HELICOPTER MOM 3B-5

Evidence Based Dentistry Rounds
Specialist: Dr. Okunseri

D4 Luke Bjorklund
D3 Caroline Lynch
D2 David Donoso
D1 Dana Elchami

“Daisy”

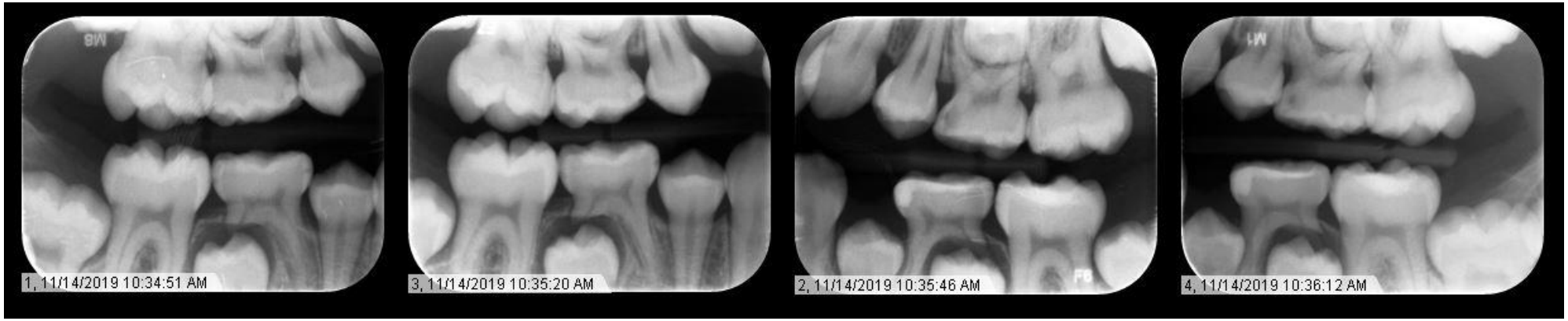
- Pt is healthy 13-year-old Caucasian female from a rural area.
- CC “ I have cavities that hurt when I drink cold water”
- Pt has parents with joint custody. Mother believes that fluoride causes systemic disease if introduced into the body. Mother lives on a farm with well water. Although the mother encourages proper brushing and flossing, she only buys “natural” fluoride free tooth-paste. Father allows mother to make these decisions.
- Patients info has been deidentified through presentation

Health History

- Patient takes no medications
- Patient has no diseases.
- Patient is healthy and active in sports.
- Patient has an allergy to amoxicillin and pomegranate. (Causes hives and itching),

Dental History

- History of multiple caries as a child.
- Pt regularly brushes and flosses.
- Pt has limited sugar intake.
- Pt enjoys the dentist, and she is pleasant to work with.



