Adolescent’s perception of the aesthetic impact of dental fluorosis in areas with and without water fluoridation

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Abstract

Background

The use of fluorides for caries prevention is well established but is linked with an increased risk of dental fluorosis which may be considered to be aesthetically objectionable. Patient opinion should be considered when determining impact on aesthetics. The aim of this study was to assess subject perception of dental aesthetics of 11 and 12 year olds participating in an epidemiological caries and fluorosis survey in fluoridated and non-fluoridated communities in Northern England.

Methods

Consented subjects were invited to rank in order of preference (appearance) a collage of 10 images on a touch-screen laptop. The photographs comprised an assortment of presentations of teeth that included white teeth, a spectrum of developmental defects of enamel and dental caries. Data were captured directly and exported into SPSS for analysis.

Results

Data were available for 1553 subjects. In general, there were no significant differences in the rank positions between the two cities, with the exception of teeth with caries and teeth with large demarcated opacities. Overall, there was a trend for teeth with fluorosis to be more tolerated in the fluoridated community; for TF 1 and TF 2 this preference was significant (p<0.001).
Conclusions

The results of this study suggest teeth that are either very white have the highest preference but teeth with a fluorosis score of TF 1 may not be deemed unattractive to this population and age group. Images depicting teeth with caries or large demarcated opacities were deemed to be the least favoured. Subject preference of images depicting fluorosis falls with increasing severity of fluorosis.
Background

The use of fluorides in dentistry has been associated with a decline in the prevalence of dental caries through the use of optimally fluoridated community water supplies and fluoridated oral care products. However, the presence of multiple vehicles for fluoride delivery has also been associated with concerns regarding increased prevalence of dental fluorosis in both fluoridated and non-fluoridated communities [1-4].

It has been demonstrated that exposure to fluoridated water supplies in addition to the use of fluoridated dentifrices is more effective than the use of fluoridated dentifrice alone in preventing caries [1]. However, the increase in the prevalence of enamel fluorosis has led to concerns over the risk benefit ratio with respect to the use of fluorides to reduce caries and the risk of enamel fluorosis. In the UK, a systematic review commissioned by the government known as the York Report [5] stated the occurrence of fluorosis at water fluoride levels of 1ppm was found to be high (predicted 48%, 95% CI 40 to 57). Of this fluorosis, the proportion considered to be aesthetically objectionable was lower (predicted 12.5%, 95% CI 7.0 to 21.5).

Studies addressing the aesthetic impact had taken place prior to the York Report [6, 7]. Teeth with Thylstrup and Fejerskov (TF) index scores of 3 were identified as eliciting concerns regarding appearance. This was in contrast to mild fluorosis (TF index 1 or 2) [7]. Dental fluorosis was deemed to be perceived as a potential aesthetic problem [6] and despite the increase in prevalence of fluorosis it was not perceived by clinicians to be important to patients in less severe presentations [8]. A recent review of the literature
relating to fluorosis aesthetics and Oral Health Related Quality of Life (OHRQoL) concluded very mild and mild fluorosis was not associated with negative effects on OHRQoL, but more severe presentations of fluorosis was consistently reported less favourably [3].

It is probable there are differences in perception of aesthetics between clinicians and patients [9, 10], but there is inconsistency in the literature with respect to this [6]. However, this does not take into consideration the different social norms and beliefs between the various study populations that could have an impact upon the outcome of perception of aesthetics, nor does it reconcile the desire to record clinically significant or aesthetically objectionable fluorosis with the need to record all forms of fluorosis for epidemiological purposes.

Nevertheless, a report from the Medical Research Council (UK) [11] that followed the York Report added a further qualification on the viewpoint of the aesthetic component of fluorosis by stating:

“Further studies should determine the public’s perception of dental fluorosis with particular attention to the distinction between acceptable and aesthetically unacceptable fluorosis.”
The ability of a group of lay persons to reliably comment upon the aesthetic appearance of fluorosis is difficult to assess. Research had shown agreement between groups that included lay people reduced as the TF score (severity of fluorosis) increased [12].

