

At what age should parents start brushing the teeth of young children with fluoridated toothpaste?

An evidence based report

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Abstract

The objective of the evidence based review is to suggest the most appropriate age for parents to start brushing the teeth of their young children using a fluoride dentifrice. The question here was of weighing the benefits of using a fluoride dentifrice against the risks associated with it. The benefits of using fluoride dentifrices are well documented. The risks associated are multiple and need to be brought together to make an effective comparison. Electronic search of various databases yielded 8 studies which looked into the various factors involved in making this decision. The studies considered the risk factors associated. Strict inclusion and exclusion criteria were incorporated in order to keep the report systematic and relevant. The articles obtained were assessed using applicable standard validity checklists to make sure that the best available evidence was used. The results from the articles showed that the question was multifaceted. Different factors such as caries risk, fluoride concentration in the dentifrice, quantity of dentifrice used, incomplete mastery of the swallowing reflex, type of dentifrice, and dentifrice ingestion all had a bearing on this issue. From the studies scored, there was fair to poor evidence to conclude that parents should not use a fluoride dentifrice for their young children before two and a half years of age.

Introduction

Toothpastes are an integral part of oral hygiene maintenance. They are used as aids for cleaning and polishing tooth surfaces as well as vehicles for chemotherapeutic agents such as fluoride ions. Fluoride containing dentifrices have been used in Canada for the past forty years. These dentifrices have a topical effect on teeth and help in reducing the incidence of caries. It is conceivable that part of the toothpaste used is being swallowed. This possibility is especially great in young children. This may lead to adverse effects like fluorosis. So how do parents decide on the type of toothpaste to use for their young children. When is it safe for them to start using fluoridated toothpaste? This review seeks to answer this question. A careful comparison of the benefits to risks needs to be made in deciding on this issue. We decided to concentrate on the age group from birth to five years, when the teeth were most vulnerable to developmental defects. There is exhaustive literature towards this end. There are several studies which study benefits and others, risk factors associated with fluoride dentifrice use in children. For example, one of the studies we reviewed on the beneficial effects of fluoride dentifrices was done by Schwartz (1). He conducted a field trial demonstration in 1997. He showed that using fluoride containing toothpaste (1000 ppm) resulted in 43% less caries incidence in the intervention group as compared to the control group. The risks involved can be broken down into acute and chronic effects. Acute effects are due to ingestion of a large quantity of toothpaste at one time. It is possible that a child eats

a whole tube of toothpaste because she or he likes the flavor. This can lead to fatal results. The other possibility occurs when a child keeps on swallowing small amounts of dentifrice over a period of time, potentially leading to defects like dental fluorosis. Though we have come across anecdotal evidence with regards to acute toxicity, most of the literature deals with the latter. Hence we decided to concentrate on the chronic effects of fluoride dentifrice use by children

Objectives:

The objective of this review is:

1. to assess and determine the proper time to start brushing teeth of young children with fluoride dentifrice.
2. To analyze the benefits and harms of using fluoride dentifrices in this age group (0 to 5 yrs).

Keywords

Fluoridated toothpaste
Preschool children
Fluorosis
Dental fluorosis
Caries prevention
Infants
Toothpaste ingestion
Tooth brushing
Parents and tooth brushing