RADIOGRAPHS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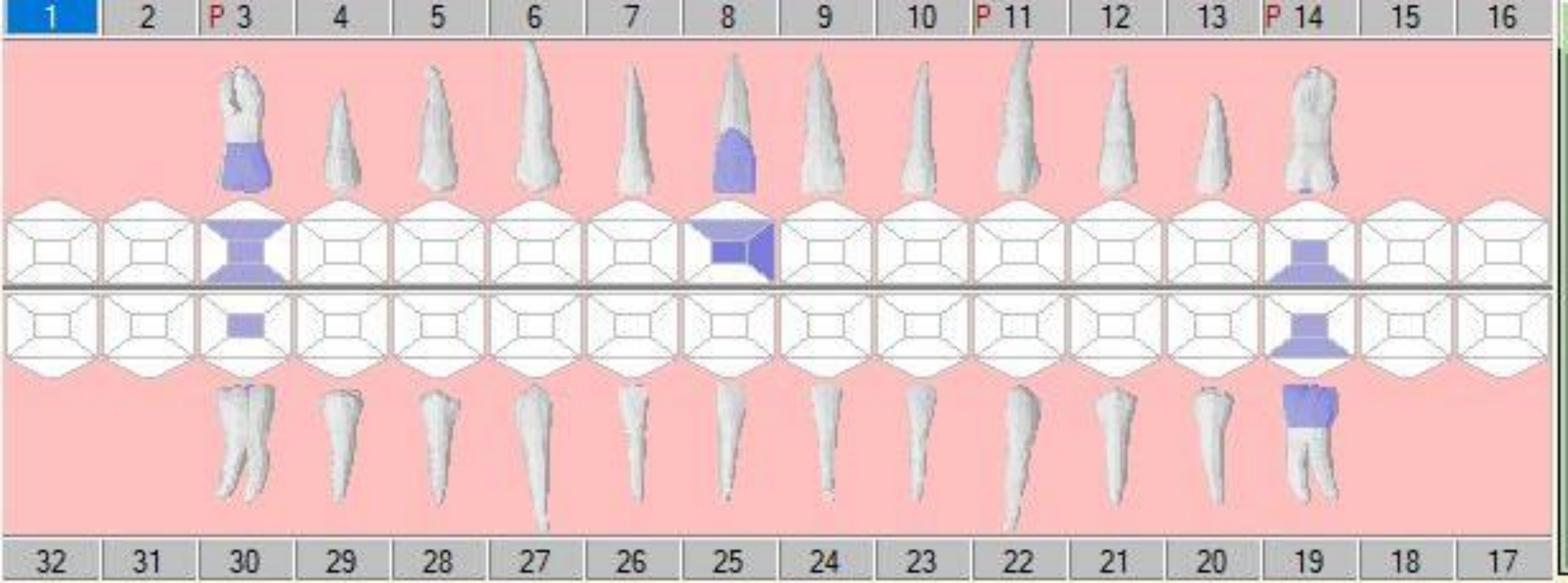
Radiographic Findings

- Mixed Dentition
- Caries
- Multiple Restorations
- Anterior Crowding

CLINICAL FINDINGS

Decay
#3 BOL,
#8 MIF,
#13 OL,
#19OB,
and #30 O



SPECIFIC FINDINGS

White spot lesions present on multiple surfaces.

MGJ			5	5	5	4	4	4	4	4	4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	
CAL			3	3	3	2	2	2	2	2	2		2	2	2	2	2	2	2	2	2	2	2	4	2	2	2	2	2	2	4	3	3	
P.D.			3	3	3	2	2	2	2	2	2		2	2	2	2	2	2	2	2	2	2	2	4	2	2	2	2	2	2	4	3	3	
FGM			0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	1	2	3			4			5			6			7			8			9			10			11			12			13			14			15	16
FGM			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
P.D.			4	2	3	3	2	3	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3	3	3	3	3	2	2	2	3	2	3		
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MGJ																																						
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CAL			3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	1	2	2	1	2	2	1	2	2	2	2	2	2	
P.D.			3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	1	2	2	1	2	2	1	2	2	2	2	2	2	
FGM			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	32	31	30			29			28			27			26			25			24			23			22			21			20			19			18	17
FGM			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
P.D.			3	3	2	3	2	3	2	1	2	2	1	2	2	1	2	2	1	2	2	1	2	2	1	2	2	1	2	2	2	2	3	2	3	2	2	2	

PERIO CHARTING

DIAGNOSIS GINGIVIS

Problem List

- Past decay
- Anterior crowding
- INADEQUATE FLUORIDE
- Strong willed Mom?

Where do we get fluoride and what delivery methods are available in dentistry?

- Fluoride is a necessary supplement in dentistry as it has proven to have numerous benefits in **preventative dentistry**
- Some of its benefits include:

➢ *promotion of remineralization of enamel*

➢ *inhibition of glycolysis and demineralization due to cariogenic bacteria*

- While there are several available fluoride delivery methods available in dentistry, fluoride varnish and community water fluoridation appear to be of critical importance given their effectiveness and efficiency
- CWF and FV are necessary not only because they have proven to reduce caries, but also because they are easy to use when working with difficult patients, such as children, and patients from low socioeconomic backgrounds

Where do we get fluoride and what delivery methods are available in dentistry?

