

Systematic Literature Review

[Name of Student]

[Name of Course]

[Date of Submission]

Abstract

Background

This systematic literature review aiming to analyse the effective use of topical fluoride in order to reduce dental caries within children's and adolescents. Since, this study objective is to provide evidence based recommendations for the dentist and other oral health practitioners.

Methods

This study has conducted systematic review on research articles based on primary studies from last three years. Also, the study methodology has been done by critical appraisal tool for the quality and limitation of the selected articles. Also, PRISM framework have also been used for the search strategy process.

Results

This research is comprises of 2,000 articles from various databases such as Google scholar, CINHALL and PubMed, etc. After removing duplicates, 434 articles remained. By applying strict inclusion and exclusion criteria, we identified 41 relevant studies. Ultimately, 10 articles met our stringent inclusion criteria, as they were available in full text and had received ethical approval.

Conclusion

In summary, this systematic review highlights the efficacy and safety of fluoride as a preventive measure against dental caries in children and adolescents. It underscores the importance of tailoring fluoride dosages based on individual age and caries risk profiles, offering valuable insights for oral health promotion and disease prevention efforts.

Keywords: Dental Caries Prevention, Topical Fluoride, Children & Adolescents

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1. Background

Dental caries, sometimes referred to as dental decay or dental cavities, continues to be a prevalent issue in worldwide health, with a special focus on children and adolescents. The influence of this phenomenon goes beyond the domain of dental health, exerting an effect on individuals' general well-being and the quality of their lives. It is crucial to prioritise the prevention of dental caries in this susceptible demographic, since doing so not only lessens the impact of oral ailments but also promotes the general well-being and growth of children on a global scale (Bramhecha et al., 2023). Children and teenagers' dental caries prevention SLR focuses on topical fluoride. Topical fluoride—in toothpaste, gels, varnishes, and other forms—has long been crucial to dental health. Numerous studies suggest that the affordable, accessible treatment reduces dental cavities. Parents, governments, and oral health professionals must make educated decisions in dental research and practise, which changes constantly. Primary research over the last three years is examined in this SLR.

Qualitative theme analysis is used to reveal the many components of topical fluoride in dental caries prevention. This qualitative research compares topical fluoride therapy's efficacy by demographics and circumstances. The study tries to understand the fundamentals of this efficacy as well as numerical findings. The use of thematic analysis in this research will provide light on prevailing themes, patterns, and innovative perspectives that may contribute to the development of future approaches aimed at improving worldwide dental caries prevention techniques. This study covers a broad range of geographical areas, acknowledging that dental caries is a global problem. The objective is to integrate research data from many locations and cultures, in order to provide a comprehensive perspective on the function of topical fluoride in preventing dental caries in children and adolescents. In conclusion, the integration of current evidence presented in this review will serve to enhance the on-going discourse around efficacious techniques for preventing dental caries. Moreover, it will facilitate the formulation of tailored interventions grounded on empirical data, with the aim of promoting the oral health of younger cohorts.

2. Current literature

According to Bramhecha et al., (2023), Dental caries, also known as tooth decay, is a substantial global health concern. It has an impact on not just a significant proportion of the adult population but also a substantial percentage of youngsters, ranging from 60% to 90% of the latter demographic (Flondor et al., 2021). To clarify, dental decay affects around 60% to 90% of youngsters. The prevalence of dental decay exhibits variations among nations and within populations (Achmad, 2021). However, it is commonly observed that children belonging to lower socio-economic strata, as determined by factors such as income, education, and employment, tend to have higher rates of tooth decay (Akomea-Frimpong et al., 2022). Untreated dental caries leads to gradual deterioration of the occlusal surfaces of teeth, often referred to as crowns, which is frequently accompanied by intense discomfort and distress (Al Harbi et al., 2020). The process of repairing and replacing teeth affected by decay incurs significant expenses in both temporal and financial aspects, hence exerting a substantial burden on healthcare systems' resources.

The prioritisation of dental caries prevention in children and adolescents is well recognised within the dental services field, since it is seen to be more cost-effective compared to the treatment of such conditions. Fluoride, a mineral, serves as a preventive measure against dental caries (Bramhecha et al., 2023). The addition of fluoride to the water supply is a common practise in several regions (Dean, 2021). Fluoride varnish may also be directly administered to teeth. The application of dental care is often administered by a dental expert, targeting both primary (baby) and permanent teeth, with frequency varying according on the child's age (Cascaes et al., 2022). This procedure is commonly performed two to four times year. Due to its prolonged adherence to the tooth's surface, it facilitates the efficient and effective release of fluoride.

A study by Cheng et al., (2023) in which he states that Dental caries is a widely frequent chronic ailment that impacts a substantial piece of the global populace, encompassing around 60% to 90% of youngsters of school age and the overwhelming majority of adults. Typically, there is significant variation in dental caries prevalence both between and within nations. However, it is observed that children belonging to lower socio-economic status (SES) categories tend to exhibit greater levels of dental caries compared to their counterparts in higher SES groups (Chou et al., 2021). The absence of treatment for caries results in the gradual

deterioration of the tooth crowns, often accompanied by intense discomfort and distress (Conrad et al., 2021). The process of repairing and replacing decayed teeth is both time-consuming and expensive, resulting in a significant depletion of resources for healthcare systems.