Methods

Search Strategy

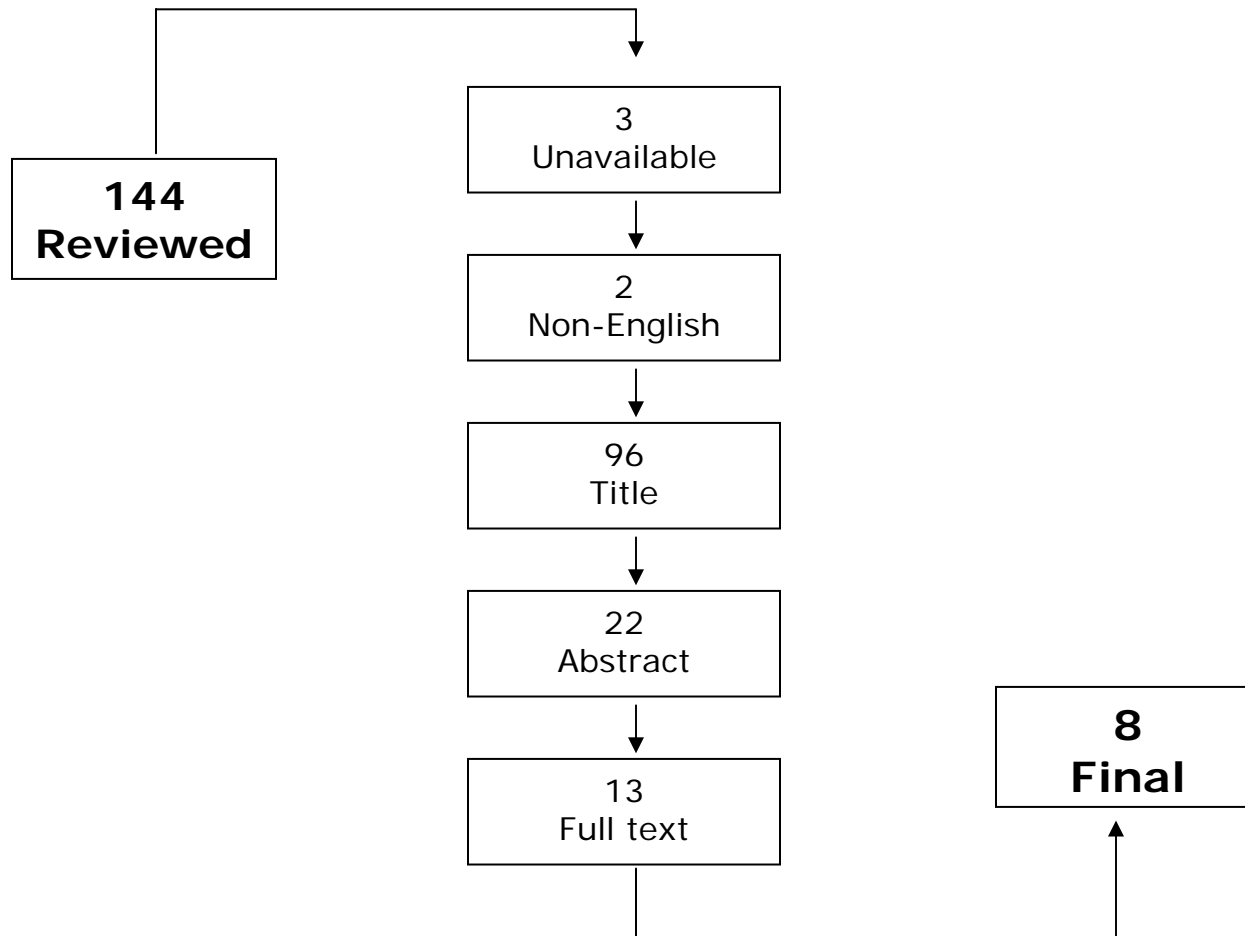
Three main research sources were used to identify useful studies: electronic databases; reference lists from the most relevant articles found via electronic search and colleagues' personal files.

The following electronic databases were scanned in the first step of our search: Pub Med ;Ovid (1966 to present), EBM reviews: Cochran database; EMBASE;AMED;CNAHL and Medline. The searches were limited to human subjects, articles printed in the English and available on-line or in the library of Faculty of Dentistry. Studies conducted on young children (0-5years) were reviewed. Using the keywords mentioned above separately and in various combinations, eliminating duplicates and overlapping the results, we found in electronic databases 44 articles related to our topic.

Search Term	Articles found
Fluoride toothpaste	149
Fluoride	50157
Preschool children	10405
Fluorosis	3719
Dental fluorosis	1067
Caries prevention	1979
Infants	264831
Toothpaste ingestion	9
Tooth brushing	6492
Parents and tooth brushing	282

After combining the various terms and removing duplicates, title and abstract assessment of these articles was done. A subsequent search was undertaken in which the reference lists of the most significant articles were used as an additional source of information. 97 articles were selected from the references and analyzed for their relevance. Three articles from colleagues' file records were also reviewed.

Elimination Process



Determination of Relevance

The whole group reviewed a total of 144 articles for a better selection of the most relevant ones.

