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Research Article

Affirmation: Fluoridated Water Reduces Caries in Children

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Abstract

Caries is the most common pathology afflicting modern mankind. Children develop tooth decay in their deciduous teeth and permanent dentition. To reduce prevalence of tooth decay Eu fluoride (1 ppm Fl) in municipal waters is used to minimize development of tooth decay. Few reports record the effect on tooth decay at 0.71 ppm Fluoride in children from 1 to 18 years of age. Using DMFT [Decayed Missing Filled Teeth Index: Total cohort n=1240; non fluoridated areas n=900; fluoridated areas n=340] recent research shows a significant ($p<0.01$ Student-t) reduction in tooth decay in children from 1 to 18 years of age, in areas which have fluoridated water at 0.71 ppm Fl.

Note: One Part Per Million (ppm) = One Milligram Per Liter (mg/L).

Keywords: Caries; Dentistry; Eu fluoride; Fluoride; Osteoporosis; Prophylaxis; Teeth

Introduction

Tooth decay is among the most prevalent of diseases affecting Mankind; tooth caries affects deciduous and permanent dentitions. Dental health is moderated by many factors, including diet, oral hygiene practices and of fluoride in potable water. Ideal fluoride concentration in municipal water for caries prophylaxis termed eu fluoride (1.0 Parts Per Million (ppm)). This level of fluoride prevents early decalcification and encourages re-mineralization by favoring formation of calcium fluor-hydroxyapatite [1]. Fluor-hydroxyapatite resists acid demineralization from stagnant oral bio film, and accordingly reduces the start of initial decay formation [1,2]. Too much fluoride in drinking water (more than 1.2 ppm) can lead to toxicity and a risk of dental fluorosis [2]. Lack of fluoride in drinking water increases the risk of dental caries. In Montreal, Chateauguy and Dorval are the only areas with fluoridated water, each with its' own separate local water works. Montreal is an island surrounded by the Great St Lawrence River. Chateauguay is an off island suburb in the southwest area of Montreal and has its' own separate fluoridated water supply. Eight other districts of Montreal are supplied mainly by Charles-J. Des Baillets and Atwater, which are interconnected with non-fluoridated water systems (Figures 1 and 2) [4].

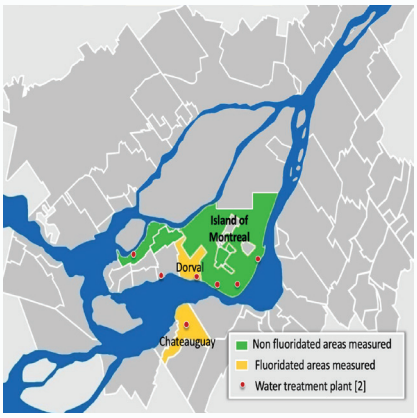

Figure 1: Map of Montreal Quebec, Canada. locations of dorval and chateauguay. Green are non-fluoridated areas, yellow are fluoridated. Dorval and chateauguay have independent water treatment plants [3].

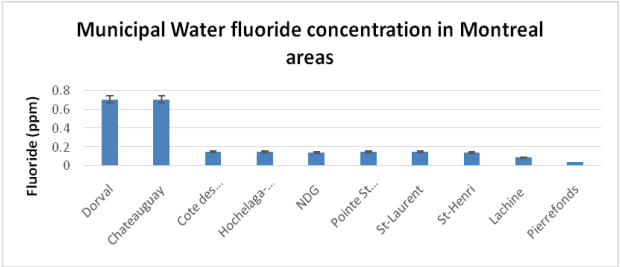

Figure 2: Fluoride content of municipal waters in montreal; Dorval and chateauguay are measured at 0.7 imgF/L, while all the other nine districts are all below 0.2 mgF/L.
Note: The I-bars on the graphs show ± SD's [3].

Aim

This paper appraises and compares the Decayed Missing Filled Teeth (DMFT) indexes from the report [5], all obtained from practicing dentists' charts in 10 Greater Montreal districts; two with fluoridated water (0.71 ppm Fl) and eight other non-fluoridated water (<0.2 ppm Fl).

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Materials and Methods

DMFT (Decay Missing Filled Teeth) indexes were acquired by chance from clinical charts of practitioners (with IRB consent; see below) in 10 districts of Greater Montreal. The DMFT scores were compiled and compared statistically (Student-t, including Bonferroni's modification for multiple variables). Only clinical charts of children up to the age of 18 years were selected. Area matching was done using the patient's postal codes. Charts with postal codes that were not in the practice geographic location, were matched with the group of the patient's district of residence. Two persons un aware of the purpose of this study, (usually the dental hygienist and dental assistant at the source of the charts, were standardized in scoring) were used to avoid inter and intra operator bias. Each person checked the details and accuracy of recorded data. To assess the prevalence of carries at different ages in the children, the cohorts were arbitrarily grouped as 0 to 6 years (Figure 3); 7 to 12 years (Figure 4); and 13 to 18 years (Figure 5). The charts were selected by chance from registered qualified dental practitioners' completed data. Scoring was done by direct, rapid visual access, from records in practices, from all ten GM districts including Dorval and Chateauguay. To ensure a wide sample range of the population of treated patients, the general dental practices were selected arbitrarily, from the ODQ (2008) dentist directory [6].