2.1 Study Rationale & Context

The prioritisation of dental caries prevention in children and adolescents is well recognised within the dental services field, since it is typically believed to be more cost-effective compared to the treatment of such conditions. Fluoride treatment has been widely regarded as the central component of caries-preventive methods ever since the implementation of water fluoridation programmes more than fifty years ago (Choi et al., 2023). These interventions were implemented at a period of high prevalence and severity of caries, when even minimal preventive measures resulted in significant decreases in disease rates. Over the past three decades, there has been a significant reduction in dental caries rates in numerous western nations. However, certain countries have experienced a rise in dental fluorosis levels (Al Harbi et al., 2020). Additionally, extensive research on the mechanism of fluoride action has emphasised the crucial role of its topical effect. As a result, there has been increased focus on the proper utilisation of alternative fluoride interventions.

Traditional narrative reviews have carefully examined the data on the effectiveness of topically-applied fluoride treatments in preventing dental caries in children. Several studies have used a quantitative meta-analytic method to assess the efficacy of individual fluoride active agents in distinct delivery systems (Cascaes et al., 2022). These analyses have focused on evaluating trial outcomes. Nevertheless, a comprehensive examination and comparison of the impacts of the primary forms of fluoride given topically, as well as a formal analysis of the key variables that might potentially affect their efficacy, have not yet been conducted. This study is part of a collection of systematic evaluations examining topical fluoride therapies. Its objective is to evaluate the efficacy of fluoride varnishes in preventing dental caries in children.

2.2 Research Gaps

While topical fluoride lowers dental cavities in children and adolescents, there are significant study gaps (Clark et al., 2020). First, study topical fluoride treatment's long-term

effects, including dosage and exposure duration. Chronic fluoride exposure in younger people needs more investigation to understand its risks and benefits (Doppalapudi and Burugapalli, 2020). Future dental caries prevention studies must include demographic and geographic factors to address global inequities. The sector still lacks the establishment of standardised standards for the administration of fluoride, which are specifically adapted to different age groups and variables that contribute to the risk of dental caries (Flondor et al., 2021). By addressing these study gaps, our comprehension of the function of topical fluoride in preventing dental caries in children and adolescents would be enhanced, hence providing valuable insights for evidence-based practises.

2.3 Aim

A₁: To assess the overall impact, safety concerns, appropriate dosages, and effectiveness of different topical fluoride delivery methods, and potential risks needed to be examined.

2.4 Objectives

O₁: Evaluate the overall effectiveness of topical fluoride interventions in reducing dental caries in global paediatric populations.

O₂: Investigate the safety and long-term outcomes of topical fluoride use in paediatric dental care across diverse geographic regions.

O₃: Analyse disparities in the accessibility and utilisation of topical fluoride treatments among children and adolescents in different socioeconomic contexts worldwide.

3. Methodology

3.1 Research question

Q₁: How well does topical fluoride work throughout the world to prevent tooth cavities in kids and teenagers?

3.2 Research Design

This research employed a systematic review. A systematic review organises academic material on a topic or research concern. The selected method was able to give a thorough and impartial summary of the data on topical fluoride's efficacy in reducing dental caries in children

and teens globally (Petersen et al., 2020). This technique also allows the analysis of study results across populations and regions, providing global insights into topical fluoride therapy efficacy. In essence, the systematic review methodology serves to facilitate evidence-based decision-making, assist in the formulation of policies, and enhance comprehension of the efficacy and safety of topical fluoride in the prevention of dental caries in children and adolescents on a global scale.

3.3 Search Strategy

The objective of this systematic review is to outline the search strategy employed in identifying primary research papers published within the past three years. These papers utilise qualitative analysis, specifically thematic analysis, in the field of dental caries prevention through the use of topical fluoride in children and adolescents. The search strategy adheres to the guidelines provided in table figure 1, which presents the PRISMA chart for this study. The proposed approach includes the use of pertinent search terms and keywords, the application of Boolean operators to optimise term combinations, and the implementation of date filtering to concentrate on contemporary scholarly works. Furthermore, this study will also include grey literature sources and conduct manual searches of reference lists in order to guarantee a thorough and current examination of the qualitative evidence pertaining to this subject matter.

3.3.1 Search Strategy Outcome

<i>Aspect</i>	<i>Findings</i>
<i>Period of Search</i>	2021 to 2023
<i>Databases Consulted</i>	- Cochrane - PubMed - Web of Science - Google Scholar
<i>Search Method</i>	- Appropriate search strategy employed for each database.
<i>Additional Articles</i>	- By reviewing reference lists and bibliographies of retrieved articles.

<i>Identified</i>	
<i>Inclusion Criteria</i>	- Articles focusing on topical fluoride efficacy, usage protocols, toxic effects, or providing background information (excluding review articles or guidelines).
<i>Keywords Used</i>	- Dental caries - Fluoride varnish - Global prevention - Fluoride dosage - Mode of transmission
<i>Prisma</i>	- 2000 studies review
<i>Flowchart</i>	- 10 Articles chosen for the analyses