An article was considered relevant if it met the following inclusion criteria:

- 1) Studies pertaining to the age group less than 5 years
- 2) Use of fluoridated toothpaste
- 3) Human, in vivo studies
- 4) RCT, cohort, cross-sectional, or case-control studies (strong and/or moderate designs)
- 5) Checklist scores above 50% of the maximum possible
- 6) Available in local holdings

We excluded articles containing information about:

- 1) Usage of systemically or other topical fluoride products in conjunction with toothpaste.
- 2) Oral hygiene programs without quantification of toothpaste used;
- 3) Inconclusive results or contradictory evidences;
- 4) Lack of proper follow-up in studies in which the authors used other studies for baseline information

Validation

Eight articles met all 4 inclusion criteria and these were then scored by two members of the research group according to related checklists to assess evidence of

1. prevalence and incidence
2. Causation
3. Efficacy of therapy or intervention

In cases of scoring discrepancies, the research group met and re-evaluated checklists until a final score was established. The eight articles that remained were used to construct a table of evidence to show the relevant finding in a concise manner (Appendix 3). The highest attainable score was 17.

Discussion

To identify the appropriate age at which parents need to start brushing the teeth of their young children with fluoridated dentifrices we had to take into consideration various influencing factors. The associated risks were evaluated. The eight articles we selected studied these factors.

Risks associated with using a fluoride containing dentifrice:

Concentration of fluoride in the dentifrice: Tavener, Davies et al (appendix 3 ,table 1) demonstrated that a concentration 1450 ppm of fluoride in dentifrices was associated with an increased risk of dental fluorosis of esthetic concern (TF 3) in children. Davies in an earlier study had suggested delaying the use of fluoridated dentifrice until children were 2 ½ years old to reduce the risk of fluorosis while maintaining its major impact on caries in primary molar teeth (2).

Age and Fluorosis: Studies by Franzman et al (4) and Alfonso et al (5) looked into the association of age of children brushing with fluoridated toothpaste and the incidence of fluorosis. Franzman (appendix 3, table 2) found fluorosis to be associated with fluoride intake from dentifrices alone, at 24 months of age. As well, that this was the age at which children swallowed substantial amount of dentifrice. Alfonso (appendix 3, table 3) concluded that a statistically significant correlation was evident between early start of tooth brushing and prevalence of fluorosis ($p < 0.05$). Very young children have been found to be lacking complete mastery of the swallowing reflex. The findings of these two studies corroborated this well known fact. Age of the child was also important because there is a critical stage in the development of a tooth when it is most susceptible to developmental defects. Enamel fluorosis results from exposure to excessive fluoride during enamel formation. The early maturation stage (about 24 months of age) is more critical than early secretory stage with regard to development of fluorosis (5). There is increased risk of developing dental fluorosis with greater use of fluoride dentifrices during the first two years of life. Children brushing with fluoridated dentifrices between ages 6 and 24 months were at 11 times greater risk of developing dental fluorosis than children who did not begin brushing before age of 24 months (5). The duration of exposure to fluoride before the early maturation stage also affects the severity of enamel fluorosis (6).

For maxillary incisors which have the greatest cosmetic importance, the critical age of fluoride ingestion would be between 15 and 24 months for males and between 21 and 30 months of age for females (7). A study by Evans et al(appendix 3, table 4), indicated that there was a eight month window of risk between 20 through 27 months of age during which there was there was a risk of developing fluorosis

in maxillary central incisors. But they pointed out that the greatest risk was during a critical 4 month period around 22 months of age. This was the period when enamel at the incisal region is at the maturation phase (8).

