PICO Part A: Preventing Dental Erosion

DH 211 Introduction to Research

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Vishav Sidhu

January 05, 2025

2. Background Questions:

Who is more at risk of erosion, preschool children, children, and adolescents?

Each client has unique genetic predispositions, habits, dietary consumption, and more. "There was no significant difference in the prevalence of erosive tooth wear in different age groups when compared with children 6 years of age(Yip & Laml, 2022) ". Age range is not a predictor in measuring a child's prevalence of erosive tooth wear. "The estimated combined prevalence of erosive tooth wear in children below 7 years old is 39.64%"(Yip & Laml, 2022).

What type of fluoride is most effective in preventing erosion?

The difference between the active ingredient of one dentifrice from another can dictate the difference between an erosive environment and protecting the enamel. "Daily use of a stabilized SnF2 dentifrice provides the most effective means of protecting teeth against the increasing risk of dental erosion"(Faller & Noble, 2018). Using dentifrice containing the following ingredients reduces the effects of various dietary acids consumed by patients.

Where can you see the first signs of dental erosion?

Preventative care prioritizes identifying early signs of developing conditions to keep them from progressing. "Characteristic early signs of dental erosion include smooth and flat facets on facial

or palatal surfaces, and shallow and localized dimpling on occlusal surfaces. Early intervention is key to effectively preventing erosive tooth wear" (Ren, 2011). This indicates that the client has not implemented a protocol to offset the erosion. The environment in the oral cavity lacks the needed protection that can be provided by fluoride.

When is a drink considered too acidic?

Certain beverages are more acidic than others, however, solely measuring the harmfulness of a drink based on the pH does not provide the full picture."Although enamel may be dissolved at a pH of 5.2-5.9 and dentine at pH 6.0-6.8 there is no fixed critical PH for dental erosion. Besides PH, factors such as acid type, buffer capacity, adhesion, chelating effect, phosphate, fluoride, and calcium content play a role in the erosive properties of a drink"(Zimmer et al, 2015).

How many acidic drinks a day leads to erosion?

The beverages you consume daily can act as a protective factor, given it is fluoridated water, or a risk factor, given it is an acid drink. "As few as four acidic exposures throughout the day can put enamel at risk from acid erosion"(Sensodyne, 2020). This showcases the importance of fluoride in protecting the enamel from such exposure.

Why is fluoride necessary?

Fluoride is a naturally occurring compound that maintains our oral health. Due to outside factors, we are susceptible to harm which is why interventions are vital. Fluoride has many benefits “It promotes remineralization, reduces glycolysis, and exerts antibacterial effects, particularly against cariogenic bacteria like streptococcus mutans”(Mankar et al, 2023). Fluoride has multipurpose uses, one of which is to prevent the onset of erosion by protecting the enamel.

3. PICO:

Patient/ Problem - Young client who experiences dental erosion due to overconsumption of acidic drinks

Intervention - Fluoride varnish would aid in remineralization

Comparison group - Fluoridated toothpaste

Outcome - Maintains the integrity of the enamel

4. PICO question:

For a young client who experiences dental erosion due to a diet composed of acidic drinks, would fluoride varnish compared to only fluoridated toothpaste be more effective in maintaining the integrity of the enamel?

5. Therapy/ Prevention:

The purpose of this PICO question is to determine how the intervention of fluoride varnish can keep the enamel intact by providing the necessary minerals. As fluoride varnish is used to ensure the vitality of the outer layer of tooth enamel it would be considered a therapeutic or prevention type of question. The treatment is intended to fight the chemical process caused by acidic drinks and maintain the long term health of the tooth. In this scenario finding a treatment that is most effective in prolonging the health of the enamel will solve the client's problem.