Community Water Fluoridation

- is considered the most efficient way to prevent tooth decay
- cost effective: according to the ADA, "for most cities, every $1 invested in water fluoridation saves $38 in dental treatment costs"
- prevents at least 25% of tooth decay in children and adults

We can assume the same logic when talking about CWF

Fluoride Varnish

- requires less chairside time and prevents gagging since it does not require a mouth tray for delivery
- comes in a variety of flavors, and is only required in small amounts since it is highly concentrated
- can be billed by Medicaid

Role of fluoride varnish in preventing early childhood caries: A systematic review

Poulami Mishra,[1] Nusrath Fareed,[1] Hemant Battur,[1] Sanjeev Khanagar,[1] Manohar A. Bhat,[1] and Jagan Palaniswamy[1]

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fluoride varnishes have not been reported in any of the trials/studies. Fluoride varnishes have been used at concentrations of 1% and 5% for the prevention of ECC. The preventive fraction for 1% fluoride varnish ranged from 6.4% to 30% (on the basis of two studies only) and for 5% fluoride varnish it ranged from 5% to 63%. The preventive fraction was influenced by the frequency of application, the duration of study and

Fluoride Varnish and Dental Caries in Preschoolers: A Systematic Review and Meta-Analysis

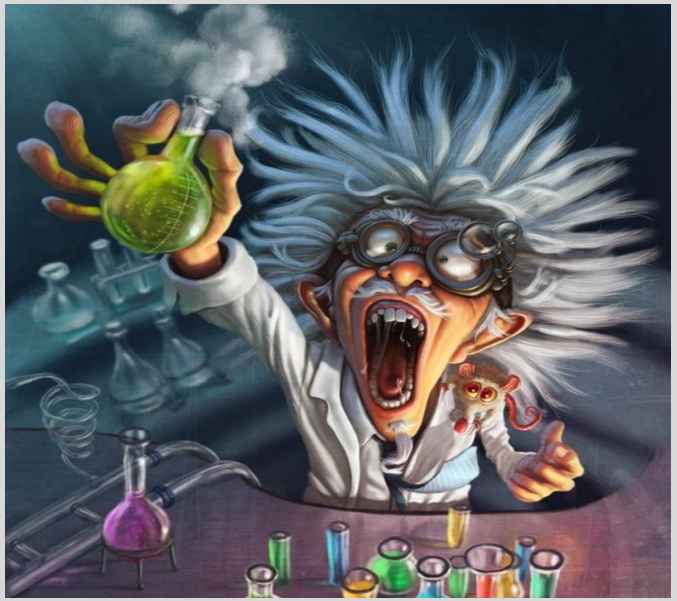
de Sousa F.S.O.[a] · dos Santos A.P.P.[a] · Nadanovsky P.[b,c] · Hujoel P.[d,e] · Cunha-Cruz J.[d,f] · de Oliveira B.H.[a]

In the present review, a large number of the children developed new dentine caries lesions, regardless of FV use. The cause of dental caries, and of the increase in caries with age, is the excessive exposure to sugar, not the lack of fluoride exposure [Sheiham and James, 2015; Simón-Soro and Mira, 2015]. Sugar reduction is urgently needed as fluoride does not halt caries when sugar intake is high (≥10%) [Sheiham and James, 2014, 2015]. Our study highlighted that increasing the exposure to professionally applied fluoride through varnish made hardly any difference for the risk of developing new caries in children.

D2 Question: How does Fluoride affect the enamel structure?

- **Enamel:** A highly mineralized acellular tissue in which microscopic calcium phosphate crystals comprise some 99% of the dry weight [1]
  - **Mineral**: a solid inorganic compound of natural occurrence (many different definitions but this one is most appropriate)
    - Recall that in general, the molecular structure of minerals are crystalline
- There are four closely related of apatite crystals which constitute the vast majority of enamel structure [1]
  - Hydroxyapatite (HAP)
  - Carbonated Hydroxyapatite (CHAP)
  - Fluorhydroxapatite
  - Fluorapatite
- In simple terms we can think of enamel as a mass primarily composed of four different salts that exist in solution (our saliva) inside the oral cavity
- The pH of the solution (saliva) varies between acidic (lower pH) or alkaline (higher pH)

Let's think about chemistry now...



Le Chatelier's Principle: If a system in dynamic equilibrium is disturbed by changing the conditions the position of the equilibrium moves to counteract the change [2].