Studies have highlighted the effects of facial features, viewing distance and tooth morphology and alignment as factors that can influence an individual’s perception of aesthetics [13-15]. The display media employed may also have an effect on a viewer’s capacity to rate images with image magnification, and ambient lighting acting as confounding factors. Whilst standardized techniques can be used to capture images, the decision to capture images of wet or dry teeth will have an effect on the degree of hypomineralization that is recorded.

The aim of this study was to evaluate subject perception of dental aesthetics. The main focus was the perception of aesthetics relating to enamel fluorosis in selected populations residing in fluoridated and non-fluoridated urban communities.

**Methods**

Subjects were males and females aged 11 to 13 who were participating in an epidemiological survey of caries and fluorosis prevalence and severity in an urban population with water fluoridation (Newcastle Upon Tyne, UK) and without (Greater Manchester, UK). Ethical approval was obtained from the University of Manchester Committee on the Ethics of Research on Human Beings (ref: 07952) to include the subject assessment of fluorosis aesthetics. Written informed consent was obtained from
the subjects following an opportunity for parents to object to their child’s participation via a postal return of pre-prepared slips.

**Screening and selection of subjects**

In order to obtain balance between the two cities with respect to social deprivation, schools were initially targeted based upon the percentage Free School Meals Entitlement (%FSME). The %FSME data was obtained through the schools and Local Authorities and has been used as a variable for estimating social deprivation in resource allocation for schools in Northern Ireland [16]. During recruitment the subjects provided postcode details that were used to obtain Index of Multiple Deprivation (IMD) scores. Eligible subjects were required to be lifelong residents in their geographical location (self reported).

**Aesthetics perception assessment**

Recruited subjects were asked to complete a brief computer based assessment of tooth aesthetics. The assessment comprised of a montage of ten images of teeth with a variety of dental conditions which the subjects were asked to rate in order of preference with respect to appearance (Figure 1). The images were computer simulated images with “stencils” of dental conditions overlaid onto a base image of an individual’s teeth. This ensured the size and contour of the teeth as well as the lips and gingival tissues were consistent across the images. Every subject used the same computer to ensure the image size and the viewing distances were consistent for each subject. The ten images are illustrated and described in Figure 1.
The images were loaded into a programme written in Microsoft Visual Studio (Microsoft Corp, Seattle, USA) running on an IBM ThinkPad (Lenovo X60). Each subject was invited to enter their unique subject identifier into the computer which then displayed the ten images in a randomized order on the screen. The subjects were asked to independently rate the images in order of preference by dragging a number between 1 and 10 to the images using a touchscreen pen. The subjects were free to alter their preferences by relocating the numbers between the images. Once the subjects were satisfied with their selection they were asked to save their preferences which downloaded the information to a database and exited the programme in readiness for the next subject.

**Data Management and analysis**

The database was exported to SPSS for analysis. The mean ranks were calculated for each of the images and analysis performed to explore patterns in the data with respect to fluoridation status, deprivation and gender by performing t-tests between data generated between the two cities and non-parametric pairwise comparisons of rankings for the images to explore image preference.

**Results**

In total, data for 1553 subjects were available for analysis. Demographics for the subjects are described in Table 1. Descriptive statistical analysis provided mean image ranks for Newcastle (fluoridated), Manchester (non-fluoridated) and for all subjects and are displayed in Table 2. Overall, subjects expressed the highest preference for very white teeth and teeth Vita shade A1. Images of teeth with caries or large demarcated opacities
demonstrated the least preference. Teeth with a fluorosis severity of TF 1 had an overall rank position of third. However, there was no clear pattern of preference amongst the remaining images with clustering of mean ranks and greater variability. In general, there were no differences in the rank positions between the two cities, with the exception of the rank positions of teeth with caries (Figure 1j) and teeth with large demarcated opacities (Figure 1h) which were ranked 9 and 10 in Newcastle but in Manchester caries and large demarcated opacities were ranked 10 and 9 respectively. Similarly, the rankings of teeth with a chipped incisal edge (Figure 1i) and teeth with fluorosis score TF 2 (Figure 1d) are reversed between the two cities. Comparison of the mean ranks for each image between the two cities revealed significant differences for images of teeth with fluorosis severities TF1 and TF2 (Figure 1c, and 1d respectively). There were also significant differences between the cities for images of teeth with caries and teeth with a chip in the incisal edge. This is also displayed in Table 1. A scatter plot of the mean image ranks for the two cities is illustrated in Figure 2. The scatter plot reveals the differences in mean image ranks for teeth with fluorosis have a lower rank in fluoridated Newcastle than non-fluoridated Manchester i.e. fluorosis appears to be considered more aesthetically acceptable in Newcastle. Caries was preferred less by subjects in Newcastle compared to subjects in Manchester.