6. Search Conducted

A) Dental Erosion AND fluoride

B) Dental Erosion AND toothpaste

C) Fluoride AND erosion therapy

D) Erosion AND fluoridated toothpaste

E) Erosive Tooth Wear AND demineralization

LITERATURE CITED

Yip K, Lam PPY, You CKY. Prevalence and Associated Factors of Erosive Tooth Wear among preschool children - A systematic review and meta-analysis [Internet]. 2022 Mar 7; [Cited 2025 Jan 05] Available from https://pubmed.ncbi.nlm.nih.gov/31940633/

Faller RV, Noble WH. Protection From Dental Erosion: All Fluorides are Not Equal.[Internet] 2018. Mar; Cited 2025 Jan 05] Available from https://pubmed.ncbi.nlm.nih.gov/29493253/

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Mankar N, Kumbhare S, Nikhade P, Mahapatra J, Agrawal P. Role of Fluoride in Dentistry: A Narrative Review. Cureus.[Internet] 2023, Dec 21; [Cited 2025 Jan 05] Available from https://pmc.ncbi.nlm.nih.gov/articles/PMC10799546/pdf/cureus-0015-00000050884.pdf

PICO ASSIGNMENT RUBRIC PART A

Student Names: Vishav Sidhu

	Value	Grade
1. Title page	1	1
2. Formulates the background questions by creating general knowledge inquiries about the condition, problem or issue that ask the questions: a. ***Who*** b. ***What*** c. ***Where*** d. ***When*** e. ***How*** f. ***Why*** Answers each of the background questions identified in *part A* in a clear and concise manner.	 2 2 2 2 2 2	 1.5 1.5 1.5 1.5 1.5 1.5
3. Begin to define the question using PICO by identifying the a. ***Patient/Problem***_____ b. ***Intervention*** _____ c. ***Comparison group***_____ d. ***Outcome(s) desired*** _____	4	4
4. Writes out the PICO question using the format provided and include the elements ***patient, client, or population, intervention, comparison group, and outcome(s) desired.***	4	4
5. Identifies the type of question or problem that is appropriate to the client a. ***Therapy/prevention*** b. ***Diagnosis*** c. ***Etiology/causation/harm*** d. ***Prognosis***	2	2
6. Provides a list of the main topics and key words that were used in the search.	2	2
7. Provides a copy of the first page of the search conducted for each key term used and circles the MeSH terms.	2	2
8. Mechanics a. ***Free of grammatical errors*** b. ***Reference Page*** c. ***Correct formatting of the reference page***	 1 1 1	 0.5 1 0.5

TOTAL	**30**	26
Value to Grade (10%):		87%

Comments: Good work. Areas of improvement: Who question can stop at 'erosion.' Lacking clarity and integration of research facts and findings into own words/ thoughts. Work on blending the two effectively. Use higher level sources for some answers (i.e. how question). Take out 'remineralization' in I of PICO and the word 'only' in your PICO question. Errors in lit cited page (i.e. not alphabetized, indented, etc). HR

PICO Part B: Thesis

Topic - Fluoride varnish vs. fluoridated toothpaste in young clients: A comparative research

Course - DH 211 Introduction to research

Instructor - Miss Ramesha, RDH

Due Date - February 02, 2025

By - Nikita Garg, Sarah Lobo, Nariman Mahboub, Indhira Mateo, Vishav Sidhu and Tuyen Tran

Introduction

The structure of tooth enamel is rigid in its functionality; however, it is susceptible to integrity when exposed to bacteria and acid. Adequate mineralization is required to protect the enamel and the underlying sensitive structures of the tooth against caries. Preventive dental care is essential in maintaining the longevity of tooth surfaces. Fluoride has the necessary chemical properties to bond with the inorganic compositions of enamel, helping to prevent its deterioration (Nassar and Brizuela 2023). While there are various ways to apply fluoride to enamel, not all methods are equally effective. As dental caries become more prevalent in young clients, a comparison of fluoride varnish to fluoridated toothpaste will provide insight into the effectiveness of each treatment option. **As dental caries become more prevalent in young clients, a comparison of fluoride varnish to fluoridated toothpaste will help determine the efficacy of each intervention.**

Fluoride varnish: An effective method to prevent dental caries in children

With the evolution of fluorides in dentistry, topical fluoride varnish has been extensively used for over three decades to prevent dental caries in children and adolescents. The credit for its rising

popularity can be given to the local protective effect it has on exposed teeth combined with the low risk of ingestion (Marinho, Worthington, Walsh and Clarkson, 2013). In a study done by Lawrence, Binguis, Douglas, McKeown, Switzer, Figueiredo and Laporte (2008), a randomized control trial of groups receiving fluoride varnish in Ontario, Canada, had an astonishing 196% decrease in caries risk opposed to those not receiving varnish and were proven effective especially with oral health counselling. The ADA recommends 2.26% Sodium Fluoride (NAF) for ages 6 and up as their source of prescription-strength varnish (Weyant, Tracy, Anselmo, Beltrán-Aguilar, Donly, Frese, Hujoel, Iafolla, Kohn, Kumar, Levy, Tinanoff, Wright, Zero, Aravamudhan, Frantsve-Hawley and Mayer 2013).

