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Comparative Evaluation of the Efficacy of Silver Diamine Fluoride, Sodium Fluoride and GC Tooth Mousse Plus and Fluoride Varnish as an Antibacterial Agent in Childhood Caries: As a Literature Review

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Abstract

Background: In preventive dentistry, it is important for the need to prevent rather than to treat early childhood caries and to improve the types of fluoride and application to see if the comparative efficacy is sufficient or insufficient because every type can relieve and give comfort to patients. **Aims:** To compare the effect of Silver Diamine Fluoride (SDF), fluoride varnish, fluoride gel and GC tooth mousse plus on *Streptococcus mutans* bacterial load. To evaluate the effect on the types of fluoride on caries. To compare the effect of prevention's of early childhood caries by using different types of fluoride. **Searching the databases using the keywords:** sodium diamine fluoride; GC tooth mousse; fluoride varnish; fluoride gel; early childhood caries; caries; varnish; prevention. **Materials and methods:** 2010-December 2018, databases which were searched: MEDLINE via Ovid, Web of science, Embase, Cochrane Library, LILACS, and Dental specialties: pediatrics, oral preventive. Foreigner languages, editorials, letter to the editor, experimental studies with animals and Short communications were excluded from this review. **Results:** 2 studies assessed un-clear and need further research of SDF. 5 studies assessed that 12% of SDF has no effect but 38% has an effect with dentin and enamel with black staining as a disadvantage. 1 study showed that SDF is safe and effective compared to fluoride varnish, 2 studies showed that tooth mousse is recommended for early child caries without mentioning SDF and 3 studies found that it decreases the growth of mutants and aids in the remineralization of both enamel and dentin structure. **Conclusion:** To sum up this study silver diamine fluoride is effective and safe to use for preventing childhood caries than silver fluoride, GC tooth mousse and fluoride varnish, which saves time with increase accuracy and patient satisfaction.

Keywords: Silver diamine fluoride, Childhood caries, Prevention

Abbreviations: SDF-Silver Diamine Fluoride, DMFS-Decayed, Missing or Filled Tooth Surfaces, CPP-ACP-Casein Phosphopeptide-Amorphous Calcium Phosphate

Introduction

Dental caries is one of the most common chronic illnesses in the whole world, affecting people across all age gatherings and nations [1]. Carious teeth can be both prevented and arrested by utilizing fluoride-based materials for example professional applied varnishes [2]. Dental caries is the most continuous childhood chronic disease worldwide [3]. Childhood caries the available quantity of one or more Decayed, Missing or Filled Tooth Surfaces (DMFS) in any primary tooth in a preschool-mature youngster has been associated by the American Dental Association as an important feature of public health

issue [4]. ECC initiates with a white -spot lesion in the upper primary incisors along the margins of the gingiva. If the lesions progress, cavities can progress that will lead to destruction of the tooth.

Children with experienced early childhood caries will lead to future destruction of primary and permanent teeth. In fact some of the children with caries are suffering from lack of eating, underweight because of the associated pain, which is also related to iron deficiency. In the coming years, a decrease in general caries indicators has been accounted for; in any case, an expansion in childhood caries has been

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documented [5]. If childhood caries stands by untreated, oral health lifestyle, body weight, growth, school attendance and school participation can be affected [6]. Children caries treated under general anesthesia have a higher inclination to develop dental caries in the permanent dentition, because severe childhood caries experience is a significant predictor for adult caries, methodologies to prevent and control childhood caries are essential to improve general and oral health [7,8].

Clinical examinations have been shown the effectiveness of SDF in childhood caries prevention and arrest. Semiannual utilization of SDF at 38% concentration has been recommended. SDF has been proposed for complex-to-treat carious lesions and patients with high probability of caries, adding those with medical or behavioral complications, those individuals who need numerous treatment visits, or those without access to dental care [9].