To explore the effect of deprivation on aesthetics perception, the mean image ranks for all subjects in the lowest and highest quartiles of deprivation (as determined by Index of Material Deprivation) were compared and shown in Table 2. After performing probability corrections to account for multiple comparisons, significant differences for teeth with
medium demarcated opacities (p=0.001) and teeth with a chip in the incisal edge (p=0.001) were found between subjects from the lowest and highest quartiles of deprivation. A scatter plot of the mean ranks for the images and deprivation is illustrated in Figure 3. The data suggests teeth with a medium demarcated opacity are deemed more acceptable to subjects who are more deprived and teeth with a chip in the incisal edge are deemed more acceptable to less deprived subjects.

There were no significant differences in mean image ranks when looking at data for gender in this population.

A binomial analysis was carried out exploring pair-wise comparisons between each of the images to determine which image was preferred over the other. Selected data from this analysis is displayed in Table 3 for very white teeth and for teeth with a fluorosis score of TF 1. The data clearly illustrates subjects significantly preferred very white teeth compared to all of the other images. When exploring the data for teeth with a fluorosis score of TF 1, subjects did not prefer TF 1 to teeth shade A1 or very white teeth. A majority of subjects preferred TF 1 to teeth with a medium sized demarcated opacity but this preference was not statistically significant (p = 0.182). Teeth with a fluorosis score of TF 1 were significantly preferred over all remaining images.

**Discussion**

The results of this study suggest teeth that are either very white have the highest preference but teeth with a fluorosis score of TF 1 may not be deemed unattractive to this
population and age group. The very white teeth represented an unnatural presentation that could only be achieved by cosmetic procedures. Unsurprisingly, images depicting teeth with caries or large demarcated opacities were deemed to be the least favoured. This is consistent with work on previous work related to dental aesthetics [17, 18]. The remaining images provided an equivocal representation of subject preference. This is not an unusual finding with ranked data where there is a clear separation at extreme ends of the scale for the most and least preferred images and where there remains a central group of images that subjects have no strong preference of one image over another. The finding that teeth with a chip in the incisal edge were deemed more acceptable by subjects who are less deprived is of interest. However, it is difficult to provide a satisfactory explanation for this phenomenon as additional contextual information was not available. For example, it was not known if a subject’s decision was influenced by factors such as the effect routine restorative treatment would have on the appearance of the teeth. Consequently this image was associated with the largest standard deviation of mean rank position i.e. the most uncertainty and variation. It is important to recognize the outcome of this study was to explore subject preference, not to establish a level of aesthetically objectionable fluorosis. However, when considering comparisons between the two cities it is clear when location (fluoridation status) is a factor subjects have more difficulty expressing preference when assessing images with fluorosis severities of TF 1 and TF 2 in terms of preference when compared to TF 3. This might suggest when fluorosis severity reaches threshold of TF 3 subjects more reliably express a lower preference.
It should, however, be stated there are several limitations with the study design and there are issues to be raised from the interpretation of the data. The nature of the study assessment, a brief computer-based questionnaire, is not a novel technique and has been used successfully and reported elsewhere in the literature [13-15]. However the outcomes of the current study were limited to simple ranking data, associated with limitations and difficulties in analysis and interpretation as the numeric output has more limited value in analytical terms. Additional work may be undertaken to examine the use of “ties” between rating and Likert scales – although these approaches also have their limitations.