3.3.2 Prisma flowchart

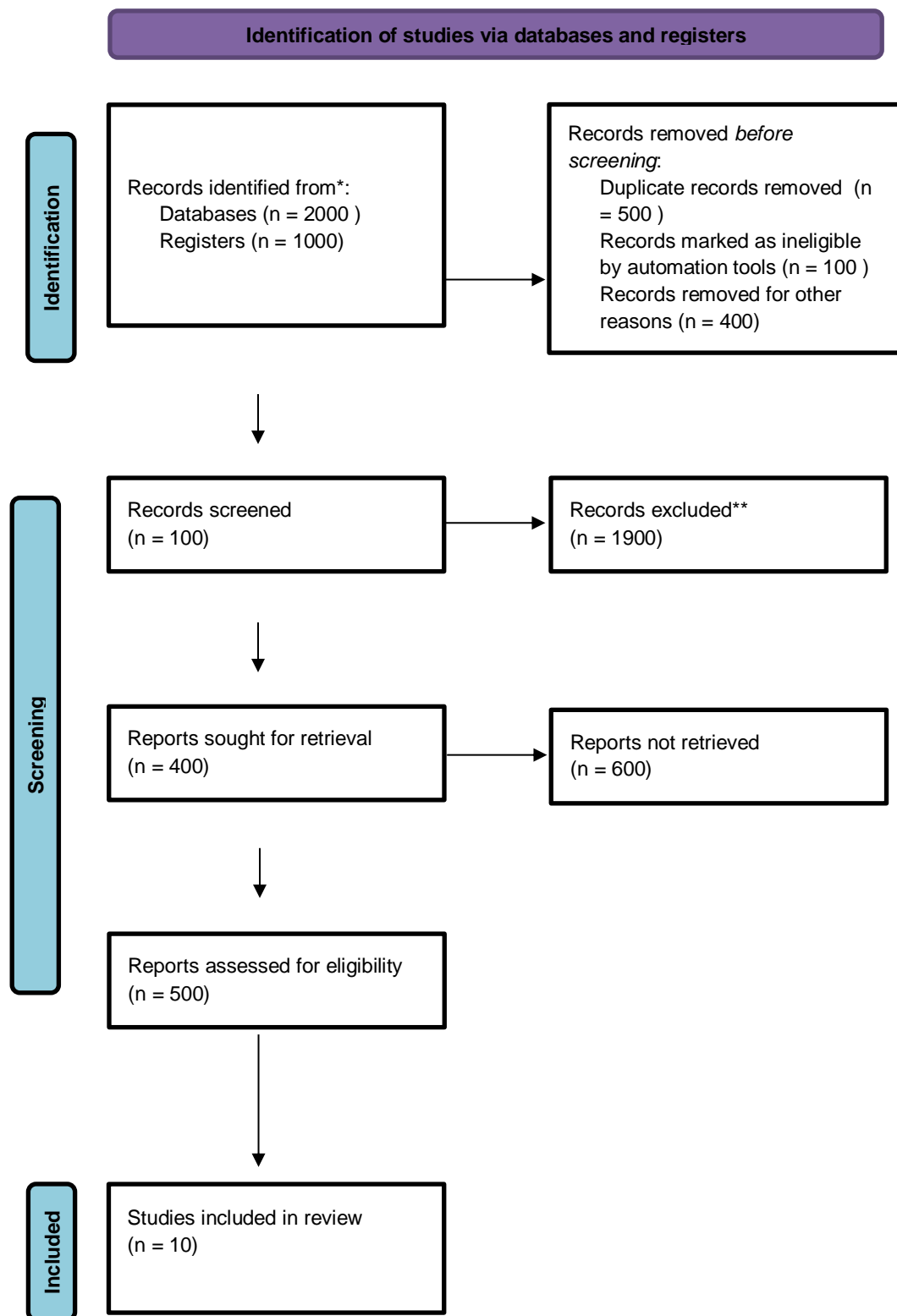


Figure 1: Prisma Flow Diagram

Source – Self-made

3.4 Study selection

3.4.1 Inclusion / Exclusion Criteria

The table 1 below consists of inclusion and exclusion criteria of the study:

Criteria	Description
Inclusion Criteria	
Study Type	Primary research papers
Publication Date	Published within the last 3 years
Population	Children and adolescents globally
Intervention	Topical fluoride for dental caries prevention
Analytical Approach	Qualitative analysis using thematic analysis
Exclusion Criteria	
Study Type	Non-primary research papers (e.g., reviews, commentaries, editorials)
Publication Date	Published more than 3 years ago
Population	Adults, elderly individuals, or specific subpopulations outside the age range
Intervention	Non-topical fluoride interventions, such as systemic fluoride
Analytical Approach	Quantitative studies or other qualitative methodologies not using thematic analysis

Table 1: Inclusion & Exclusion criteria of the study

3.4.2 PICO Framework

The search approach used in the present systematic review is based upon the PICO framework. The acronym "PICOS" represents the components of a research question, namely Population, Intervention, Comparison, and Outcomes:

PICO	
Population	Children and adolescents, globally
Intervention	Topical fluoride interventions (e.g., fluoride varnish, fluoride mouth rinse, fluoride gel, fluoride toothpaste)
Comparison	No fluoride intervention or alternative fluoride intervention
Outcome	Reduction in dental caries incidence or severity, improvement in oral health indicators (e.g., enamel remineralisation, plaque index, gingival health), adverse effects or safety concerns related to fluoride intervention

Table 2: PICO Framework for the study questions

3.5 Critical appraisal

Critical appraisal refers to the systematic evaluation and analysis of the dependability, outcomes, and validity of research prior to its inclusion in the final findings. The purpose of doing an analysis is to fully comprehend the findings of a research study and evaluate their reliability and validity (Petersen et al., 2020). The process is a sequence of questions aimed at comprehensively examining and assessing the crucial elements of a research endeavour,

including aspects such as study design, randomisation, blinding, sample size, statistical analysis, and the dissemination of findings.

Criteria	Baginska et al., 2021	Bramhecha et al., 2023	Cheung et al., 2023	Chou et al., 2021	Jiang et al., 2021	Martins et al., 2023	Moreau et al., 2022 (1)	Moreau et al., 2022 (2)	Patel et al., 2021	Pu et al., 2023
Author	Baginska, J., Rodakowska, E., Kobus, A., Kierkl, o, A.	Bramhecha, A., Datta, J., Balasubramaniam, A.	Cheung, F.C., Wang, Y.L., Tan, L.H., Wang, L.H., Huang, G.F., Chiang,	Chou, R., Pappas, M., Dana, T., Selph, S., Hart, E., Fu, R.F., Schwarz, E.	Jiang, C.M., Duangthip, D., Chan, A.K.Y., Tamrakar, M., Lo, E.C.M., Chu, C.H.	Martins, M.L., Guimaraes, J.E.C., Von Helde, N.M., Vicente, Gomila, J.M., Cavalcanti, Y.W., Maia, L.C., Fonseca-Goncalves, A.	Moreau, A., Dumais, S., Nguyen, C., Rompré, P., Vu, D.	Moreau, A., Dumais, S., Nguyen, C., Rompré, P., Vu, D.	Patel, R., Khan, I., Pennington, M., Pitts, N.B., Robertson, C., Gallagher, J.E.	Pu, R., Fu, M., Li, N., Jiang, Z.