- In a more acidic environment enamel is more soluble and therefore the disassociated state (the products side of the reaction) is more prominent.
- If we disturb the system by adding fluoride ion (F^-) to the acidic oral environment, then we are adding more F^- to the product and therefore the reaction will move to the left (the reactants side) which is the process of enamel remineralization.

$$Ca_{10}(PO_4)_6(OH)F \rightleftharpoons 10\ Ca^{2+}\ 6PO_4^{3-} + OH^- + F^-$$

$$Ca_{10}(PO_4)_6(OH)F \leftarrow 10\ Ca^{2+}\ 6PO_4^{3-} + OH^- + F$$

- If we disturb the system by removing fluoride ion (F^-) from the acidic oral environment, then in effect, we are taking away some of the F^- from the product side thereby driving the reaction to the right (the products side) which is the process of enamel demineralization.

$$Ca_{10}(PO_4)_6(OH)F \rightleftharpoons 10\ Ca^{2+}\ 6PO_4^{3-} + OH^- + F^-$$

$$Ca_{10}(PO_4)_6(OH)F \rightarrow 10\ Ca^{2+}\ 6PO_4^{3-} + OH^- + F^-$$

D3 PICO

- **Clinical Question:**

In adolescent patients, how does reduced fluoride affect caries rates?

PICO Format

P: **Adolescent patients**

I: **Fluoride use/therapy**

C: **No therapy**

O: **Reduced caries incidence rate**

PICO Formatted Question

- **In adolescent patients, does the use of fluoride as compared to no fluoride reduce the caries incidence rate?**

Clinical Bottom Line

- Ample evidence to support that fluoride use in adolescent patients reduces caries incidence

Search Background

- **Date(s) of Search: 10/30, 11/2, 11/4**
- **Database(s) Used: PubMed**
- **Search Strategy/Keywords:**
  - **Fluoride, water fluoridation, fluoridated toothpaste, adolescents, caries incidence**

Search Background

- **MESH terms used:**
  - **Adolescent, dental caries, fluoride, caries control, topical fluoride, fluoridated toothpaste, caries incidence, child**

Article 1 Citation, Introduction

- **Article 1: Fluoride toothpastes of different concentrations for preventing dental caries in children and adolescents**
  - Walsh T, Worthington HV, Glenny AM, Appelbe P, Marinho VC, Shi X. Fluoride toothpastes of different concentrations for preventing dental caries in children and adolescents. Cochrane Database Syst Rev. 2010 Jan 20;(1):CD007868. doi: 10.1002/14651858.CD007868.pub2. Update in: Cochrane Database Syst Rev. 2019 Mar 04;3:CD007868. PMID: 20091655.

- Study Design:
  - Meta analysis which compared 75 RCT studies all relating to effectiveness of fluoridated toothpaste at reducing adolescent/childhood caries

- Study Need / Purpose:
  - Address the question if fluoride truly helps reduce caries in children
  - Specific focus on the effectiveness of fluoride toothpaste in preventing caries

Article 1 Synopsis

- Method
  - Either placebo, fluoridated, or low concentration-fluoride toothpaste was given to children to use for one year
  - Given to children up to the age of 16
  - Followed up in 1 year to assess caries incidence
  - Measured by assessing numbers of decayed/filled surfaces at 1 year follow up

- Results
  - Measured effect was the prevented fraction (PF), the caries increment of the control group minus the caries increment of the treatment group, expressed as a proportion of the caries increment in the control group
  - Fluoridated toothpaste showed lower caries rates but only significantly for fluoride concentrations of 1000 ppm and above
  - The relative caries preventive effects of fluoride toothpastes of different concentrations increase with higher fluoride concentration.
  - Caries preventive effect of fluoride toothpaste increased significantly with higher fluoride concentrations (D(M)FS PF compared to placebo was 23% (95% credible interval (CrI) 19% to 27%) for 1000/1055/1100/1250 parts per million (ppm) concentrations rising to 36% (95% CrI 27% to 44%) for toothpastes with a concentration of 2400/2500/2800 ppm), but concentrations of 440/500/550 ppm and below showed no statistically significant effect when compared to placebo.