The subjects who participated in the survey were self-reported lifetime residents of their locality. Therefore this analysis does not take into consideration the aesthetic perceptions of individuals who moved into a particular location. These data suggest subjects who were lifetime residents in a fluoridated region may tolerate or perceive mild levels of fluorosis more favourably than individuals residing in a non-fluoridated area. Is this a phenomenon resulting from social norms and would an individual who moves from a non-fluoridated region into a fluoridated region hold the same views? Similarly, this study has not taken into account possible effects of subject ethnicity on aesthetic perception. Both of these should be considered for future work – perhaps concentrating on smaller subject numbers and a more qualitative approach.

Whilst the remit of this study was to investigate subject perception of tooth aesthetics, particularly fluorosis, it is important the make a distinction between fluorosis prevalence and severity as determined by a dental professional and what is considered to be fluorosis
of aesthetic concern from the perspective of a patient. The latter is an important factor in fully determining the impact of the risk benefit ratio of an intervention such as water fluoridation or the use of fluoridated oral care products. However, it is necessary to consider all presentations of fluorosis from an epidemiological standpoint particularly when identifying trends or changes in fluorosis prevalence and severity. The choice of index employed during the assessment of fluorosis has a bearing on the determination of the prevalence and severity of fluorosis. An index which requires the drying of teeth prior to scoring such as the TF Index will result in the dehydration of hypomineralized enamel and a change in refractive index. Hence minor fluorotic opacities may not be visible when teeth are viewed wet. As a result of this phenomenon the results of this study represent an artificial scenario whereby subjects are being asked to rate preference of teeth viewed as if they had been dried. It would be interesting to note any changes to subject perception if the teeth had been viewed as they would appear wetted by saliva.

In order to control the experimental environment, measures were taken to remove confounding factors. The use of a standardized base image removed the effects of tooth morphology and surrounding facial features that could impact on aesthetic perception. However, this resulted in the subjects being asked to rate only a single presentation of each type of condition. It stands to reason that different presentations of conditions could be rated differently within their classification (e.g. differing presentations of TF 2) or between images of fluorosis and different classifications such as caries or demarcated opacities. The subjects also viewed images at a life size level of magnification and this was consistent throughout the study. It has already been shown in the literature that both
the image magnification, the image viewing distance and the presence of other facial features has an impact of aesthetic perception [15].

**Conclusions**

It is clear from the results of this study that subjects have a preference for white, blemish free teeth, even within this age group many of which are still in the mixed dentition stage. The inference from the data is mild forms of fluorosis (TF 1) do not appear to be associated with aesthetic issues. As fluorosis severity increases, the level of acceptance declines which is in agreement with earlier work [7, 15, 18-20]. However, it is not possible from the outcome of this study to determine a cut off level of fluorosis severity that is considered to be an aesthetic problem.

**List of abbreviations**

- %FSME: percentage free school meal entitlement
- CI: confidence interval
- IMD: Index of Multiple Deprivation
- OHRQoL: oral health related quality of life
- SPSS: Statistical Package for Social Sciences
- TF: Thylstrup & Fejerskov Index
Competing interests

None of the authors are aware of any competing interests in the production of this manuscript.

Authors' contributions

MGM prepared the protocol, conducted the fieldwork, was involved in the analysis of data and wrote the manuscript. RPE inputted into the study design and inputted into the manuscript. NB co-ordinated the study, conducted fieldwork and subject instruction on questionnaire completion. MG conducted the statistical analysis. IAP inputted into study design and manuscript. All authors read and approved the final manuscript.