Quantity of dentifrice use and ingestion: It was essential to find a relation between the quantity of dentifrice used and the quantity ingested to establish that increased amounts used during brushing are risk factors for fluorosis. On comparing amount of dentifrice used, rinsing after tooth brushing, variations in ingestion of fluoride dentifrices, Naccache et al (appendix 3, table 5) found a strong correlation between the quantity of dentifrice used and the amount of fluoride ingested as a result of tooth brushing (9). On investigating the amount of fluoride ingested from various sources Martinez et al(appendix 3,table 6) found that in non fluoridated areas, fluoride ingested as a result of fluoride dentifrice use accounted for most of the daily fluoride intake. Factors like frequency of brushing dentifrice brands, quantity of dentifrice used and the amount ingested were calculated. The amount of fluoride ingested 0.18- 0.20 mg/kg/day, was well above the upper limits of proposed safe threshold for fluoride intake, 0.05 – 0.07mg/kg/day. It was noted that children who used “pea size” amount of toothpaste or less did not exceed the recommended threshold for safe fluoride intake (10). The total daily ingestion of fluoride in excess of 0.10mg/kg/day is sufficient to cause dental fluorosis (4, 5, 6). For a 2 year old the amount of fluoride ingested per brushing is 0.40mg and for a 3 year old 0.18mg (11).

Type of dentifrice used: Toothpastes flavored for children have been related to higher ingestion than that of regular toothpastes. Children brushed their teeth for a significantly longer period of time with child dentifrice than with adult dentifrice (12). Levy et al (appendix 3, table 7) found that the quantity of fluoride used was directly proportional to the amount of fluoride ingested and that preschool children used more dentifrice when they brushed their teeth used child dentifrices compared to adult dentifrices (13). Adair et al (appendix 3, table 8), concluded that children tend to use more child dentifrices and brush for longer duration compared to adult dentifrices. The quantity of fluoride ingested was thus proportionally higher.

The results of the studies reiterated what we suspected at the beginning of the review. The benefits of Fluoride dentifrice were there but so were the harms associated if parents were not careful. The ill effects resulted mainly from the ingestion of the toothpaste. It is interesting to note that the maximum risk of adverse outcome of this ingestion was for children in the zero to two and half years age group when the developing permanent teeth, especially anterior teeth, were most vulnerable. Waiting till the age at which a child masters swallowing is an option. This however entails waiting till at least six years and losing on the caries preventive effect on primary teeth. As well, a child may swallow flavored toothpaste if she or he likes it, irrespective of the physiologic development stage.

Limitations:

1. The studies look at fluoride from dentifrice as a causative factor for fluorosis. Hence it is ethically not possible to achieve the highest levels of evidence.
2. For the same reason , in the study by Tavener et al, parents of children were given specific instructions to use pea sized quantities of fluoride and to encourage their children to rinse and spit after brushing. Thus this may not be the representative behavior of children when brushing. As well, the children in the control group were free to use any kind of toothpaste. It is a possibility that some of the children from that group used fluoridated toothpaste. The study was conducted in areas where the water was not fluoridated. So we can expect different results in areas where the water is fluoridated.
3. The studies that dealt with the type and quantity of dentifrice used assumed a directly proportionality between quantity and duration with the amount of toothpaste ingested. This may not necessarily always be true.
4. The children knew they were being observed and that may have altered their behavior.
5. The Canadian Task Force ratings for 3 of the 8 studies was level III. The descriptive study has its weaknesses and thus lowers the validity.

Conclusion

The studies in this review present with insufficient evidence on fluorosis caused by fluoride from dentifrice. The design ratings for 3 of 8 articles was level III. This reduces the validity of the studies. Thus the challenge is to find better study designs while keeping the studies ethical. However when benefits of using fluoride toothpaste are weighed against the possible risks involved, we can make a few recommendations. There are precautions we need to adhere to when introducing them in age group 0 to 5 years. The most important adverse effect occurs from the swallowing of toothpaste by the child. The solution to this dilemma however is not simply waiting for the child to complete its physiologic development. Nor is it advisable to wait till the child is mature enough to understand why she or he should not swallow the toothpaste. The possibility of dental fluorosis can be minimized while still retaining the preventive benefits of fluoridated dentifrice. All primary teeth erupt by the age of two years. The most critical time period for occurrence of developmental defects in permanent teeth, especially anterior teeth is a window around two years. So if the parents start brushing the teeth of their young children after two years, they can minimize the chances of fluorosis while still availing the benefits of fluoride. Also after reviewing the different studies in relation to the use of fluoride dentifrices we recommend that the amount of fluoride dentifrices dispensed must be kept to a minimum (less than “pea size” or even a smear) for young children. The amount of time used for brushing should be monitored and should not exceed more than what is recommended. Children should not brush more than twice daily especially with flavored toothpastes. Children must be encouraged to rinse their mouth and expectorate after brushing their teeth. Dentifrice with lower than conventional

(1000ppm) Fluoride concentration should be evaluated further for use by preschool children. In summary, we conclude that there is fair to poor evidence to suggest that parents should begin to brush the teeth of their young children with fluoridated dentifrice after they are two and half years old.

