

Evaluation Of Caries Prevalence Among Children Treated With Silver Diamine Fluoride

Research Article

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Abstract

Introduction: Dental caries is one of the most prevalent preventable diseases which is present worldwide commonly affecting young children. Untreated caries can contribute to health problems. Fluoride application has played a major role in preventing caries by identifying the high risk population and use of fluoride on them has controlled caries to a considerable extent. Silver diamine fluoride is one such dental practice culture that helps in controlling caries. Silver diamine fluoride is minimally invasive, low cost and can reduce fear in young children and can also be used in community settings in vitro studies have proven that silver diamine fluoride has reduced dentin demineralisation, and has antimicrobial action and increases the pH of biofilm.

Aim: The aim of this study was to analyse the efficacy of caries control by using silver diamine fluoride.

Materials and Methods: The study was performed as a retrospective study under a university setting in the outpatient department of Pediatric and Preventive Dentistry. Data was collected by reviewing patient records and analysed data of 500000 patients between June 2020 to Feb 2021. Verification of the data was done with the presence of additional reviewers. Collected data was subjected to statistical analysis by chi-square test in SPSS software.

Results: Children with primary dentition were most commonly treated with silver diamine fluoride (72.41%). Among the females treated with silver diamine fluoride, 58.52% had DMFT score above 2, while 1.72% had DMFT score less than 2. Among the males treated with silver diamine fluoride, 20.69% had DMFT score above 2, while 18.97% had DMFT score less than 2. Females with a higher caries prevalence were treated with silver diamine fluoride when compared to males. This difference was found to be statistically significant ($p=0.000$).

Conclusion: Silver diamine fluoride is painless and easy to apply to young children with special needs. It is a minimally invasive procedure non aerolising option and can arrest early childhood caries. It can be applied independently or concurrently along with restorative procedures.

Keywords: Dental Caries; Silver Diamine Fluoride; Oral Health; Fluoride Application; Innovative Material.

Introduction

Oral health is very significant in young children. Negligence of oral health can lead to various issues like dental caries [1]. Dental caries is one of the most prevalent preventable diseases which is present worldwide commonly affecting young children. Untreated caries can contribute to health problems like pain, poor quality of life, psychosocial suffering and also societal burdens by reducing the productivity at the workplace or an educational environment like school or college.

Dental caries is a progressive disease and treating it as early as possible can lead to improvement of longevity of teeth and their supporting structures and assist patients to avoid more invasive procedures in future [2]. Dental caries are influenced by various factors like oral hygiene, socioeconomic status, awareness and attitude towards maintaining oral health, congenital malformations like any developmental disorders [3].

Dental caries occur due to biofilm formation that is formed due

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to the sugar consumption and the cariogenic bacteria which survive in the oral cavity which causes an ecological shift that increases the favour of growth of microbes [4]. In early stages of cavity formation even before cavitation occurs we can prevent it and reverse it by making changes in the dietary habits and also prevent their recurrence by certain dental practices [5].

Fluoride application has played a major role in preventing caries by identifying the high risk population and use of fluoride on them has controlled caries to a considerable extent. Targetive preventive intervention of fluoride is very significant in preventing caries. Silver diamine fluoride is one such dental practice culture that helps in controlling caries. Silver is found to have many ways of action like antibacterial, cariostatic and also obturation of dental tubules [6]. Due to irregular patterns of caries it is observed that silver diamine fluoride is more effective in controlling caries.

Silver diamine fluoride is minimally invasive, low cost and can reduce fear in young children and can also be used in community settings [7]. Silver diamine fluoride has also been demonstrated in previous studies to have shown this characteristic of preventing even the root caries which makes it a better choice for usage. Silver diamine fluoride was found to be more suggestive in arresting lesions as well as had high fluoride intake when compared to other methods like fluoride varnish and acidulated phosphate fluoride gel [8]. Semiannual application of silver diamine fluoride has been recommended [9]. *in vitro* studies have proven that silver diamine fluoride has reduced dentin demineralisation, and has antimicrobial action and increases the pH of biofilm [10]. Silver diamine fluoride is also appropriate to be used in a community setting making it an affordable procedure to control caries. Our team has extensive knowledge and research experience that has translated into high quality publications [11-23, 24-30] The purpose of this study was to analyse the effectiveness of silver diamine fluoride in controlling caries.