Statistical Analysis and Results

Number of DMFT's derived from clinical charts: Total cohort n=1240. 0 to 6 years n=290; 7 to 12 years n=300; 13 to 18 years n=310.

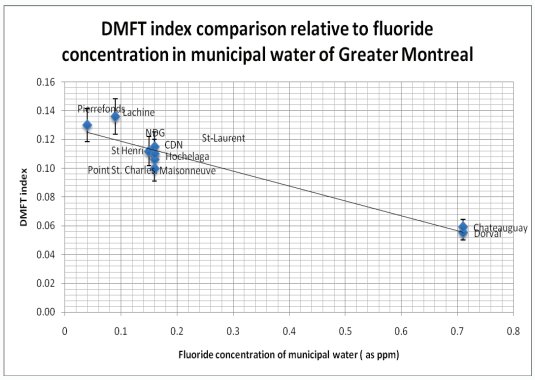

Figure 3: DMFT Scores and Fluoride concentrations in municipal water. Comparisons between fluoridated and non-fluoridated areas. The children's DMFT Indices are significantly (P<0.01) lower in the fluoridated areas [5].

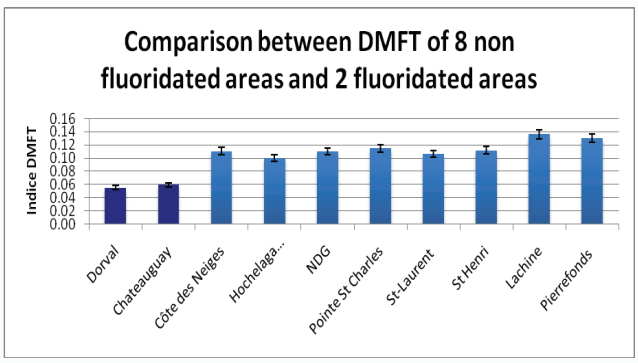

Figure 4: Bar-graph Showing children's DMFT differences between fluoridated areas and Non-fluoridated areas. Navy blue=fluoridated areas; light blue Non-fluoridated areas.
Note: The I-bars on the graphs show ± SD's [5].

Total of non fluoridated areas n=900: Total of fluoridated areas n=340. Comparisons were made using The Student-t paired analysis (including Bonferronis' modification for comparisons of multiple variables) was done between DMFT Dorval and Chateauguay against individually and collectively (pooled) data. Highly significant differences (p<0.01) were consistently revealed (Figures 3-6) [5].

Discussion

Fluoride stops caries by influencing oral microbes, increasing re-calcification of decalcified areas, to form acid resistant calcium fluor-hydroxyapatite [1]. Eufluoride in potable water at 1 ppm, is cariostatic and ideal to arrest decay formation. From Figure 6, fluoride at 0.71 ppm produces a highly significant (p<0.01) reduction of DMFT in Dorval and Chateauguay. This level (0.71 ppm Fl), successfully supplements dietary fluoride intake. Fluorosis (coronal chalky areas, hypoplasia, staining etc. on teeth present) at 0.7 ppm fluoride, no case of clinically diagnosed fluorosis was uncovered or noted among all charts the children's DMFT charts assessed. At 0.71 ppm fluoride in the water supplies, is shown here to be not toxic. All three age groups showed significant decreases in the frequency of tooth decay, [filled and missing teeth (DMFT)], when comparisons of recorded cases from Dorval or Chateauguay, were made against the eight non-fluoridated areas (Figures 3-8).

From Figure 6, it is obvious that omitting fluoride at 0.71 ppm fluoride to municipal water manifests with an increased prevalence of caries. The non-fluoridated communities are very similar in other respects, but have significantly higher (p<0.01) DMFT indexes, when compared to a fluoridated (0.71 ppm) areas in Montreal.

