شهرا.

أظهر التحليل الإحصائي عدم وجود فروق ذات دلالة إحصائية في وجود وغياب التسوس على سطوح الأسنان بين المجموعتين في وقت خط الأساس وبعد 6، 12، 18 و 24 شهرا في فترات الاستدعاء للتقييم.

كان هناك بعض الأدلة حول تفوق ختم التجويف و الشق على استعمال الفلورايد الموضعي في الوقاية من تسوس سطوح الأسنان. مع ذلك، فانه لا يزال غير واضح إلى أي مدى هناك اختلافات بين فعالية ختم التجويف والشق مع وبدون استعمال الفلورايد

الموضعي. ا يمكن إعطاء أي توصية للممارسة السريرية وينبغي النظر في الاستفادة من
ختم التجويف والشق مع وبدون استعمال الفلورايد الموضعي محليا وبشكل فردي.
كلمات مفتاحية: ختم التجويف والشق، الوقاية من التسوس، الفلورايد الموضعي،
تجربة سريرية.