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Library staff, Faculty of Dentistry, University of Toronto

Appendix 1

Inclusion criteria	Exclusion criteria
Age: 0-5 years	Systemically or topical applications of fluoride products used in conjunction with fluoridated toothpaste
Language: English	Oral hygiene programs without quantification of toothpaste used;
Subject: use of fluoridated toothpaste	Inconclusive results or contradictory evidences;
Local holdings availability	Lack of proper follow-up in studies in which the authors used other studies for
Human subjects	baseline information
In vivo studies	
Strong and moderate designs	
Checklist scores: above 50% from the maximum achievable	

Appendix 2-

Checklists for the critical appraisal of the literature

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Checklist to Assess Evidence of Prevalence and Incidence

(Descriptive or Longitudinal Studies)

Citation: _____

1. Was the study ethical? _____
2. Was the study internally valid? _____

Sampling:

- Was the sampling frame complete, or for longitudinal studies, were all members of the cohort entered at the beginning? _____
- Did the sampling scheme allow a representative sample? _____

Participation:

- Was the response rate 80% or higher, or for longitudinal studies, was

loss to follow-up low - less than 20%? _____

- Was completion rate on individual items of the assessment instrument high? _____

Measurement:

- Did the survey use valid measures of disease (case definition) and risks? _____

- Were the data gathered using the best-accepted techniques?

(e.g., trained telephone interviewers or examiners, mail questionnaire) _____

- Were the data tested for accuracy and reliability? _____

3. Do the findings relate to your population/patients?

- Are the age/sex distributions similar? _____

- Is there evidence of no systematic differences in prevalence

or trends in disease between this group and your patients? _____

- Is there evidence of no systematic differences in important

environmental, behavioral or health care access factors

between this group and your patients? _____

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Checklist to Assess Evidence of Efficacy of Therapy or Prevention

Citation: _____

1. Was the study ethical? _____
2. Was a strong design used to assess efficacy? _____
3. Were outcomes (benefits and harms) validly and reliably measured? _____
4. Were interventions validly and reliably measured? _____
5. What were the results?
 - Was the treatment effect large enough to be clinically important? _____
 - Was the estimate of the treatment effect beyond chance and relatively precise? _____
 - If the findings were “no difference” was the power of the study 80% or better _____
6. Are the results of the study valid?
 - Was the assignment of patients to treatments randomized? _____
 - Were all patients who entered the trial properly accounted for and attributed at its conclusion? _____
 - i) Was loss to follow-up less than 20% and balanced between test and controls _____
 - ii) Were patients analyzed in the groups to which they were randomized? _____

- Was the study of sufficient duration? _____
- Were patients, health workers, and study personnel “blind” to treatment? _____
- Were the groups similar at the start of the trial? _____
- Aside from the experimental intervention, were the groups treated equally? _____
- Was care received outside the study identified and controlled for _____

7. Will the results help in caring for your patients? _____
- Were all clinically important outcomes considered? _____
- Are the likely benefits of treatment worth the potential harms and costs? _____

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Checklist for Assessing Causation

CITATION: _____

Is the etiological agent infectious? If “Yes”, use 5A) test. If “No”, use 5B) tests.

1. Was the study ethical? _____
2. Was a strong design used to assess causation or risk? _____
3. Were cases defined validly and reliably measured? _____
4. Were the risks validly and reliably measured? _____
5. **For diseases with multi-factorial risks, were the risks assessed controlling**
for other factors and was the model’s prediction power strong _____

6. Do the findings meet the tests for causation? (Use either A or B tests)

A) Koch's test for infectious agents

1. Was the organism present in every case? _____
2. Was the organism isolated and grown in a pure culture? _____
3. Was the organism able to produce a specific disease
when inoculated in an animal model? _____
4. Was the same organism recovered from the sick animal? _____

B) Tests for causation of non-infectious agents.