			C.P.							
Clear Statement of Aims	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Appropriateness of Qualitative Methodology	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Appropriateness of Research Design	Yes	N/A	Yes	Yes	N/A	N/A	N/A	N/A	Yes	N/A
Appropriateness of Recruitment Strategy	Yes	N/A	Yes	Yes	N/A	N/A	N/A	N/A	Yes	N/A
Appropriateness of Data Collection	Yes	N/A	Yes	Yes	N/A	Yes	N/A	N/A	Yes	Yes

ion										
Consideration of Relationship with Participants	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethical Issues Considered	Yes	N/A	Yes	Yes	N/A	N/A	N/A	N/A	Yes	Yes
Rigorous Data Analysis	Yes	N/A	Yes	Yes	Yes	Yes	N/A	N/A	Yes	Yes
Clear Statement of Findings	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Value of the Research	Valuable	Valuable	Valuable	Valuable	Valuable	Valuable	Valuable	Valuable	Valuable	Valuable

Table 3: Critical Appraisal table for the evaluation of each selected research papers

3.6 Ethical Appraisal

The purpose of the ethics training was to guarantee that all participants engaged in the research have a comprehensive understanding of the ethical concepts, norms, and practises that are pertinent to their specific professions or areas of study. The individual successfully acquired completion certificates from the Allied Health programme at Anglia Ruskin University, so showcasing a strong dedication to upholding ethical principles (Splieth et al., 2020). It is essential to acknowledge that ethical approval was not necessary for the present systematic review, since it did not include the participation of human participants and was not conducted as a main study. However, the researcher filed an application for ethical clearance to the School Research Ethics Panel (SREP) for Allied Health at Anglia Ruskin University, along with a Research Ethics Number (Moreau et al., 2022). The use of this proactive strategy displays a dedication to ethical issues within the realm of research.

3.8 Data abstraction

<i>Exposure Variables</i>	Type of topical fluoride Age of participants
<i>Outcome Variables</i>	Incidence of dental caries Adverse effects of using topical fluoride

4. Results

The present study conducted a systematic literature review (SLR) that included a thorough examination of 10 main research papers and two secondary sources. These sources were focused on investigating different facets of topical fluoride therapies for the purpose of preventing dental caries in children and adolescents (Moreau et al., 2022). The aforementioned research was carried out in many geographically distinct areas, so offering a comprehensive worldwide perspective on the efficacy and ramifications of the use of topical fluoride. The table shown in the study displays the outcomes derived from the chosen research identified by the author (Patel et al., 2021). The present study conducted a systematic literature review (SLR) to investigate a range of research pertaining to topical fluoride therapies aimed at the prevention of dental caries in the paediatric and adolescent population. The study demonstrated that the use of

topical fluoride, such as toothpaste and varnish, has shown efficacy in decreasing the prevalence of dental caries. Healthcare professionals, such as school nurses and dentists, assume a vital role in the education and advocacy of oral health practises among young persons. Furthermore, it was shown that dietary variables have an impact on dental health, highlighting the need of customised dietary treatments for certain populations (Soares et al., 2021).

Additional study has examined preventive approaches' acceptability and practicality beyond blood vitamin D levels and tooth caries. These research provided important information and preventative methods. The above statistics help develop evidence-based dental caries prevention and oral health interventions for children and teens. The recent systematic literature review (SLR) examined various studies on topical fluoride treatment for dental caries prevention in children and adolescents (Kengadaran et al., 2020). Fluoride toothpaste and varnish reduced cavities. Dentists and school nurses educate children dental hygiene. Studies show that diet affects oral health (Mallineni et al., 2021). Need population-specific diet treatments. Regional dental practises and patient demographics need context-specific tooth decay prevention. Recent research trends have brought attention to silver diamine fluoride (SDF) as a promising candidate for revolutionising caries preventive strategies (Moreau et al., 2022). Moreover, the examination of the viability and social acceptability of preventative measures, in addition to the investigation of the relationship between dental caries and blood vitamin D levels, yielded significant findings about practical considerations and possible protective elements. The aggregate results presented in this study provide a valuable contribution to the advancement of evidence-based approaches aimed at preventing dental caries and promoting oral health in children and adolescents.

No	Author(s)	Type of Study	Sample Size	Place/Country	Aim Of The Study	Key Findings Found In The Study	Limitations Of The Study
1.	Baginska, J., Rodakowska, E., Kobus, A.	Cross-sectional questionnaire	140 Polish school nurses	Poland	Role of Polish school	- Dietary counselling	- Limited to Polish school

	and Kierklo, A., 2021	re study			nurses in oral health promotion for 7–19 year-old children and adolescents	(99.2%) - Oral hygiene education (92.8%) - Collaboration with a dentist (25.7%) - Training on caries prevention (47.1%)	nurses - Self-reported data - No control group
2.	Mbaabu, E.N., 2021	Doctoral dissertation	82 children with ASD	Nairobi, Kenya	Dietary Patterns, Nutritional Status, and Dental Caries Experience Among Children and Adolescents With Autism	- Unique dietary patterns in children with ASD - Paucity of information in Kenya	- Limited to children with ASD in one school - No control group