Another systematic review supports the claim. According to the Azarpazhooh and Main (2008), biannual application of fluoride is recommended in children aged 13-16 years living in moderate and high-risk areas. They also concluded that varnish is a time-efficient method and causes less discomfort as compared to other professional topical fluoride options. To state it simply, while varnishes are a professional topical fluoride therapy, they can be a useful adjunct to prevent caries in children.

Fluoridated Toothpaste

Research comparing fluoride varnish and fluoridated toothpaste highlights their effectiveness in dental caries prevention. “The pooled results of the 70 studies assessing the effect of fluoride toothpaste on the permanent dentition suggest that the use of this intervention is associated on average with a 24% reduction in decayed, missing and filled tooth surfaces (D(M)FS), and this reduction falls within narrow confidence intervals (CIs) (21 to 28%)” (Marinho et al, 2003).

Efficacy of fluoride is shown to be dependent on frequency of use and dose per application. “The suggested greater treatment effect with increased fluoride concentration is consistent with that reported in two large clinical trials directly comparing different fluoride concentrations in toothpaste (dose-response relationship): they reported that an increase in fluoride of around 500 ppm F in toothpastes.containing 1000-2500 ppm F brings an additional 6% reduction in caries” (Marinho et al, 2003). Incorporating a high PPM fluoridated toothpaste can alter the progression of caries risk in young clients and prolong the onset of decay. “Tooth brushing with 1500 ppm F toothpaste reduces decayed, filled surfaces (dfs) increment when compared with placebo toothpaste (moderate-certainty evidence)” (Walsh et al, 2019)). Daily absorption of fluoride from fluoridated toothpaste ensures protected enamel. According to a study by Petersson et al., fluoride toothpaste significantly reduces the incidence of caries when used consistently, forming a protective barrier against acid attacks on enamel. This aligns with findings from another study by Marinho et al., which emphasizes the role of fluoride in remineralising enamel and inhibiting bacterial activity that leads to caries formation. Both interventions are essential, but fluoridated toothpaste's daily use provides continuous exposure to fluoride, which is crucial for maintaining oral health in high-risk groups. Thus, while fluoride varnish offers targeted protection, fluoridated toothpaste proves indispensable in the daily oral hygiene regimen for its sustained preventive benefits against dental caries.

Effectiveness of fluoride varnish vs. fluoridated toothpaste

The comparative effectiveness of fluoride varnish and fluoride toothpaste has produced inconsistent findings in different studies. Marinho et al. (2004) draws attention to the Petersson

(1985) trial that compared the effectiveness of toothpaste and varnish on carious primary teeth. This trial involved 183 participants aged between 1 and 16 years of age, and found no significant difference in caries development between children using fluoride varnish and those using fluoride toothpaste. This further emphasizes the uncertainty regarding the efficacy of these treatments (Marinho et al. 2004).The study indicated that while toothpastes are more commonly used, the advantages of varnishes in caries reduction remain uncertain, as benefits in caries reduction were unclear among fluoride mouthrinse, fluoride varnish, and toothpaste. In contrast, a more recent study by Lalwani, Jangade, Chhajed and Nayak (2024) demonstrated that fluoride varnish significantly reduced the probability of new dental cavities compared to fluoride toothpaste. The study revealed a significant 7% decrease in caries increment in the varnish group, statistically significant results. This study found that administering fluoride varnish quarterly, offered significantly greater preventive advantages than the daily use of fluoride toothpaste among schoolchildren in rural India, resulting in almost a 50% decrease in the progression of cavities. In summary, the existing trials and studies conclude with mixed results, emphasizing the need for additional trials and studies to determine the comparative effectiveness of fluoride varnish and toothpaste in reducing caries in primary teeth.