Review of the Literature

Fluoride has multiple ways of application and agents in preventive dentistry which can be delivered as topical (as in, gels, foams, silver fluoride and fluoride varnish) or systemic (as in community water fluoridation) and self-administered such as (toothpastes and mouthrinses) and we can ignore the fact that fluoride transmission through topical or systematically and aim to delivering it to the oral cavity, so that it can play a role in caries control [1]. The key subject of the growing hysteria on fluorosis is the consumption of fluoride from toothpaste by young children, resulting in the intake of extra fluoride. While young children's use of fluoride toothpaste may be considered a risk factor for dental fluorosis, the following shows the most common usage of fluoride agents in the dental field for children:

Silver Diamine Fluoride

Silver diamine fluoride is a correlation with silver nitrate and fluoride that reduces the progress of cariogenic bacteria to grow, inhibits degradation of collagen in dentin, and hinders demineralization and stimulates remineralization of both enamel and dentin. Japan used SDF for decades and in Argentina, China, and Brazil and has been approved by the Food and Drug Administration (FDA) for tooth desensitization. Concentration of the silver diamine fluoride is 10 to 38% to enhance dental caries. It is a simple and inexpensive procedure and is called minimally invasive dentistry and the way of application was lesion first located with mirror and explorer only and SDF was applied with proper cotton isolation and is suitable for younger and uncooperative patients [2].

SDF shown to be 89% from 49% to 138% more effective in arresting dental caries in primary teeth than other active treatments. The main disadvantages in SDF is black staining and when the patients that are allergic to silver [3]. Mechanism of action of SDF that fluoride ions mainly works on tooth structure while silver ions acts mainly on cariogenic bacteria. SDF reacts with hydroxyapatite in an alkaline environment to form calcium fluoride and silver phosphate as major reaction products. Calcium Fluoride (CaF_2) provides adequate amount of fluoride to form fluorapatite [$\text{Ca}_{10}(\text{PO}_4)_6\text{F}_2$] which is less soluble and silver phosphate forms an insoluble layer to facilitate the transform hydroxyapatite to fluorapatite (Figure 1 and Figure 2) [4].

Fluoride Varnishes

Fluoride varnishes were discovered and developed in the early 1960's so that dentists could practice topical application of fluoride in a way that provided more prolonged tooth structure; enamel without consuming time in a dental visit, Fluoride varnish is a concentrated topical fluoride with a resin or synthetic base [5].



Figure 1: Silver diamine fluoride 38%.

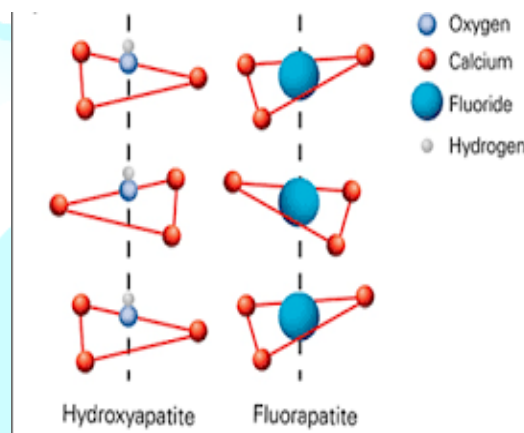


Figure 2: Formula of hydroxyapatite and fluorapatite.

Recent commercial formulations of fluoride varnish such as: Duraphat® (5% NaF-Sodium Fluoride), Duraflor® (5% NaF) and Fluor Protector® (1% DifluoroSilano), the ages of the children at base-line varied from 6 months to 8 years for studies of the primary teeth, application technique is very easy and well tolerated and the time needed to apply the varnish depends on the number of teeth available from 1 to 4 minutes per patient and the child can directly close his mouth as varnish hardens as soon as there is contact with saliva, teeth were dried with gauze, and varnish was brushed onto all surfaces of the maxillary and mandibular anterior teeth, and the proximal and occlusal surfaces of the posteriors and forms a film that cohere to tooth surfaces, patient has to avoid eating for two hours after applying the varnish and not to brush the same day to give time for the varnish to contact the enamel for several hours [6].