Article 1 Synopsis

- Conclusions
  - This review confirms the benefits of using fluoride toothpaste in preventing caries in children and adolescents when compared to placebo
  - There was significantly lower caries incidence in the group with fluoridated toothpaste above 1000ppm
- Limitations
  - Patient home factors → cannot ensure all children brushed equally and twice a day as instructed
  - Certain children more prone to caries → anatomy, appliances, genetic
  - Must be weighed against risk of fluorosis in children under 6
  - Mentions 75 studies used, but not specific number of children per study

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Article 1 Selection

- Applicable to case selection
- Relevance to fluoridation in children
- High level of evidence

Article 2 Citation, Introduction

- Citation: **Fluoride mouthrinses for preventing dental caries in children and adolescents**
  - Marinho VC, Chong LY, Worthington HV, Walsh T. Fluoride mouthrinses for preventing dental caries in children and adolescents. Cochrane Database Syst Rev. 2016 Jul 29;7(7):CD002284. doi: 10.1002/14651858.CD002284.pub2. PMID: 27472005; PMCID: PMC6457869.

- Study Design:
  - Meta analysis evaluating 37 RCT studies involving 15,835 children all of which were relating to effectiveness of fluoridated mouth rinses at reducing adolescent/childhood caries

- Study Need / Purpose:
  - Evaluate the effectiveness of fluoridated mouth rinses at preventing caries in children/adolescents

Article 2 Synopsis

- Method
  - All studies but 2 were conducted at school where children were given daily fluoridated rinses (except weekends)
    - 2 were conducted at home
  - Daily rinse with NaF was given at either 230 or 900ppm
  - Rinse was given to children up to 16 years of age
  - Study duration had to be at least one year
  - Outcome was measured as a caries increment based on the change in number of decayed, missing, and filled surfaces
- Results
  - D(M)FS pooled PF was 27% (95% confidence interval (CI), 23% to 30%; I(2) = 42%) (moderate quality evidence)
  - Supervised regular use of fluoride mouthrinse by children and adolescents is associated with a large reduction in caries increment in permanent teeth
  - Moderate certainty of the size of the effect based on studies

Article 2 Synopsis

- Conclusions
  - This review confirms the benefits of using fluoridated rinses in preventing caries in children and adolescents when compared to placebo
  - However, there were biases/limitations that decreased the confidence in the outcomes

- Limitations
  - 28 studies were listed as being at risk for bias
  - 3 studies incompletely recorded data on tooth staining
  - 1 study incompletely recorded data on mucosal irritation/allergic reaction
  - Unclear how results would translate from school to home setting (patient compliance factors)

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Article 2 Selection

- Applicable to case selection
- Relevance to fluoridation in children
- Moderate level of evidence

Article 3 Citation, Introduction

- Citation: **Prevalence of dental caries and fluoride concentration of drinking water: A systematic review**
  - Goodarzi F, Mahvi AH, Hosseini M, Nodehi RN, Kharazifard MJ, Parvizishad M. Prevalence of dental caries and fluoride concentration of drinking water: A systematic review. Dent Res J (Isfahan). 2017 May-Jun;14(3):163-168. doi: 10.4103/1735-3327.208765. PMID: 28702056; PMCID: PMC5504867.

- Study Design:
  - Systematic review of studies and articles all aimed at assessing fluoride concentrations in water sources and their effect on prevalence of caries

- Study Need / Purpose:
  - to assess the relationship between fluoride concentrations in drinking water and caries levels

Article 3 Synopsis

- Method
  - MEDLINE databased was used with 2 reviewers auditing each source for the inclusion criteria: (1) an original study, (2) studying humans, (3) being related to fluoride in drinking water supplies and dental caries, (4) at least one group of individuals being included in the study, and (5) reporting measurable outcomes in a group accompanied by the amount of fluoride in its drinking water supply
  - Third reviewer then audited results from the studies gathered
  - Results of fluoridated water's effect was measured as # of teeth becoming decayed, missing, and filled (DMFT) was used to classify dental caries. Dental caries was defined in this review as any level more than 0 on DMFT
- Results
  - Group 1 had too much heterogeneity to pool the results together, but group 2 did not so was able to be assessed
  - When grouped within social class, the population receiving >.7ppm fluoridated water had decreased caries prevalence by a margin of about 5% on average