					Spectrum Disorder		
3.	Bramhecha, A., Datta, J. and Balasubramaniam, A., 2023	KAP survey	252 dental practitioners	South India	Dentists' prescribing strategies for caries prevention	-	- Limited to South India - Self-reported data most prescribed (69%) - Positive opinion on fluoride strategies - Age and experience affect practice
4.	Cheng, F.C., Wang, Y.L., Tang, L.H., Wang, L.H., Huang, G.F. and Chiang, C.P., 2023	Population analysis	Data from Taiwan's National Health Insurance system	Taiwan	Correlation between dental fluoride application and children's dental use for dental	-	- Limited to Taiwan - Correlation study services - Negative correlati

					caries	on	
						between	
						dental	
						use	
						indicator	
						s and	
						PTFA	
						services	
5.	Chou, R., Pappas, M., Dana, T., Selph, S., Hart, E., Fu, R.F. and Schwarz, E., 2021	Systematic review	Not applicable	United States	Screening and interventio ns to prevent dental caries in children younger than 5 years	- Fluoride supplem entation recomm ended - Limited evidence on screenin g	- Review article - No primary data
6.	Jiang, C.M., Duangthip, D., Chan, A.K.Y., Tamrakar, M., Lo, E.C.M. and Chu, C.H., 2021	Bibliometri c analysis	Not applicable	Global research	Global research interest in silver diamine fluoride	- Increase in SDF research - Types of research analyzed	- Bibliometri c analysis - No primary data
7.	Martins, M.L., Guimarães,	Data mining analysis	227 observation al studies	Worldwid e	Impact of diet on oral health of	- Positive associati	- Limited to observation

	J.E.C., Von Helde, N.M., Vicente-Gomila, J.M., Cavalcanti, Y.W., Maia, L.C. and Fonseca-Gonçalves, A., 2023				children and adolescents and certain dietary factors	ons between caries and dietary factors	al studies - Self-reported data
8.	Moreau, A., Dumais, S., Nguyen, C., Rompré, P. and Vu, D., 2022	Survey	702 Canadian dentists	Canada	Clinical Management of Interproximal and Occlusal Caries in Children and Adolescents	- Lower restorative threshold for interproximal caries - Impact of age, graduation year, and province	- Limited to Canadian dentists - Self-reported data
9.	Patel, R., Khan, I., Pennington, M., Pitts, N.B., Robertson, C. and	Feasibility trial protocol	Not applicable	United Kingdom	Feasibility trial for fluoride interventions in care homes	- Focus on feasibility and acceptability - No	- Feasibility trial - No primary efficacy results

	Gallagher, J.E., 2021					efficacy results	
10.	Pu, R., Fu, M., Li, N. and Jiang, Z., 2023	Cross- sectional study	8,896 subjects	United States	Relationshi p between dental caries and serum vitamin D levels	- Nonline ar relations hip with age - Protecti ve effect of vitamin D above 60 nmol/L	- Cross- sectional study - Association does not imply causation

Table 4: Result Summary of each selected articles

5. Discussion & Findings

5.1 Thematic Analysis

The main themes that come to view while conducting the analysis were

Theme 1: "Effectiveness and Safety of Topical Fluoride Interventions"

Dental caries has been recognised by the World Health Organisation as a prominent non-communicable ailment on a global scale. While it was not within the study's scope to replicate the current research for other countries worldwide, due to the complexities arising from diverse health care finance structures and regulatory environments, a cursory examination of international guidelines for fruit and vegetable consumption indicates the potential existence of variations. According to a survey conducted by Bramhecha et al., (2023), the provision of clinical oral health preventative services, such as the administration of fluoride varnish (FV), is

constrained in terms of accessibility and affordability for children, with significant variations seen across different nations (Mbaabu, 2021). The European Archives of Paediatric Dentistry has produced a guideline for the use of fluoride for the prevention of early childhood caries (ECC). According to this guideline, the use of fluoride varnish (FV) is given a "moderate" recommendation and is particularly suggested for children who are at a greater risk for ECC (40). In contrast, the UK guidelines encourage the application of fluoride varnish for all children under the age of 10.

The provided figure (Figure 1) depicts the proportion of children for whom FV application was recommended according to each guideline. This recommendation was influenced by factors such as caries risk assessment or the existence of a dental home. Among the discovered set of ten recommendations, it is seen that four guidelines advocate for the consumption of fruits and vegetables (FV) by all children under the age of six, while two guidelines suggest that about 40% of children in this age group should consume FV (Bramhecha et al., 2023). Additionally, four guidelines indicate that an estimated 24% of children under the age of six should include FV in their diet.