Also in some researches fluoride divided into two percentages which was either 2.26% or 0.1%. Further research revealed that products identified with an identical brand name (Fluor Protector, Ivoclar Vivadent, Am-herst N.J). A sustain of compositional change in 1987 from 0.7% fluoride to 0.1% fluoride, the 0.7% fluoride product is no longer available in the commercial field. Therefore, the data are subdivided into 2.26% and 0.1% fluoride varnish categories. So, researchers approved that fluoride varnish reduces the incidence of early childhood caries of up to six years of age (Figure 3 and Figure 4) [7].

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Figure 3: Application of fluoride varnish.



Figure 4: Sodium fluoride paste.

GC Tooth Mousse Plus

GC tooth mousse plus achieved a huge popularity in the commercial field, it works as caries prevention and treating white lesion in the tooth structure. GC tooth mousse have tooth mousse (MI paste) and tooth mousse plus (MI paste plus) which contains an ingredient Casein Phosphopeptide-Amorphous Calcium Phosphate (CPP-ACP) and are marketed by the GC corporation (**Figure 5 and Figure 6**) [8].

Tooth Mousse Plus contains 900 parts per million fluorides in a molar ratio with the calcium and phosphate of 5 calcium, 3 phosphates and 1 fluoride which is reported by Reynolds and co-workers as the ideal ratio for building fluorapatite. The development of the GC products Tooth Mousse and Tooth Mousse Plus is to be applauded as scientific innovation is critical in the quest to improve the oral health of patients [9].



Figure 5: GC Tooth Mousse.

However, when the dental team use and recommend products for patient care there must be sound scientific evidence to support their treatment planning decisions and advice. CPP-ACP in the form of Tooth Mousse and Tooth Mousse Plus are widely recommended for the prevention of early dental caries [10]. The manufacturer instructions recommend Tooth Mousse for patients of any age except those with milk protein allergies but limit the indication of Tooth Mousse Plus to patients over six years of age because of the fluoride content. These products are much more expensive to use than fluoride products, so it is important to examine the evidence supporting their general usage [11].



Figure 6: GC Tooth Mousse Plus.

To this end a systematic review on the specific use of these two products “GC tooth mousse and GC tooth mousse plus” for caries prevention and treatment has been undertaken, in order to determine whether their efficacy warrants use in general dental practice. The aim of the systematic review is to answer the question. “Is there sufficient clinical evidence available to support the use of Tooth Mousse and Tooth Mousse Plus over a routine oral care regimen for the prevention and treatment of early dental caries?”

Sodium Fluoride Gel

The usage of fluoride gel for the recommended amount every year is possible and it helps in gradually reducing tooth decay. It can be self-applied or under supervision depending on the preference of the individual. A review of trials found that fluoride gel can reduce tooth decay in children. One in two children with high levels of tooth decay would benefit from fluoride gel and as a result would lead to lower levels of tooth decay [12].

However, because fluoride gel is mostly applied and used in children, research is needed as children tend to swallow the gel during application. Fluoride gels must be differentiated from fluoride toothpaste, which are also available in the form of gels. The amount of fluoride in the toothpaste is substantially less than the fluoride gel and the fact that fluoride toothpaste contains abrasives means that fluoride gel can be applied at relatively infrequent intervals [13].

Various methods and concentrations and frequencies of gel applications have been tested, with or without prior dental prophylaxis, and different fluoride compounds have been used. Typically, Acidulated Phosphate Fluoride (APF) gels in the concentration of 12,300 parts per million of Fluoride (ppm F) are professionally-applied twice a year. The excessive ingestion of fluoride during topical application is not recommended as it may cause toxic and harmful effects (**Figure 7 and Figure 8**) [14-16].



Figure 7: Sodium fluoride gel.

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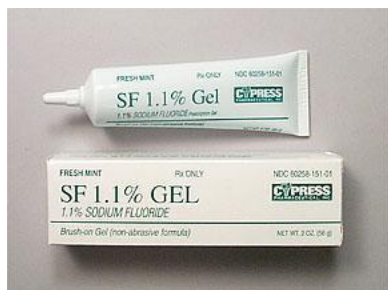


Figure 8: Sodium fluoride gel.