Subgroup number	Fluoride level (ppm)	Social class	Number of studies	I^2*(%)	P**	Pooled estimate ofdental caries prevalence (95% CI)
1	<0.7	High	4	10.8	0.339	70.6% (66.2-75.0)
2	<0.7	Medium	4	9.4	0.346	76.6% (73.9-79.3)
3	<0.7	Low	4	0.0	0.769	78.9% (77.3-80.6)
4	>0.7	High	3	24.9	0.264	65.1% (57.7-72.4)
5	>0.7	Medium	3	24.9	0.264	69.1% (64.4-73.9)
6	>0.7	Low	3	26.1	0.258	69.2% (61.4-77.0)

Article 3 Synopsis

- Conclusions
  - Meta-regression showed tooth type and social class had a significant association with the difference in the prevalence of dental caries
  - These variables were the sources of heterogeneity, and the studies must be grouped and sub-grouped based on these variables
- Limitations
  - A lack of complete analysis in terms of inclusion of all the confounding factors is considered one of the most important shortcomings
  - Too many outside factors/social factors and subgroupings necessary to fully determine the validity of results
  - Too much heterogeneity within the studies

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Article 3 Selection

- Applicable to case selection
- Common source of fluoride not accounted for by patients
- Meta analysis

Levels of Evidence

- [x] **1a** – Clinical Practice Guideline, Meta-Analysis, Systematic Review of Randomized Control Trials (RCTs)
- [ ] **1b** – Individual RCT
- [ ] **2a** – Systematic Review of Cohort Studies
- [ ] **2b** – Individual Cohort Study
- [ ] **3** – Cross-sectional Studies, Ecologic Studies, "Outcomes" Research
- [ ] **4a** – Systematic Review of Case Control Studies
- [ ] **4b** – Individual Case Control Study
- [ ] **5** – Case Series, Case Reports
- [ ] **6** – Expert Opinion without explicit critical appraisal, Narrative Review
- [ ] **7** – Animal Research
- [ ] **8** – In Vitro Research

Double click table to activate check-boxes

Strength of Recommendation Taxonomy (SORT)

☒	**A** – Consistent, good quality patient oriented evidence
☐	**B** – Inconsistent or limited quality patient oriented evidence
☐	**C** – Consensus, disease oriented evidence, usual practice, expert opinion, or case series for studies of diagnosis, treatment, prevention, or screening

Double click table to activate check-boxes

Conclusions: D3

- Very applicable evidence to show patient's parents
  - Articles aid in demonstrating the benefits of fluoride use
  - Discuss all possible fluoride tx modalities
  - Recommendation to D4?
    - Evidence-based patient education
    - If still no results… discuss other caries preventative measures
      - i.e. diet, habits

Conclusion D4

- Fluoride prevents caries.
- A consistent message shared with a parent and child over time is more likely to be successful.
- Someday "Daisy will make her own decisions"
- Dentist must wear many hats.

Psychology of Business

1. Don’t criticize, condemn, or complain
2. Make people feel important with curiosity
3. Appeal to the other person's desires
4. Let the other person talk
5. Find out "Why"

Discussion Question
For patients with low salivary flow due to medications or autoimmune conditions like Sjogrens syndrome, which fluoride treatment regimen is best?
For patients that use vegan toothpastes with no flouride, what are some possible consequences of this?
How much of a negative effect does habitual use of nonfluoridated water have on the longevity of the adult dentition, in patients with good oral hygiene?
What are the risks associated with ingesting too much fluoride?
What are some adversities that public health officials face when considering the provision of a fluoridated water supply?
Does reduced fluoride have a bigger impact on caries rate in adults or adolescents?
What alternatives can be recommended for patients with low fluoride exposure?
Are there any age groups that require more fluoride than others? Would adults require higher levels than children or vice versa?
What additional sources of fluoride are recommended when a patient lives in an area without fluoridated water?
Has fluoride use in adults been proven to work as effectively as it does in children?
What is the correlation between xerostomia and decreased fluoride consumption?
What would be a good method to approach a patient that is apprehensive about the safety of fluoride use?
Has any one source of fluoride i.e. fluoridated water, toothpaste, or varnish proven to be the most critical in caries prevention in children?

DISCUSSION

Thank You

References

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