1. Did the "cause" precede the effect? _____
2. Was the estimate of risk beyond chance, and large? _____
3. Was there a dose-response relationship? _____
4. Was reversibility demonstrated? _____
5. Is the "cause" consistently observed in different times, places? _____
6. Is the "cause" biologically plausible? _____
7. Is the "cause" specific to that disease? _____
8. Is the "cause" analogous to another established disease/exposure? _____

Appendix 3

Table 1) Concentration of fluoride in the dentifrice and incidence of fluorosis

Study	Population	Intervention	Control	Outcome	Critical Appraisal	Conclusion, Strength of Evidence, scores
<p>The prevalence and severity of fluorosis and other developmental defects of enamel in children who received free fluoride toothpaste containing either 440ppm or 1450ppm F from the age of 12 months J.A.Tavener, G.M Davies & others. 2004</p>	<p>927 children Age: 8-9 Years</p>	<p>Different Fluoride containing dentifrices</p> <p>2 groups; - 440 ppm - 1450ppm</p> <p>-used from age 12 months to age 5-6 yrs</p>	<p>Non fluoride dentifrices</p>	<p>-No statistically significant differences among the three groups for scores TF 2 or 3.</p> <p>-However all subjects identified with TF 3 had used the 1450 ppm F dentifrice</p>	<p>Weaknesses:</p> <p>-Test group was given instructions to use a pea sized amount of the toothpaste, and specifically spit out the toothpaste after brushing. Though this was necessary to keep the study ethical, it may not be representative what actually happens in case of children using dentifrices.</p> <p>-Control group was not given instructions regarding whether or not to use fluoride. So it is possible that participants from the control group may have used fluoride dentifrices.</p>	<p>Randomized controlled trial</p> <p>CTFPHE scores Level: I Grade: I Score: 11/18 There is a slight increase in the prevalence of TF score 3. Careful targeting and implementation of a program of this type is required to maximize benefits and minimize the risks of fluorosis.</p>

Table 2) Age as a risk indicator for fluorosis: At 24 months: Fluorosis is associated with fluoride intake from dentifrice alone (high swallowing of dentifrice 0.017mg/kg)

Study	Population	Risk factor	Outcome	Critical Appraisal	Conclusion, Strength of Evidence, Scores
<p>Fluoride dentifrice ingestion and fluorosis of permanent incisors</p> <p>Michael R. Franzman, Steven M. Levy et al</p>	<p>343 infants <i>50% boy</i> <i>50% girl</i> <i>Iowa Fluoride Study</i> <i>Followed from Birth to 7-11 yrs</i></p>	<p>Quantity of fluoride ingestion</p> <p>Questionnaires: <i>- Filled by mothers,</i> <i>-At 16, 24 and 36 months,</i></p> <p>Regarding: <i>- Water sources,</i> <i>- Ingestion of water</i> <i>- Other beverages</i> <i>-Food,</i> <i>- Fluoride supplements,</i> <i>-Tooth brushing patterns</i> <i>-Use of fluoride dentifrices</i></p> <p>Assessment: <i>fluorosis(using fluorosis risk index)</i> <i>-one mixed-dentition examination between ages of 7 and 11,for assessing</i></p>	<p>Relationship: <i>-Consistent, positive between ingestion of fluoride dentifrice and fluorosis experience (not statistically significant for all periods of studies)</i></p> <p><i>-At 16months children with/without fluorosis had similar intake of fluoride dentifrice</i></p> <p>-At 24 months: <i>Fluorosis is associated with fluoride intake from dentifrice alone (high swallowing of dentifrice 0.017mg/kg)</i></p> <p><i>-At 36 month intake from dentifrices didn't show significant differences between children with or without fluorosis</i></p>	<p>Strengths: <i>-Large sample</i> <i>-Specific and detailed questionnaire</i> <i>-Strong case definition</i> <i>-Detailed estimates of fluoride intake and its sources</i></p> <p>Weaknesses: <i>-Cohort composed mostly by children from mid-class families, white mothers, well educated parents</i> <i>-Only based on parents reports(biased by recall)</i> <i>-Missing information because not all parents return their questionnaires</i></p>	<p>Cohort study (longitudinal) CTFPHE scores Level: II-2 Grade: I Score: 9/13</p>