Conclusion

Fluoride varnish has been widely recognized as an effective method for preventing dental caries in children, offering targeted protection with minimal risk of ingestion. While research consistently supports its role in caries prevention, comparisons with fluoridated toothpaste have yielded mixed results. Some studies suggest that fluoride varnish provides superior protection,

especially in high-risk populations, while others indicate no significant difference between the two interventions. Despite these variations, both fluoride varnish and fluoridated toothpaste play essential roles in maintaining oral health, particularly when combined with oral health counselling. Further research is needed to establish their comparative effectiveness definitively. Ultimately, integrating both methods into a comprehensive preventive strategy may offer the most effective approach to reducing dental caries and promoting long-term oral health in children.

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PICO Summary

Client Name: __Justin____ Student Name: __Indhira Mateo, Nikita Garg, Nina Mahboub, Tuyen Tran and Vishav Sidhu_____
Date: ___February 02, 2025____

1. Write out PICO question including all aspects of client specific problem.

For a young client who has multiple dental caries, would fluoride varnish compared to fluoridated toothpaste be more effective in maintaining the integrity of the enamel.

P - A young client with multiple dental caries

I – Fluoride varnish

C – Fluoridated toothpaste

O – Maintenance of integrity of enamel

Client – Justin is a 10-year old with multiple teeth with dental caries. Justin has never been to a dental clinic. He uses herbal toothpaste while brushing once a day. His diet is 61% grains and carbohydrates, 28% proteins and 11% fruits and vegetables. He drinks only 3-4 glasses of water every day and likes apple juice with all his meals.

2. Using evidence-based decision-making (EBDM), briefly describe the conclusion drawn from your research.

Based on our research, we have learnt that fluoride varnish helps to prevent dental caries in young clients. Unlike fluoridated toothpastes which have potential risk of being ingested by children, topical fluoride varnish has minimal risk of ingestion. It is time-efficient and only needs to be done twice in one year. However, fluoridated toothpaste being used in adequate concentration on a daily provides a more consistent exposure to fluoride, which is crucial for maintaining good oral health. Essentially, fluoride acts as protective covering for the tooth structures and both topical fluoride varnish and fluoridated toothpastes should be integrated in maintaining the integrity of tooth structures and prevent dental caries.

3. Summarize the specific recommendation(s) made to the client.

1. Use fluoridated toothpaste in pea-sized amount twice every day.

2. Plan regular dental check-ups.

3. Get in- office topical fluoride varnish treatment every 6 months.

4. Reduce cariogenic components (fermentable carbohydrates) of diet e.g. Chocolates, breads and cookies and drink sugar-free apple juice.

5. Reduce grains and increase fruits and vegetables in his meals.

6. Increase water intake.

PICO Delivery Date: _____ **Client Signature: _____**

Student Signature: _____ **Faculty Signature: _____**

LITERATURE CITED

Canadian Dental Association. Fluoride varnish in the prevention of dental caries in children and adolescents: A systematic review. J Can Dent Assoc [Internet]. 2008 Feb [cited 2025 Feb 02]; Vol 74(1):76-7. Available from: https://www.cda-adc.ca/jcda/vol-74/issue-1/73.pdf

Lalwani P, Jangade M, Chhajed N, Nayak P. Evaluating the effectiveness of different fluoride treatments in preventing tooth decay: A community-based observational study. Int J Acad Med Pharm [Internet]. 2024 [cited 2025 Jan 18]. Available from: https://academicmed.org/Uploads/Volume6Issue1/52.%20%5B2305.%20JAMP_Moha%20Ali%5D%20263-266.pdf.