Aims and Objectives

- To compare the effect of SDF, fluoride varnish, fluoride gel and GC tooth mousse plus on *Streptococcus mutans* bacterial load in children.
- To evaluate the effect of silver diamine fluoride, fluoride gel, fluoride varnish and GC tooth mousse plus on caries.
- To compare the effect of prevention of early childhood caries by using silver diamine fluoride, fluoride gel, GC tooth mousse plus.
- The objective of this paper is to signify the types of fluoride efficacy on early childhood caries and the effect on the streptococcus mutans.

Materials and Methods

Duration: 6 months

Study design: literature review

Inclusion criteria: 2010-December 2018, databases which were searched: MEDLINE via Ovid, Web of science, Embase, Cochrane Library, LILACS and Dental specialties: pediatrics, oral preventive.

Exclusion criteria: Foreigner languages, editorials, letter to the editor, experimental studies with animals and short communications were excluded from this review.

Data collection procedure: Searching the databases using the keywords: sodium diamine fluoride, GC tooth mousse, fluoride varnish, fluoride gel, early childhood caries and caries.

Ethical consideration: Ethical approval was obtained from RAK Research Ethics Committee and favorable ethical opinion was obtained from The Ministry of Health and Prevention Research Ethics Committee; under reference number (RAKMHSU-REC-50-2019-U-D) (Appendix-1).

Results

Study process: the databases (MEDLINE via Ovid, Web of science, Embase, Cochrane Library and LILACS) were searched; a total number of 40 articles were identified for an inclusion. Only 16 articles were included in the research according to inclusion criteria and 5 articles were excluded according to the exclusion criteria. As shown in the flow (Figure 9).

Discussion

This topic was selected to differentiate between the agents of fluoride: silver diamine fluoride, fluoride varnish, silver fluoride and GC tooth mousse plus as antibacterial agent and mainly to check if the silver diamine fluoride has heterogenous or homogenous effect comparing to the other agents. But with upcoming generations preventive dentistry is getting improved with new knowledge and different agents.

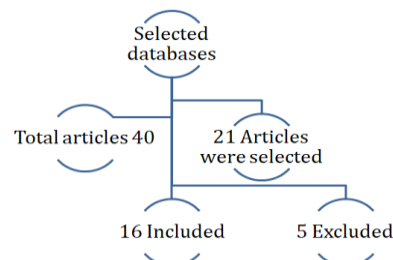


Figure 9: Flow diagram 1 of the method of data collection that shows the databases that were searched of a total 40 articles and 23 of them were selected and 16 articles included whereas 5 of them were excluded.

Discussion of the materials and methods: Articles after 2000 were used for the research because of the new silver diamine fluoride agent used at this time. Databases such as MEDLINE via Ovid-Web of science-Embase-Cochrane Library-LILACS were used as they contain all the medical articles which were very helpful for the research.

Discussion of the results: 2 studies assessed un-clear and need further research of SDF. 5 studies assessed that 12% of SDF has no effect but 38% has an effect with dentin and enamel with black staining as an disadvantage. 1 study showed that SDF is safe and effective compared to fluoride varnish, 2 studies showed that tooth mousse is recommended for early child caries without mentioning SDF and 3 studies found that it decreases the growth of *S. Mutants* and aids in the remineralization of both enamel and dentin structure.

The articles discussed in the following research studied the effect of silver diamine fluoride although there were 5 of the articles in the study had no conclusive results due to the lack of enough evidence, (Oliveira, 2018) and in another article the results needed further investigations to spot the difference between different materials. In studying the different materials such as silica tetrafluoride, fluoride gel, sodium fluoride and SDF they have found that they all help in the remineralization of early enamel caries. As for the fluoride gel the result showed arresting the effect on dentine [14].