Table 3: Age as a risk indicator for fluorosis: Statistically significant correlation between early start of tooth brushing and the prevalence of fluorosis

Study	Population	Risk factor	Outcome	Critical Appraisal	Conclusion, Strength of Evidence, Scores
<p>Association between early use of toothpaste and other variables with dental fluorosis</p> <p>Marilia Alfonso Rabelo Buzalaf et al, 2002</p>	<p>101 children, 12 Yrs 55 Female 46 Male</p>	<p>Age Questionnaires for parents regarding: -socioeconomic levels -use of fluoride supplements -frequency of tooth brushing -type of milk consumed by children</p> <p>Assessment : -caries(WHO) -fluorosis (examining central incisors)</p>	<p>-Statistically significant correlation between early start of tooth brushing and the prevalence of fluorosis (p =0.008)</p>	<p>Strengths: -large sample</p> <p>Weaknesses: -biased by parents recall -lack of measurements regarding water used and its fluoride concentration</p>	<p>Transversal Retrospective Study CTFPHE scores Level :III Grade: I Score: 7/12</p>

Table 4: Age as a risk indicator for fluorosis: A fluoride challenge acting during a critical 4 months period (around 22 months from birth)

Study	Population	Risk factor	Outcome	Critical Appraisal	Conclusion, Strength of Evidence, Scores
<p>An epidemiologic Estimate of the critical period during human maxillary central incisors are most susceptible to fluorosis</p> <p>R.Wendell Evans, John W.Stamm</p>	<p>Study data from school children:</p> <ul style="list-style-type: none"> - Obtaining from Cohort & survey study in 1986 - In Hong Kong - Three Cohorts were selected -Children born in '75,'76and''77, -Totally 576 children 	<p>Age</p> <ul style="list-style-type: none"> - The amount of fluorosis in the selected group -comparing it with the years in which Maxillary incisors were calcifying -Comparing it with the years of downward adjustment of fluoridated water (1975 to 1977) 	<p>The result from the study indicates:</p> <ul style="list-style-type: none"> -Maxillary Central Incisors are more susceptible to Dental Fluorosis <p>-A fluoride challenge acting during a critical 4 months period (around the 22 months from birth)</p>	<p>Strengths:</p> <ul style="list-style-type: none"> -Large sample <p>Weakness:</p> <ul style="list-style-type: none"> -Biased to the portion of enamel studied (the incisal enamel is more susceptible to fluorosis) -No randomization 	<p>Cohort Study</p> <p>CTFPHE scores</p> <p>Level: II-2</p> <p>Grade: I</p> <p>Score: 7/12</p>

Table 5: Quantity of dentifrice ingested: The proportion of dentifrice ingested is inversely proportional to age

Study	Population	Risk factor	Outcome	Critical Appraisal	Conclusion, Strength of Evidence, Scores
<p>Factors Affecting the Ingestion of Fluoride Dentifrice by Children</p> <p>Hermine Naccache, Paul L. Simard et al 1992</p>	<p>405 Children</p> <p>-Age: 2-7years</p> <p>-Quebec city</p>	<p>Fluoride ingestion :</p> <p>-Children brush their teeth</p> <p>- Given specific amount of gel dentifrice</p> <p>- Containing 0.24 % NaF</p> <p>-Wash in portable sink</p> <p>-Measurement of ingested fluoride by subtracting fluoride in sink water from specified amount given to the children</p>	<p>Relationship</p> <p>- The proportion of dentifrice ingested was inversely proportional with age($r=-.46, p<.001$)</p> <p>65% in 2 year old and 34%in 6-7 year old</p>	<p>Strengths:</p> <p>-Large sample</p> <p>-Computerized analysis for process</p> <p>Weaknesses:</p> <p>-Cross sectional</p> <p>-Survey Level of C</p> <p>-A survey from one place at one time</p>	<p>Cross Sectional, Survey</p> <p>CTFPHE scores</p> <p>Level: III</p> <p>Grade : I</p> <p>Score: 7/12</p>

Table 6: Quantity of dentifrice ingested: Fluoride ingested from tooth paste in both cities were above safe threshold