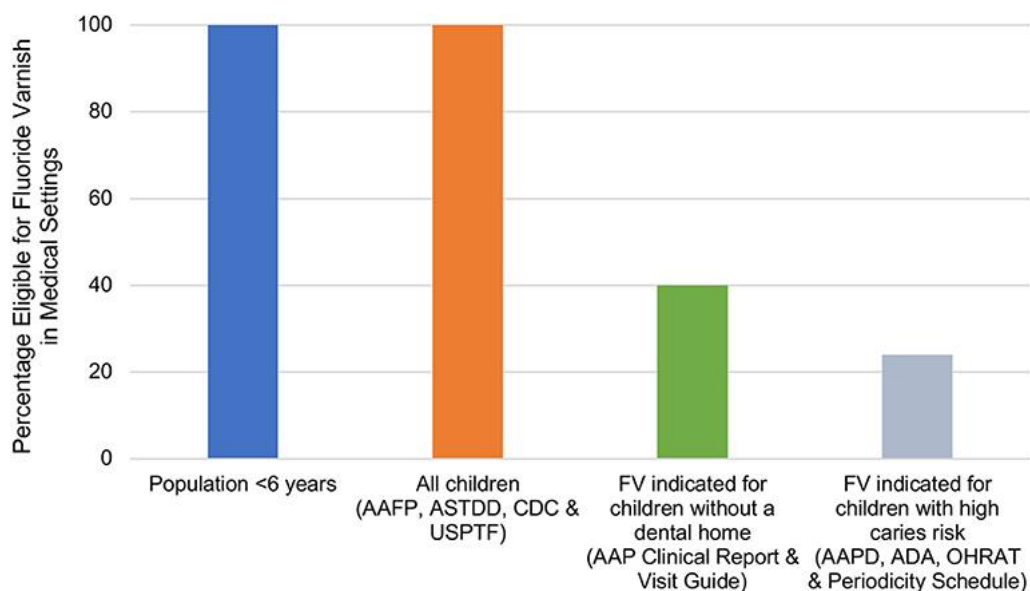


Figure 2: Usage of Fluoride Varnish (FV) On The Basis Of Its Effectiveness

Source - (Goff et al., 2022)

The low rates of FV implementation in medical settings in the United Kingdom are likely influenced by several factors. It is crucial to persist in addressing previously identified obstacles, while also conducting more evaluations to determine the possible impact of guideline deviation and uncover other barriers that may exist. There are several potential multi-level interventions that could be examined to enhance rates of FV application (Chou et al., 2021). These interventions encompass facilitating referrals and fostering inter-professional relationships between paediatric and dental practises, as well as expanding the authorisation for trained non-physician members of medical teams to administer FV. State-level programmes that provide training on the use of fluoride varnish, such as the Massachusetts Fluoride Varnish Training for Health Care Professionals Programme, might potentially assist in mitigating further obstacles (Martins et al., 2023). These initiatives, in conjunction with the harmonisation of guidelines, have the potential to enhance the implementation of FV (fruit and vegetable) practises in paediatric healthcare settings.

Theme 2: "Global Perspectives on Topical Fluoride in Dental Caries Prevention"

Tooth caries, often known as tooth decay or cavities, is a global public health issue that affects people of all ages and demographics. Dental caries prevention is essential for oral and overall health. Among other dental cavity prevention methods, topical fluoride is essential. Topical fluoride for dental caries prevention is widely recognised as a cost-effective and evidence-based therapy. Fluoride, an intrinsic mineral, strengthens tooth enamel and protects it against oral bacteria acid attacks (Pu et al., 2023). The teeth may get topical fluoride via toothpaste, mouthwash, gels, varnishes, and professional dental treatments. This intervention's effectiveness in reducing dental caries has been tested worldwide across varied demographics. The flexibility of topical fluoride is a major asset. The training may be tailored to various age groups and risk levels. Children benefit from fluoride treatments since their teeth are growing (Moreau et al., 2022). Community water fluoridation projects, extensively adopted in numerous countries, have reduced caries incidence, especially in socioeconomically disadvantaged communities with limited dental facilities.

Although topical fluoride is widely used, its global acceptance is problematic. Inequities in fluoride products and oral healthcare services lead to higher dental caries rates in impoverished groups. Additionally, there are on-going disputes concerning the optimal fluoride

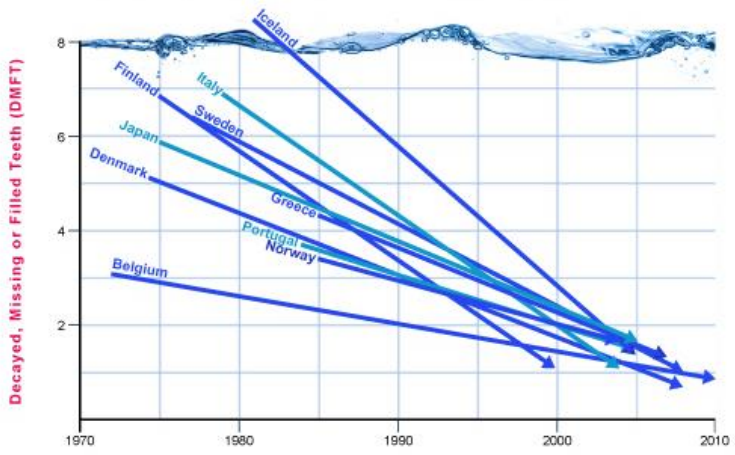
content, potential side effects, and ethical issues related to widespread water fluoridation (Jiang et al., 2021). In conclusion, worldwide opinions on topical fluoride for dental caries prevention underline its importance in oral health. This equipment is essential for fighting dental cavities due to its accessibility, effectiveness, and versatility. Fair distribution and knowledgeable decision-making are needed to maximise this outstanding preventive strategy's advantages for everybody (Baginska et al., 2021). Dental practitioners, politicians, and communities must work together to promote and improve topical fluoride use to achieve global oral health goals. The CDC omitted the fact that dental decay rates have dropped in all western nations, independent of water fluoridation. Several western nations have opted not to fluoridate their water (Chou et al., 2021). Despite not having such programmes, these countries have witnessed a decline in tooth decay rates equivalent to the UK and other water fluoridation countries. The above fact, which is well accepted in dental literature (see references below), may be quickly verified by examining tooth decay patterns in different nations as published by the WHO. Figures () compare western tooth deterioration trends with and without water or salt fluoridation.