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Nassar Y, Brizuela M. The Role of Fluoride on Caries Prevention [Internet] 2023 March 13 [cited Feb 2 2025] Available from: https://www.ncbi.nlm.nih.gov/books/NBK587342/?report=reader#_NBK587342_pubdet_

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Walsh T, Worthington HV, Glenny AM, Marinho VCC, Jeroncic A. Fluoride toothpastes of different concentrations for preventing dental caries [Internet]. 2019 March 4[cited 2025 Feb 1]. Available from: **https://pmc.ncbi.nlm.nih.gov/articles/PMC6398117/pdf/CD007868.pdf**

Student Names: _____

PICO ASSIGNMENT RUBRIC PART B

PART B	Value	Grade
1. Title page	1	
2. Based on the research, writes a paper outlining the answer to your PICO question.		
a. An **introduction** is included which contains:		
– An engaging topic sentence	1	
– A clear and concise thesis statement	2	
– The topic introduced in a concise and engaging manner	2	
– Background about the topic is provided	2	
b. Body **paragraphs** (3 or more) include:		
– A topic sentence for each paragraph	3	
– Information included in each paragraph relates to the thesis and the main idea(s) of the paragraph/no repetition of ideas or concepts	5	
– Incorporates significant findings from each research article, ensuring no new information is introduced	5	
– Relevant, current, accurate and adequate supporting evidence for each main idea	5	
c. Conclusion is included which:		
– Brings closure to the entire paper	1	
– Communicates why the paper was meaningful or useful	1	
– Synthesizes main points (rather than just repeating them) -	1	
– Includes no new information	1	
– Provides clear recommendations using EBDM	1	
– Demonstrates integrity (i.e., claims accurately reflect what is communicated in the body; does not exaggerate claims)	1	
d. PICO **Summary**		
– Writes out the PICO question by including all elements	1	
– Briefly discusses conclusions drawn from the research	2	
– Summarizes the recommendations made to the client.	2	
e. Mechanics		
– Free of grammatical errors	2	
– Transitions that connect ideas	2	
– Use of CADH Vancouver Citation Style		
▪ Reference page is submitted	1	
▪ Appropriate use of in-text referencing	2	
▪ Appropriately formatted reference page	1	
TOTAL	**45**	
Value to Grade (15%):		
Peer Assessment (5%):		
Part B and Peer Assessment Total Grade (20%):		

PICO ASSIGNMENT RUBRIC PART B

Student Names: Nikita, Vishav, Sarah, Nina,Indhira, Tuyen

PART B	Value	Grade
1. Title page	1	1
2. Based on the research, writes a paper outlining the answer to your PICO question.		
a. An introduction is included which contains:		
○ An engaging topic sentence	1	1
○ A clear and concise thesis statement	2	2
○ The topic introduced in a concise and engaging manner	2	1.5
○ Background about the topic is provided	2	1
b. Body paragraphs (3 or more) include:		
○ A topic sentence for each paragraph	3	3
○ Information included in each paragraph relates to the thesis and the main idea(s) of the paragraph/no repetition of ideas or concepts	5	5
○ Incorporates significant findings from each research article, ensuring no new information is introduced	5	4
○ Relevant, current, accurate and adequate supporting evidence for each main idea	5	3
c. Conclusion is included which:		
○ Brings closure to the entire paper	1	1
○ Communicates why the paper was meaningful or useful	1	1
○ Synthesizes main points (rather than just repeating them) -	1	1
○ Includes no new information	1	1
○ Provides clear recommendations using EBDM	1	1
○ Demonstrates integrity (i.e., claims accurately reflect what is communicated in the body; does not exaggerate claims)	1	1
d. PICO Summary		
○ Writes out the PICO question by including all elements	1	1
○ Briefly discusses conclusions drawn from the research	2	1
○ Summarizes the recommendations made to the client.	2	2
e. Mechanics		
○ Free of grammatical errors	2	2
○ Transitions that connect ideas	2	2
○ Use of CADH Vancouver Citation Style		
• Reference page is submitted	1	1
• Appropriate use of in-text referencing	2	1
• Appropriately formatted reference page	1	0.5
TOTAL	45	38
Value to Grade (15%):		84%
Peer Assessment (5%):		100%
Part B and Peer Assessment Total Grade (20%):		88%

Comments: Great work and research done. Areas of improvement: Need more background information and detail in introduction. It was concise but oversimplified. Many of your sources are dated, there are more recent articles on this topic. Question 2 of PICO summary form needs citations for your claims. Your paper and your summary recommendations don't quite match up - ensure that what you're recommending is evidenced based (i.e. where did it say that 6 months varnish will help?). Reference page should be in alphabetical order. Happy to see you all worked well together. HR