The study in Table 1 explains that fluoride varnish was shown to reduce the intensity of primary tooth caries in children of six years of age and younger [4]. It is shown in table 1 of the included articles that different concentrations of SDF gave different results, the more you apply SDF in about 38% it will give an effective result but it would have black staining with no further complications, but in giving SDF in lower concentration 12% the study have shown that it has no effect whatsoever on childhood caries [5]. SDF as an agent was proven to be the most effective, safe, and efficient in comparison to Fluoride varnish and is considered as a non-invasive method and found that it decreases the growth of *s. mutans* and it renders the remineralization of dentin and enamel structure which protects and inhibits the collagenase and the destruction of dentin collagen [6,7]. According to our study, In another study showed that tooth mousse plus is recommended for early dental caries and it is critical in the quest to improve the oral health of the patients, one of the main reasons people use tooth mousse plus is to restore mineral balance in the oral environment, And a different study says that fluoride varnish applied at every child care visits can reduce early childhood caries (Table 2) [8,9].

Conclusion

To end this study, silver diamine fluoride is effective and safe to use as silver fluoride, GC tooth mousse and fluoride varnish to prevent

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childhood caries, which saves time with increased accuracy and patient satisfaction due to its drawbacks, is contraindicated for patients with sliver allergy and who have oral ulcerations, periodontal

issues and deep caries. And over time, a faint black mark in the tooth itself may cause discoloration.

	Author	Title	Year	Journal	Results	Conclusion of the authors
1	Oliveira, Rajendra, Veitz-Keenan and Niederman,	The effect of silver diamine fluoride in preventing the primary dentition: A systemic review and meta-analysis.	2018	Caries Research	Two trails compared to silver diamine fluoride resulted with no treatment, one silver diamine fluoride compared to placebo and sodium varnish and one sliver diamine fluoride to GIC. All studies presented maximum two domains with unclear and high in 2,366 distinctive records.	The result was unclear with no difference of treatment.
2	Weyant, Robert J, et al.	Topical fluoride for caries prevention	2013	The Journal of the American Dental.	The results included 71 samples from 82 articles in this review and the estimated efficacy of multiple fluoride caries as a preventive agent and the panel of the article requires further research.	The article requires more research to identify if there is a difference between materials.
3	Gao, et al.	Caries remineralization and arresting effect in children by professionally applied fluoride treatment—a systematic review	2016	BMC Oral Health	17 randomized clinical trials were included in this review, 10 clinical studies that were checking the remineralizing effect on early enamel caries using silicon tetrafluoride, fluoride gel, silver diamine fluoride or sodium fluoride, 7 studies showed arresting effect on dentin caries using silver diamine fluoride or nano-silver fluoride. Professionally applied 5% sodium fluoride varnish can remineralize early enamel caries and 38 % silver diamine fluoride is effective in arresting dentine caries.	In this article resulted in remineralizing effect on early enamel caries using silicon tetrafluoride, fluoride gel, silver diamine fluoride or sodium fluoride, and using sliver diamine fluoride gel resulted as arresting the effect on dentin, and sodium fluoride varnish can remineralize early enamel caries.
4	Keightley Alexander J and Greig D Taylor	Fluoride varnish applications and caries incidence in preschoolers	2014	Evidence - based Dentistry	This literature review research. The results of the controlled clinical trials published in the research literature and included in the present review suggest that fluoride varnish is capable of reducing the incidence of caries in the primary teeth of children six years of age or younger, but provide no conclusive scientific evidence in this respect.	The article reviewed that fluoride varnish reduces caries in primary teeth of children six years of age or younger but there are no scientific evidence.
5	Fung HTM, Wong MCM, Lo ECM and Chu CH	Arresting early childhood caries with silver diamine fluoride-a literature review	2013	Journal of Oral Hygiene and Health	In this article, 6 clinical trials were published in English since 1980. The studies recommended that one-off application of 12% SDF is not effective in arresting caries in children, but 38% SDF is. And they stated that SDF treatment is black staining of the arrested lesion, but No significant complications were detected.	So in this article the percentage of SDF that is 12% has no effective treatment in childhood caries and the 38% gives a effective results but with black staining as a con of the Sliver diamine fluoride with no further complications.
6	Rosenblatt, Stamford and Niederman	Silver diamine fluoride: a caries “silver-fluoride bullet”	2009	Journal of Dental Research	The results of this article suggest that SDF is more effective than fluoride varnish, and may be a valuable caries-preventive intervention. As well, the availability of a safe, effective, efficient, and equitable caries-preventive agent appears to meet the criteria of both the WHO Millennium Goals and the US Institute of Medicine’s criteria for 21st century medical care.	The article mentions that SDF is the suitable agent for preventive measures and is the most efficient, safe and effective compared to the fluoride varnish.
7	Horst J	Silver fluoride as a treatment for dental caries	2018	Advances in Dental Research	In this article, carious lesion can be treated by SDF as evidence based non-invasive methods.	Silver diamine fluoride considered as a non-invasive method of treatment.
8	Reynolds EC	Calcium phosphate-based remineralization systems: scientific evidence	2008	Australian Dental Journal	After tests it was found that tooth mousse should contain 900 ppm of fluoride and 5 calcium, 3 phosphate and 1 fluoride ratio	Tooth mousse plus is recommended for early dental caries and it is critical in the quest to improve the oral health of the patients.
9	Cross KJ, Huq NL, Stanton DP,	NMR studies of a novel calcium, phosphate and	2004	Biomaterials	Tooth Mousse is recommended for patient use except those with milk allergies.	One of the main reasons people use tooth mousse plus is to restore mineral balance in the oral environment