Materials and Methods

The study was done under a university setting. The Ethical approval was obtained from the Institutional ethical committee. About 2,00,000 case sheets were obtained from June 2019 to March 2020. Informed consent was obtained from the parents or guardian regarding usage of the clinical data for research purposes.

Inclusion criteria were patients between the age group of 2-17 years, who underwent topical application of silver diamine fluoride for management of dental caries. Exclusion criteria includes patients above 18 years of age, and those patients who were not treated using silver diamine fluoride.

Digital entry of clinical examination, intraoral photographs of the oral cavity and the treatment procedure were assessed. The data collected (digital entry and intraoral photographs) was verified by an external additional reviewer. The sampling bias was minimised by a simple random sampling method. If any error in data entry or patient details or clinical data were noticed, that case sheet was excluded from the study.

The data collected were tabulated in MS Excel and was then analysed in SPSS software version 22 (IBM Corp, Texas, LA). The independent variable was age and the dependent variable was silver diamine fluoride application and gender. Descriptive statistics were used and comparison between groups were done by using Chi square tests.

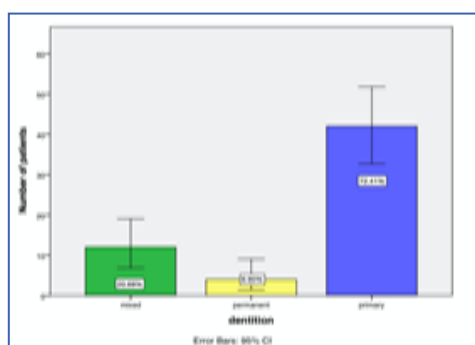
Results

A total of 68 case sheets met the inclusion criteria. Based on the dentition, children with primary dentition had the highest opportunity to get treated with silver diamine fluoride (72.41%) [graph 1]. The DMFT scores above 2 was found to be in 79.31% and below 2 in 20.69% [graph 2]. Among the females treated with silver diamine fluoride, 58.52% had DMFT score above 2, while 1.72% had DMFT score less than 2. Among the males treated with silver diamine fluoride, 20.69% had DMFT score above 2, while 18.97% had DMFT score less than 2. Females with a higher caries prevalence were treated with silver diamine fluoride when compared to males. This difference was found to be statistically significant (p=0.000) [graph3].

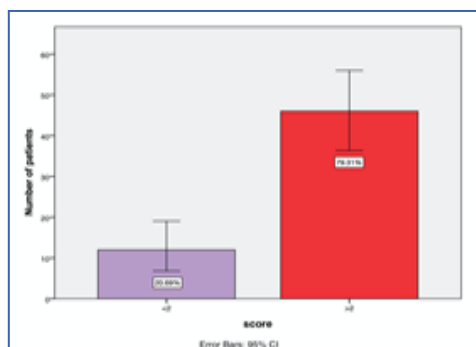
Discussion

From the results of the present study, females with more than 2 carious teeth in primary dentition were most commonly treated with silver diamine fluoride. This correlates with previous studies due to various reasons like earlier eruption of teeth in girls, frequent snacking and also longer exposure of teeth due to the cariogenic oral cavity [31]. According to another study it has been shown that females can have a defective genetic mutation in the

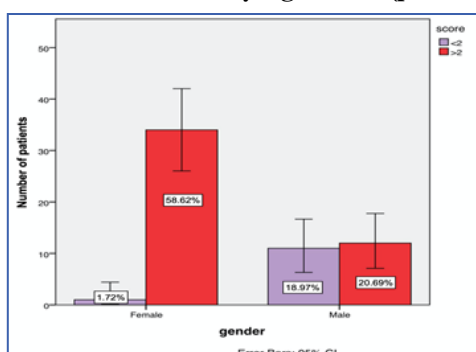
Graph 1. This graph shows the number of children under each dentition to be treated using silver diamine fluoride. The X axis shows the type of dentition and the Y axis shows the number of patients. The green colour denotes children with mixed dentition at 20.69%, yellow colour denotes children with permanent dentition at 6.90% and blue colour denotes children with primary dentition at 72.41%.