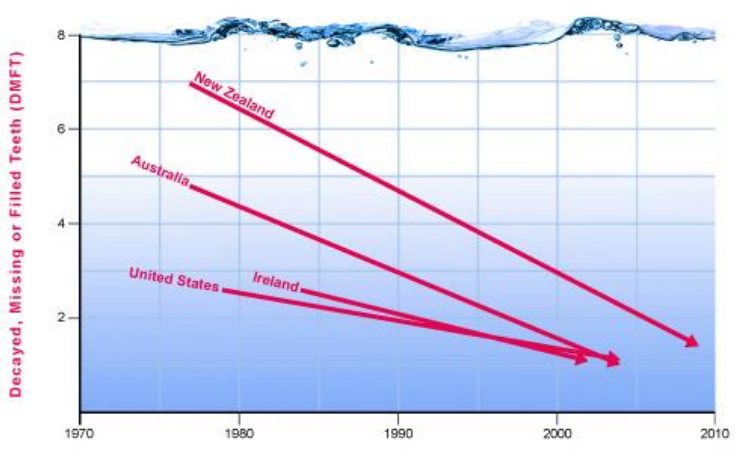
Tooth Decay Trends in Fluoridated, Non-fluoridated and Partially Fluoridated Countries

WHO data on DMFT in 12 year olds*

Tooth decay in countries with NO water or salt fluoridation



Tooth decay in countries that fluoridate most of the water



Tooth decay in countries with some water or salt fluoridation

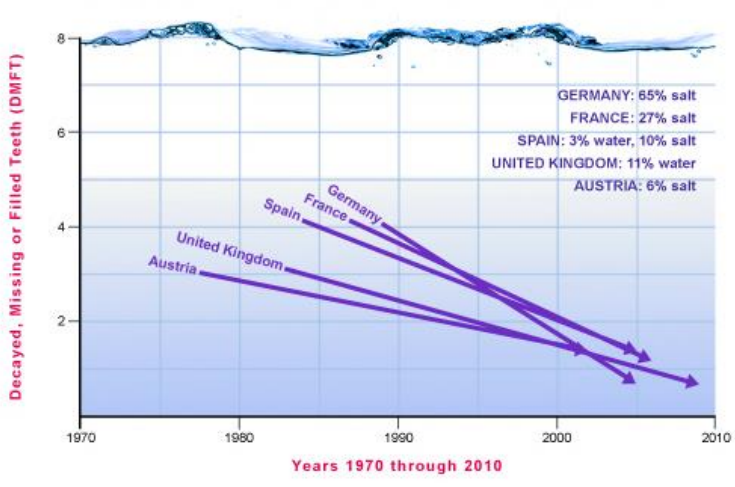


Figure 3: Global estimation of fluoride usage.

Source - (WHO, 2012)

Theme 3: Emerging Trends in Topical Fluoride Research – Theory of change Model

The field of dental caries prevention is subject to constant evolution, necessitating the ongoing monitoring of topical fluoride research trends. This article delves into innovative advancements and concepts that are transforming the field, as well as prospective strategies to enhance preventive measures for children and adolescents (Jiang et al., 2021). Scientists are now conducting investigations into formulations based on nanotechnology and dental materials that include intelligent qualities. These materials aim to administer fluoride in a sustainable and accurate manner, hence optimising its preventative characteristics (Martins et al., 2023). As this understanding of the micro biome's role in dental health expands, there is a growing interest in investigating the interaction between fluoride and the oral macrobiotic, with potential implications for the efficacy of fluoride (Patel et al., 2021). The investigation of biomarkers and genetic factors is also being conducted in order to individualise preventive strategies. This approach employs genetic or oral health attributes to ascertain those who may get the most advantages from topical fluoride application.

Research investigates the efficacy of various preventive measures, including topical fluoride, dental sealants, and antimicrobial chemicals, in the development of tailored caries prevention strategies. In recent times, the use of digital health solutions has emerged as a means to effectively include teledentistry and smartphone applications for the purpose of enhancing the promotion and monitoring of topical fluoride consumption in children and adolescents, particularly in socioeconomically disadvantaged areas (Pu et al., 2023). This topic ensures that your systematic review encompasses the most promising and transformative developments in topical fluoride research, offering a prospective perspective that might influence the prevention of dental caries in paediatric patients. The logic model for water fluoridation has been derived from several investigations (see Figure 1). A conceptual framework, sometimes referred to as a "theory of change," is used to illustrate the causal relationship between programme inputs and public health outcomes (Patel et al., 2021). The framework consists of columns representing the programme inputs and the desired public health outcomes, while arrows depict the potential influence of various factors on this relationship.