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	Sum M and Reynolds EC	fluoride delivery.				
10	Mei, Li, Chu, Lo, and Samaranayake	Antibacterial effects of silver diamine fluoride on multi-species cariogenic biofilm on caries	2013	Annals of Clinical Microbiology and Antimicrobials	In this articles result were 38% of SDF can reduce the demineralization process and It decreases the loss of mineral content and slows down collagen I destruction. Moreover, it has high concentrations of silver and fluoride ions, which can inhibit the growth of multi-species cariogenic biofilms.	38% SDF inhibits multi-species cariogenic biofilm formation on dentin carious lesions and reduces the demineralization process.
11	Chu CH, Mei L, Seneviratne C J and Lo EC	Effects of silver diamine fluoride on dentine carious lesions induced by streptococcus mutants and actinomyces naeslundii biofilms	2011	International Journal of Pediatric Dentistry	In this article the biofilm reduces due the control of SDF and some Surfaces of carious lesions were harder after SDF application than after applying water in S. mutans group, Ca and P weight percentage showed a rapid reduced level of matrix to phosphate after SDF treatment.	This study showed that SDF enhance an anti-microbial activity against cariogenic biofilm of <i>s. mutans</i> or <i>A. naeslundii</i> formed on dentine surfaces. SDF slowed down demineralization of dentine. This might be the activity could be the reason behind clinical success of SDF.
12	Twetman S and Keller MK	Fluoride rinses, gels and foams: an update of controlled clinical trials	2016	Caries research	A total of 8 papers on fluoride gel. 6 had low risk of bias while 2 had a moderate risk. All fluoride measures appeared to be beneficial in preventing crown caries and reversing root caries.	This article showed a small advantage of twice weekly supervised brushing with a self-applied high fluoride gel (12,500 ppm) on the increment of dentin lesion in comparison with a once weekly domestic use.
13	Gao S, Zhao I, Hiraishi N, Duangthip D, Mei M, Lo E and Chu C.	Clinical trials of silver diamine fluoride in arresting caries among children	2016	JDR Clinical and Translational Research	This article is Meta -analysis study, 16 clinical trials studied the caries-arresting effect on primary teeth, and 3 clinical trials were on permanent teeth. 14 studies used 38% SDF, 3 used 30% SDF, and 2 used 10% SDF. The overall percentage of active caries that became arrested was 81% and additionally there were no any complications in primary except the black staining.	The 38% of SDF gave and effective result on arrested dentin in primary teeth.
14	Delbem ACB, Bergamaschi M, Sassaki KT and Cunha RF	Effect of fluoridated varnish and silver diamine fluoride solution on enamel demineralization: pH-cycling study	2006	Journal of Applied Oral Science	The data suggested that the fluoride released by varnish showed greater interaction with sound enamel and provided less mineral loss when compared with silver diamine solution	High frequency application with low concentration of fluoride agent has been considered the most beneficial treatment regime. However, in situations of high risk of caries, the association of a method that employs high concentration of fluoride such as the professionally applied products has been recommended
15	Holve S	An observational study of the association of fluoride varnish applied during well child visits and the prevention of early childhood caries in American Indian children	2007	Maternal and Child Health Journal	In this article number of DMFS is considered and children with 4 or more treatments had 15.5 DMFS versus children with no fluoride varnish treatments who had 23.6 DMFS for a 35% decrease in overall caries. Children who received 1, 2 or 3 treatments showed no significant difference in DMFS when compared with children who had no fluoride varnish applications.	Fluoride varnish applied at well child care visits can reduce early childhood caries in American Indian children.
16	Fung MHT, Wong MCM, Lo ECM and Chu CH	Arresting early childhood caries with silver diamine fluoride-a literature review	2013	Journal of Oral Hygiene and Health	SDF was shown to be bactericidal to cariogenic bacteria, it is found that it helps in stopping the growth of the streptococcus mutants in specific , it aids in the remineralization of both enamel and dentine structure. It also represses collagenase and protects the destruction of dentine collagen	SDF found that it decreases the growth of <i>s. mutans</i> and it renders the remineralization of dentin and enamel structure which protects and inhibits the collagenase and the destruction of dentin collagen