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References

1. Whelton H, Crowley E, O’Mullane D, Donaldson M, Cronin M, Kelleher V: 
   Dental caries and enamel fluorosis among the fluoridated population in the
   Republic of Ireland and non fluoridated population in Northern Ireland in

2. Whelton H, Crowley E, O’Mullane D, Donaldson M, Kelleher V, Cronin M:
   Dental caries and enamel fluorosis among the fluoridated and non-
   fluoridated populations in the Republic of Ireland in 2002. *Community Dent
   Health* 2004, **21**(1):37-44.

   aesthetic perceptions of dental fluorosis and relationships with psychosocial
   aspects/oral health-related quality of life. *Community Dent Oral Epidemiol*


   University of York, NHS Centre for Reviews and Dissemination (Report 18);
   2000.

6. Lalumandier JA, Rozier RG: Parents' satisfaction with children's tooth color:


Figures

Figure 1. Images selected for study. Note how the images share a common base image with conditions stencilled over

1a: very white teeth; 1b: teeth shade A1; 1c teeth with fluorosis TF1; 1d: teeth with fluorosis TF2; 1e: teeth with fluorosis TF3; 1f: teeth with fluorosis TF4; 1g: teeth with a medium demarcated opacity on one tooth teeth; 1h: teeth with large demarcated opacities on both central incisors; 1i: teeth shade A1 with a chip on incisal edge; 1j: teeth with carious lesion

Figure 2. Mean rank for each image for both cities demonstrating level of agreement of subjects between cities suggesting subjects in Newcastle are more tolerant of milder presentations of fluorosis compared to Manchester

Figure 3. Mean rank for each image (all subjects) for the lowest and highest quintiles of deprivation
Table 1. Subject demographics

<table>
<thead>
<tr>
<th>City</th>
<th>Total Subjects</th>
<th>Males</th>
<th>Females</th>
<th>Mean Age Years (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newcastle</td>
<td>741</td>
<td>367</td>
<td>374</td>
<td>12.66 (0.44)</td>
</tr>
<tr>
<td>Manchester</td>
<td>812</td>
<td>471</td>
<td>341</td>
<td>12.33 (0.65)</td>
</tr>
<tr>
<td></td>
<td>1553</td>
<td>838</td>
<td>715</td>
<td></td>
</tr>
</tbody>
</table>
Table 2. Descriptive analysis: for all subjects, by city and for the lowest and highest quartiles of deprivation