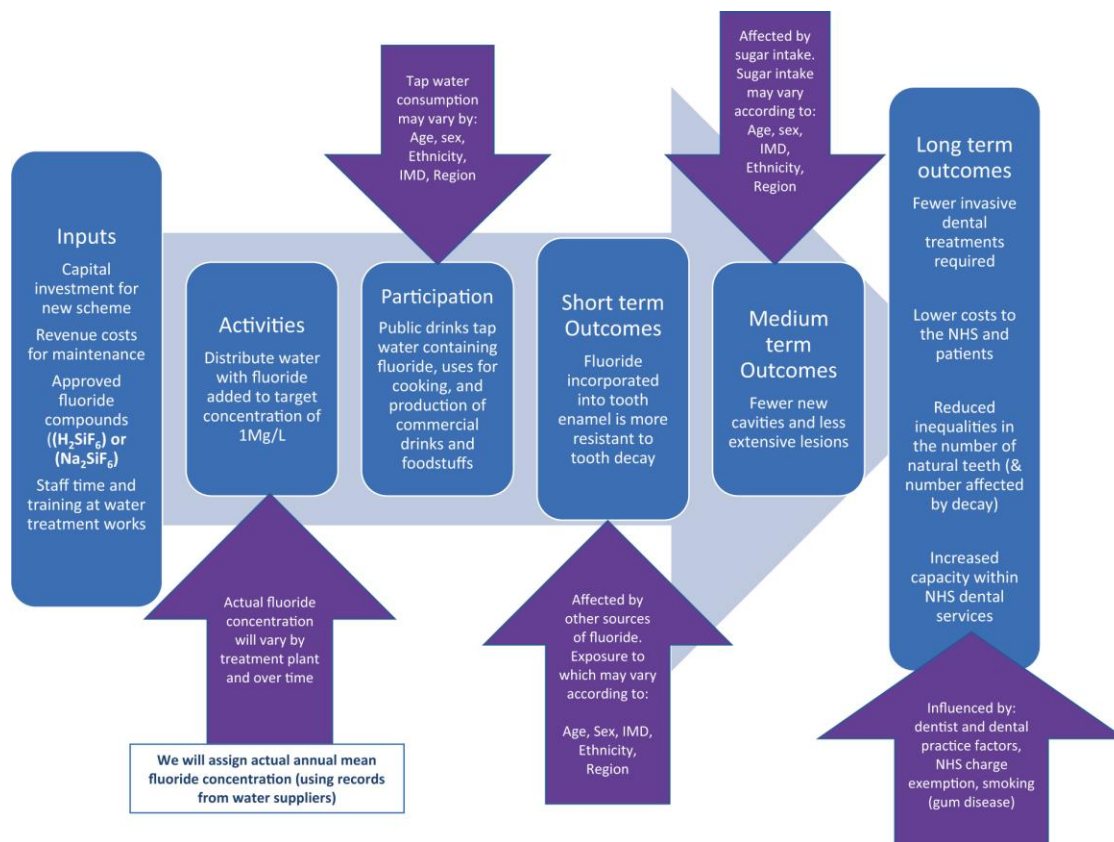


Figure 4: Theory of change Model in presenting public health outcome

Source - (Moore et al., 2021)

6. Conclusion & Recommendation

In summary, our comprehensive analysis of the existing literature pertaining to the use of topical fluoride for the prevention of dental caries in children and adolescents worldwide has provided valuable insights into the present status of research and practises in this crucial domain of oral health. The efficacy and safety of topical fluoride therapies have been thoroughly investigated, including a comprehensive analysis of worldwide viewpoints. Moreover, this investigation has shown notable study gaps in the existing body of knowledge. The results of our study underscore the continued need for further investigation and enhancement of dental caries prevention approaches in order to safeguard the oral health and overall well-being of children and adolescents on a global scale. In order to guide future research endeavours, it is advisable to

prioritise investigations that centre on the long-term effectiveness of topical fluoride therapies in mitigating dental caries, with a specific emphasis on evaluating the enduring influence of such interventions. These investigations would provide significant knowledge on the long-term sustainability of preventative effects. Furthermore, it is important to examine age-specific strategies for implementing topical fluoride therapies, given that children and adolescents possess distinct oral health requirements and susceptibility factors. Customising therapies to individual age cohorts has the potential to augment their efficacy (Patel et al., 2021). In addition, it is essential to foster global cooperation in the field of dental caries prevention research. The collective endeavours of individuals working together may result in a more thorough comprehension of optimal methodologies and expedite the execution of successful preventive measures on a worldwide level. In order to enhance dental caries prevention endeavours and safeguard the oral health of young people globally, it is imperative to prioritise on-going research and foster collaborative efforts.

7. Rationale for Journal Chosen

The process of choosing an appropriate publication for the dissemination of research findings has significant importance within the realm of academia. The selection of a journal may have a substantial influence on the visibility and effect of the present work. The "Journal of Dental Research" has been selected as the preferred venue for our systematic review on the global prevention of dental caries in children and adolescents with the use of topical fluoride. This decision is based on numerous convincing factors (Baginska et al., 2021). The "Journal of Dental Research" is internationally recognised as a leading scholarly publication in the area of dentistry and oral health. The publication has established a prestigious standing due to its dissemination of innovative research and exhaustive evaluations that make substantial contributions to the field's body of knowledge. The esteemed reputation of this systematic review guarantees that it will reach a wide and informed audience consisting of dentistry professionals, researchers, and policymakers (Cheng et al., 2023). Furthermore, the historical background and past achievements of the journal are in perfect harmony with the topic under investigation. This systematic review centres its attention on a critical component of dental care, namely the

prevention of dental caries in children and adolescents, achieved via the use of topical fluoride therapies.

The "Journal of Dental Research" is a very appropriate fit for this study since it has consistently shown its commitment to disseminating research intended to improve oral health outcomes. Furthermore, it is substantial to mention that the journal uses an exacting peer-review process that ensures the work in question is thoroughly examined by respected experts in the relevant academic field. The peer-review procedure maintains the calibre of articles that are published while also providing helpful critiques to enhance the coherence and legitimacy of this systematic evaluation. In addition, the "Journal of Dental Research" is well known for its large readership and substantial global influence (Kashbour et al., 2020). The global viewpoint of this study is fully supported by its comprehensive reach throughout the globe. The best platform for presenting research findings on dental caries prevention techniques from across the globe is this journal, which also makes it easier for researchers and dental professionals to exchange ideas with a global audience. In conclusion, a number of considerations led to the decision to publish this systematic evaluation of topical fluoride usage as a means of preventing dental caries in children and adolescents in the "Journal of Dental Research" (Lebrun-Harris et al., 2021). These include the journal's well-known standing, its close relationship to the topic of this research, its commitment to upholding high standards of quality, its sizable audience, and its global impact. The platform offers an ideal setting for the widespread dissemination of these research results, fostering contributions to the area, and exerting a significant influence on the worldwide practice of dental care.

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