Study	Population	Risk factor	Outcome	Critical Appraisal	Conclusion, Strength of Evidence, Scores
<p>Fluoride intake from foods, beverages and dentifrice by children in Mexico</p> <p>E.Angeles Martinez-Mier et al 2003</p>	<p>42 children,</p> <ul style="list-style-type: none"> -Mexico city orphanages -Without water fluoridation -14 Male - 7 Female -Age: 31.5 month +/_ 8.9 Weight 12.9 +/-3.3 kg <p>Veracruz city Orphanages</p> <ul style="list-style-type: none"> -Without water fluoridation -17 Males - 4 Females - Age:14.1months +/-9.3 -Weight 14.1+/-4.3 kg 	<p>Measurement of fluoride intake:</p> <p>From:</p> <ul style="list-style-type: none"> - Food -beverages -toothpaste - blood samples 	<p>Percentage of total fluoride intake from each source:</p> <ul style="list-style-type: none"> -Food 23% and 31% -Beverages - 5% -toothpaste ingestion 72% and 64% <p>(0.18 to0.2 mg/kg/day)</p> <ul style="list-style-type: none"> - F blood levels similar in both groups <p>Fluoride ingested from tooth paste in both cities were above safe threshold (0.07mg/kg/day)</p>	<p>Strengths:</p> <ul style="list-style-type: none"> - Institutionalized children, so available 24 h for collecting data by researchers -Precise Fluoride measurement <p>Weakness:</p> <ul style="list-style-type: none"> -no randomization of samples -sample size too small -power too low 	<p>Cross-sectional, (descriptive study)</p> <p>CTFPHE scores</p> <p>Level: III</p> <p>Grade: I</p> <p>Score: 8/12</p>

Table 7: Type of dentifrice used: Preschool children used 0.154g more dentifrice when they used a child dentifrice

Study	Population	Intervention	Control	Outcome	Critical Appraisal	Conclusion, Strength of Evidence, Scores
<p>A Pilot study of preschoolers' use of regular-flavored dentifrices and those flavored for children</p> <p>Stephen Levy, Thomas Maurice & others. 1997</p>	29 Preschool Children	Use of child dentifrice	Use of adult dentifrice.	Preschool children used 0.154g more dentifrice when they used a child dentifrice	<p>Weaknesses:</p> <p>-The study assumed that the quantity of fluoride use was directly proportional to the amount of fluoride ingested.</p> <p>-It is possible that in some cases, individuals other than the study children used the study dentifrice intended only for their use.</p> <p>-No mention of who applied the dentifrice to the toothpaste.</p>	<p>Crossover Trial</p> <p>CTFPHE Level: II-1 Grade: I Score: 14/18</p> <p>Preschool children use more dentifrice when they brush with a child dentifrice as compared to an adult dentifrice.</p>

Table 8: Type of dentifrice used: Children used more Child dentifrice, for longer duration as compared to an adult

Study	Population	Intervention	Control	Outcome	Critical Appraisal	Conclusion, Strength of Evidence, Scores
<p>Comparison of the use of a child and an adult dentifrice by a sample of pre school children</p> <p>Steven Adair, Piscitelli & others. 1997</p>	<p>50 children</p> <p>Age: 31 to 60 months.</p>	Use of child dentifrice	Use of adult dentifrice	<p>-Children used more Child dentifrice, for longer duration (0.689 g for 83.56 sec) as compared to an adult dentifrice (0.509g for 57.48sec)</p>	<p>Weaknesses:</p> <p>-The study assumed that the quantity of fluoride use was directly proportional to the amount of fluoride ingested.</p> <p>-The study considered just single brushing sessions. Thus the data was cross- sectional and not representative of the habits of the child</p> <p>The brands tested may have been unfamiliar to a number of participants and thus influenced the amount used.</p> <p>The risk factor was derived empirically(risk factor = quantity of dentifrice x duration of use) for comparing ingestion potential for the child and adult dentifrice.</p>	<p>crossover trial</p> <p>CTFPHE scores</p> <p>Level: II-1</p> <p>Grade: I</p> <p>Score: 13/18</p> <p>Younger children may be exposed to more fluoride for longer periods of time with a child dentifrice. Risk factor of CD (58.54) V/S AD (27.43).</p>

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