<table>
<thead>
<tr>
<th></th>
<th>Newcastle (N=741) Fluoridated</th>
<th>Manchester (N = 812) Non-fluoridated</th>
<th>Total (1553)</th>
<th>独立样本t检验 (城市间)</th>
<th>Lowest Quintile Deprivation (n = 308)</th>
<th>Highest Quintile Deprivation (n = 325)</th>
<th>独立样本t检验 (剥夺 quintiles)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (S.D.)</td>
<td>Mean (S.D.)</td>
<td>Mean (S.D.)</td>
<td>P值 95% CI</td>
<td>Mean (S.D.)</td>
<td>Mean (S.D.)</td>
<td>P值 95% CI</td>
</tr>
<tr>
<td>Very White Teeth</td>
<td>1.07 (0.452)</td>
<td>1.07 (0.536)</td>
<td>1.07 (0.497)</td>
<td>ns</td>
<td>1.10 (0.689)</td>
<td>1.09 (0.612)</td>
<td>ns</td>
</tr>
<tr>
<td>Vita shade A1</td>
<td>2.32 (0.945)</td>
<td>2.34 (1.031)</td>
<td>2.33 (0.991)</td>
<td>ns</td>
<td>2.38 (1.089)</td>
<td>2.40 (1.006)</td>
<td>ns</td>
</tr>
<tr>
<td>Fluorosis TF1</td>
<td>4.17 (1.529)</td>
<td>4.47 (1.618)</td>
<td>4.33 (1.583)</td>
<td>&lt; 0.001 (-0.451, -0.137)</td>
<td>4.23 (1.556)</td>
<td>4.37 (1.640)</td>
<td>ns</td>
</tr>
<tr>
<td>Medium demarcated opacity</td>
<td>4.55 (1.547)</td>
<td>4.48 (1.665)</td>
<td>4.51 (1.61)</td>
<td>ns</td>
<td>4.21 (1.514)</td>
<td>4.62 (1.705)</td>
<td>0.001 (-0.633, -0.158)</td>
</tr>
<tr>
<td>Fluorosis TF2</td>
<td>5.22 (1.620)</td>
<td>5.54 (1.678)</td>
<td>5.39 (1.658)</td>
<td>&lt; 0.001 (-0.485, -0.156)</td>
<td>5.55 (1.557)</td>
<td>5.36 (1.733)</td>
<td>ns</td>
</tr>
<tr>
<td>Vita A1 chipped incisal edge</td>
<td>5.75 (2.28)</td>
<td>5.43 (2.285)</td>
<td>5.59 (2.287)</td>
<td>&lt; 0.005 (0.01, 0.554)</td>
<td>5.92 (2.365)</td>
<td>5.30 (2.223)</td>
<td>0.001 (0.253, 0.969)</td>
</tr>
<tr>
<td>Fluorosis TF3</td>
<td>6.63 (1.512)</td>
<td>6.81 (1.504)</td>
<td>6.72 (1.51)</td>
<td>ns</td>
<td>6.60 (1.497)</td>
<td>6.77 (1.511)</td>
<td>ns</td>
</tr>
<tr>
<td>Fluorosis TF4</td>
<td>7.92 (1.453)</td>
<td>7.99 (1.639)</td>
<td>7.95 (1.553)</td>
<td>ns</td>
<td>8.02 (1.486)</td>
<td>7.99 (1.476)</td>
<td>ns</td>
</tr>
<tr>
<td>Large demarcated opacity</td>
<td>8.58 (1.395)</td>
<td>8.47 (1.523)</td>
<td>8.52 (1.464)</td>
<td>ns</td>
<td>8.38 (1.513)</td>
<td>8.63 (1.484)</td>
<td>ns</td>
</tr>
<tr>
<td>Teeth with Caries</td>
<td>8.79 (1.614)</td>
<td>8.41 (1.901)</td>
<td>8.59 (1.78)</td>
<td>&lt; 0.001 (0.203, 0.556)</td>
<td>8.61 (1.836)</td>
<td>8.46 (1.855)</td>
<td>ns</td>
</tr>
</tbody>
</table>
Table 3. Binomial pairwise comparisons: depicting image preference for very white teeth and teeth with fluorosis severity TF1 against each image

<table>
<thead>
<tr>
<th></th>
<th>First group</th>
<th>Second group</th>
<th>Asymp. Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very white vs A1</td>
<td>1494</td>
<td>59</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Very white vs TF1</td>
<td>1537</td>
<td>16</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Very white vs Medium DO</td>
<td>1544</td>
<td>9</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Very white vs TF2</td>
<td>1545</td>
<td>8</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Very white vs A1 chip</td>
<td>1549</td>
<td>4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Very white vs TF3</td>
<td>1547</td>
<td>6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Very white vs TF4</td>
<td>1549</td>
<td>4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Very white vs Large DO</td>
<td>1549</td>
<td>4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Very white vs caries</td>
<td>1549</td>
<td>4</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>First group</th>
<th>Second group</th>
<th>Asymp. Sig. (2-tailed)</th>
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</thead>
<tbody>
<tr>
<td>TF1 vs Very white</td>
<td>16</td>
<td>1537</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>TF1 vs A1</td>
<td>182</td>
<td>1371</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>TF1 vs Medium DO</td>
<td>804</td>
<td>749</td>
<td>= 0.171</td>
</tr>
<tr>
<td>TF1 vs TF2</td>
<td>1119</td>
<td>434</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>TF1 vs A1 chip</td>
<td>966</td>
<td>587</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>TF1 vs TF3</td>
<td>1359</td>
<td>194</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>TF1 vs TF4</td>
<td>1459</td>
<td>94</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>TF1 vs Large DO</td>
<td>1484</td>
<td>69</td>
<td>&lt;0.001</td>
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<tr>
<td>TF1 vs caries</td>
<td>1420</td>
<td>133</td>
<td>&lt;0.001</td>
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