Graph 2. This graph shows the DMFT scores. The X axis denotes the gender and Y axis denotes the number of patients. The red colour denotes the DMFT score more than 2 and purple colour denotes the DMFT score less than 2.



Graph 3: This graph shows the association between the gender and the DMFT scores. The X axis denotes the gender and Y axis denotes the number of patients. The red colour denotes the DMFT score more than 2 and purple colour denotes the DMFT score less than 2. The female population is having more prevalence of caries at 58.52% of score more than 2 and at 1.72% for less than 2 score. The male population has DMFT score more than 2 at 20.69% and less than 2 at 18.97%. Females with a higher caries prevalence were treated with silver diamine fluoride when compared to males. This difference was found to be statistically significant ($p=0.000$).



AMELX gene which makes them more vulnerable to caries as it is possible for them through X chromosome inactivation and mosaicism [32]. Contradicting the results obtained, another research conducted by Eleni et al, showed that male had more caries prevalence than females as they had poor oral hygiene habits which is quite contrasting to our study [33].

According to previous studies 38% concentration of silver diamine fluoride was found to be effective [34]. It is usually suggested to children with high risk of dental caries on the basis of assessment. Previous studies have shown silver diamine fluoride usage to be effective in controlling caries while some other studies show that they have certain drawbacks like dental staining, pulpal irritation and oral soft tissue irritation [35]. Certain studies have highlighted the black dental stains that appear after the silver diamine fluoride application [36]. Silver diamine fluoride is unpleasant as it is metallic in taste. Excavation of caries is not always necessary before the application of silver diamine fluoride. According to previous studies 50% of arrested caries after application of silver diamine fluoride at 6 months revert back to active lesion on 24 months. According to Gupta et al, in vitro study found the highest zone of bacterial inhibition with silver diamine fluoride [37]. According to rehardening in vivo study, Sinha et al, mentioned the remineralising, rehardening and antimicrobial abilities of silver diamine fluoride [38].

According to previous studies silver diamine fluoride application is very useful in controlling early childhood caries and is affordable and possible. It acts as a remineralising agent and antibacterial in nature to prevent the growth of cariogenic bacteria. Ac-

cording to previous study silver diamine fluoride was found to be better when compared to sodium fluoride. The disadvantage of black staining is now being overcome by adding an additional agent called potassium iodide to it. According to previous study the frequency of caries was significantly lower after the application of silver diamine fluoride [39]. According to another study, application of silver diamine fluoride in comparison with fluoride varnish or combining with fluoride varnish has led to commendable decrease in caries in patients [40]. Silver diamine fluoride has controlled caries in a concentration of 38% in a better way when compared to the conventional 12% concentration according to various previous studies conducted.

The advantage of the present study is available data. Similar ethnicity and geographical locations could contribute to the limitations of our study. The current study has maximum internal validity and minimal external validity. A limitation of the present study was the smaller sample size and unicentric data collection. Future studies have to be conducted with larger sample size and wider geographical variation to validate the efficacy of silver diamine fluoride.

Conclusion

Within the limitations of the current study, females with more than 2 carious teeth in primary dentition were most commonly treated with silver diamine fluoride. Silver diamine fluoride should be used in near future on a larger scale keeping in mind their clinical success rate and also being cautious regarding their drawbacks. Future research on this should be conducted using diverse popu-

lation studies.

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