UNIVERSITI TEKNOLOGI MARA

THE EFFECT OF SILVER DIAMINE FLUORIDE AND SODIUM FLUORIDE VARNISH ON SALIVARY PH, *STREPTOCOCCUS MUTANS,* AND *LACTOBACILLUS* COUNTS IN EARLY CHILDHOOD CARIES: A RANDOMIZED CONTROLLED TRIAL

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Dissertation submitted in partial fulfilment
of the requirements for the degree of
Doctor in Paediatric Dentistry

Faculty of Dentistry

AUGUST 2024

ABSTRACT

Recently there has been interest in Silver Diamine Fluoride (SDF) as a method for caries prevention, however there are lacking clinical study on the antibacterial efficacy. This randomized controlled trial study aimed to compare the effect of 38% SDF and 5% Sodium Fluoride (NaF) varnish on the salivary pH, *Streptococcus mutans (S. mutans)* and *Lactobacillus* counts in children with Early Childhood Caries (ECC). Sixty healthy children aged 4 to 6 years with active dentin caries (ICDAS code 5) in deciduous teeth were randomly assigned to treatment. Baseline unstimulated saliva was collected, followed by the application of the agents. After three months, saliva samples were recollected. *S. mutans* and *Lactobacillus* counts were evaluated using CFU/ml. The salivary pH and *S. mutans* and *Lactobacillus* counts were compared using a paired t-test. The comparison of 3 months treatment with 38% SDF and 5% NaF were analysed with repeated measures ANOVA. The presence and counts of *S. mutans* and *Lactobacillus acidophilus (L. acidophilus)* were then confirmed with quantitative Polymerase Chain Reaction (qPCR). Twenty-three and twenty-six children were enrolled in the SDF and NaF treatment respectively, with a total 11 dropped out children. Five of them were uncontactable, while six failed to attend the follow-up appointment. Mean age was 4.49 ±0.65 years, and more than half of the participants were boys. At the three months follow-up, both groups showed a significant increase of mean difference salivary pH in 38% SDF (0.71 ±0.24) and 5% NaF group (0.18 ±0.18). There was also significant decrease from baseline bacterial counts of *S. mutans* counts in 38% SDF (109.39 ±36.46) and 5% NaF group (25.35 ±28.09). *Lactobacillus* counts also significantly decrease from baseline in 38% SDF (9.65 ±4.94) and 5% NaF (1.23 ±1.37). However, there was a significant difference in the increase in salivary pH between 38% SDF and 5% NaF (10.19% and 2.56% respectively), reduction of *S. mutans* (66.05% and 16.21 % respectively) ($P<0.001$), and reduction *Lactobacillus* (45.20% and 6.37 % respectively) ($P<0.005$). qPCR confirmed the reduction of *L. acidophilus* in the 38% SDF compared to the 5% NaF group. This study acknowledges several limitations, including unexamined confounding factors, single-center data limiting generalizability, and the absence of long-term antimicrobial effect assessment for SDF. In conclusion, the antibacterial efficacy of 38% SDF was superior to 5% NaF in reducing *S. mutans* and *L. acidophilus* level simultaneously, reducing the salivary pH acidity.

ACKNOWLEDGEMENT

Firstly, I wish to thank Allah for giving me the opportunity to embark on my Doctor in Paediatric Dentistry and for completing this long and challenging journey successfully. I would like to take this opportunity to extend my profound gratitude to my supervisor, Associate Professor Dr. Alaa Sabah Hussein, for her unwavering dedication, invaluable guidance, and continuous support throughout the completion of my research and dissertation. I would also like to express my sincere gratitude to my co-supervisor, Dr. Nurhanani Harun, for her invaluable ideas, guidance throughout my research process, and meticulous review of my dissertation. Furthermore, I wish to express my sincere appreciation to my former supervisor, Dr. Siti Hajar Hamzah, for her invaluable guidance during the development of my research proposal and her instrumental assistance in the preparatory stages of this study.

I would like to express my sincere appreciation to the participants and their parents for their invaluable contribution to this study and for granting consent for their involvement. My gratitude extends to the Faculty of Dentistry, UiTM, for providing the necessary facilities and laboratory equipment essential for sampling and research procedures.

I am particularly indebted to Dr. Nurhayati Mohd Zain for imparting her knowledge and expertise in laboratory methodologies. Furthermore, I wish to acknowledge the laboratory staff and assistants for their constant availability and support throughout this project. Special recognition is due to Dr. Najibah Abdul Razak, the statistician who provided crucial assistance in verifying and refining my statistical analyses.

This dissertation is dedicated to my parents, Asmad Bin Osman and Zainurah Binti Zainul Abidin, whose vision and determination have been instrumental in my educational journey. I extend my profound gratitude to my husband, Mohamad Salihin Sf Bin Salim, for his unwavering support, and to my parents-in-law, Faridah Binti Omar and Salim Bin Rafie, for their invaluable assistance in caring for my children and for their constant encouragement and prayers.

To my children, Nur Syifa Sf and Aydeen Shakeel Sf, may this academic achievement serve as an inspiration for your future endeavors, both in this world and the Hereafter.

This piece of victory is dedicated to all of you. Alhamdulilah.

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CHAPTER 1

INTRODUCTION

1.1 Research Background

The World Health Organization (WHO) has identified dental caries as the most prevalent noncommunicable disease worldwide. Despite the increasing use of dental care services and the availability of preventative products, caries continues to be a significant challenge globally and is currently the leading chronic disease in childhood. According to the WHO, approximately 2 billion people are estimated to have caries in their permanent teeth, more than half a billion children have carious primary teeth, and an estimation of 60-90% of schoolchildren are globally affected by dental caries (WHO, 2022).

Dental caries is a biofilm-mediated, sugar-driven, and multifactorial dynamic disease that causes phasic demineralisation and remineralisation of dental hard tissues. It is influenced by biological, behavioural, and psychosocial factors related to an individual's environment, according to the Expert Panel at the Bangkok Global Summit on Early Childhood Caries (ECC) (Tinanoff et al., 2019). Definition of ECC as "the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled surfaces, in any primary tooth of a child under age six" was reaffirmed in the panel's clinical description of the condition (Drury et al., 1999). In addition, the Panel defined ECC as "preschool children's tooth decay, which is common, mostly untreated, and can have profound impact on children's lives" in lay terms (Tinanoff et al., 2019).

Dental caries, especially early childhood and untreated caries are a global burden to paediatric dentists and oral health professionals. It is a well-recognised major oral health burden, with 34.1% and 7.8% of the global population suffering from untreated caries in permanent and primary teeth, respectively (Kassebaum et al.,2017). It has been reported that during the past 25 years, oral health has not improved worldwide, and as the world's population has grown, the number of people with oral diseases has consequently increased (Kassebaum et al.,2017). In 2015, approximately 3.5 billion people had untreated dental problems (Kassebaum et al.,2017).