Table 1: Results of included articles.

Citation: Qanbar A, Abdulla AAM, Abutayyem H and El Din Mohamed SK. Comparative evaluation of the efficacy of silver diamine fluoride, sodium fluoride and GC tooth mousse plus and fluoride varnish as an antibacterial agent in childhood caries: As a literature review (2021) *Dental Res Manag* 5: 1-7.



Author	Title	Year	Journal	Reasons for exclusion.
Featherstone JDB	Prevention and reversal of dental caries: role of low level fluoride	1999	Community Dentistry and Oral Epidemiology	Before 2000
Anil Sand Anand PS	Early childhood caries: prevalence, risk factors, and prevention	2017	Early Childhood Caries: Prevalence, Risk Factors, and Prevention	The article talks about caries prevention in general
Dholam KP, Somani PP, Prabhu SD and Ambre SR	Effectiveness of fluoride varnish application as cariostatic and desensitizing agent in irradiated head and neck cancer patients	2013	International Journal of Dentistry	his article talks about fluoride application in cancer patients not children
Kumar V, Ithagarun A and King N.	The effect of casein phosphopeptide-amorphous calcium phosphate on remineralization of artificial caries-like lesions: an in vitro study	2008	Australian Dental Journal	Not focusing on the same idea
Duangthip D, Chen KJ, Gao SS, Edward Chin Man Lo ID and Chu CH.	Managing early childhood caries with atraumatic restorative treatment and topical silver and fluoride agents	2017	International Journal of Environmental Research and Public Health	The article is discussing alternative approaches to manage cavitated ECC.

Table 2: Articles that were excluded.

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Appendix 1

RAK Medical & Health Sciences University

(Member of RAK Human Development Foundation)



جامعة رأس الخيمة
للطب والعلوم الصحية

(عضو مؤسسة رأس الخيمة للتطوير والتعليم والتنمية البشرية)

May 16, 2020

From: Dr. Tarig Hakim Merghani Chairperson, Research & Ethics Committee, RAKMHSU, Ras Al Khaimah.	To: Dr. Huda Abutayyem RAKCODS RAKMHSU, Ras Al Khaimah.
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Dear Dr. Huda Abutayyem

Subject: Approval of the research proposal RAKMHSU-REC-229-2020-F-D

The research proposal entitled "Comparative evaluation of the efficacy of silver diamine fluoride, sodium fluoride, tooth mouse and fluoride varnish as an antibacterial agent in childhood caries: A Literature Review" has been approved by the Research and Ethics Committee of RAKMHSU.

Kindly submit your final results to RAKMHSU-REC after completion of the Study.

Yours sincerely,

Dr. Tarig Hakim Merghani Hakim
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