Weaknesses of this study: It was assumed people resident in the respective areas would regularly imbibe the supplied municipal waters and use it for daily sustenance. This would also apply to the children

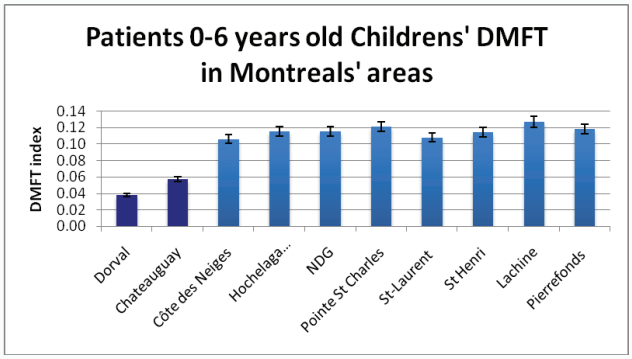

Figure 5A

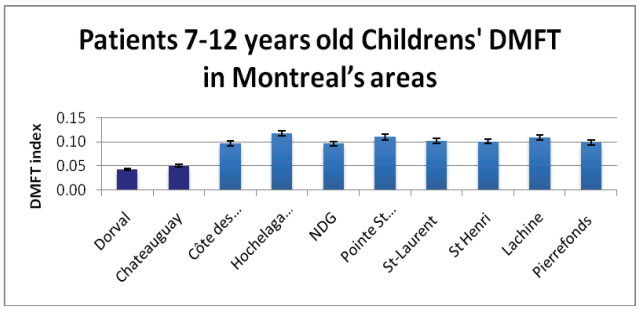

Figure 5B

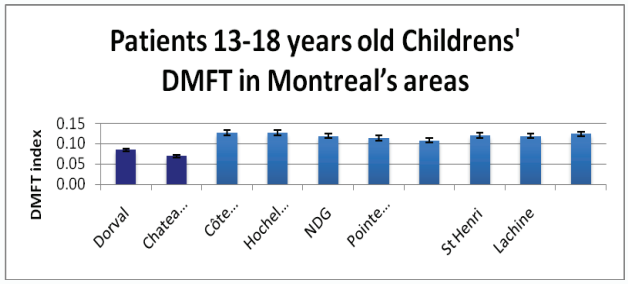

Figure 5C

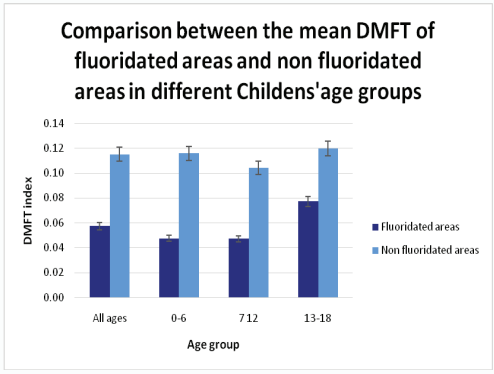

Figure 6: Comparison combined children's DMFT scores derived from Figures 5A-5C above. Note all the DMFT non-fluoridated scores are significantly higher than those in the fluoridated areas.
Note: The I-bars on the graphs show ± SD's [5].

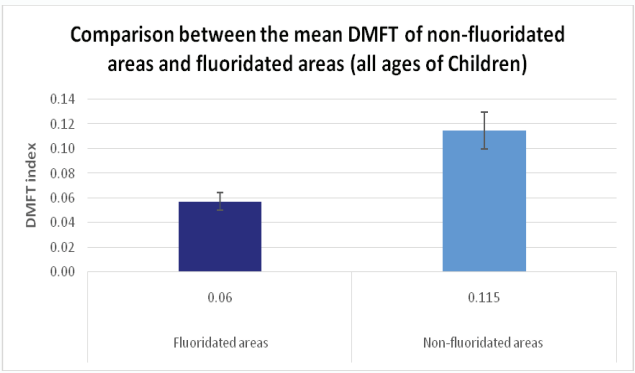

Figure 7: Comparison of means of children's DMFT in all age groups, between the fluoridated (dark navy blue) and non-fluoridated areas, there is a highly significant increase in DMFT scores for non-fluoridated areas (light blue). Note: The I-bars on the graphs show ± SD's [5].
The comparison within all age groups of children in the fluoridated areas revealed no significant difference. See figure 8A and 8B.

residing in the areas since birth. This appraisal does not consider those who consumed only bottled waters. Also no adjustments are made for people who may have relocated into the area and were not residents for the eighteen years chosen for collection of data chance. The DMFT charts based ignored sex, pregnancy or ages after 18 years old. These weaknesses were not considered important confounding factors for this study.

Concluding remarks

Re-affirmation of any scientific hypothesis that leads to a theory is based on producing evidence which is repeatable by objective

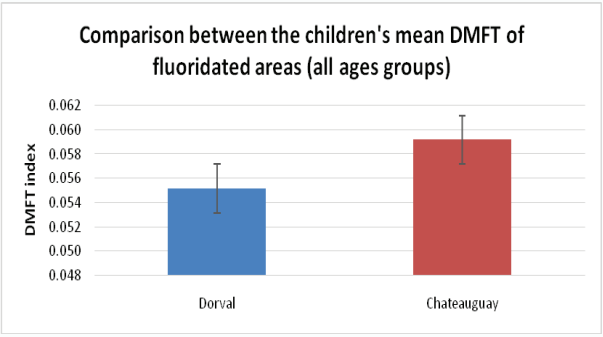

Figure 8A: Mandibular arch showing bilateral missing deciduous teeth.

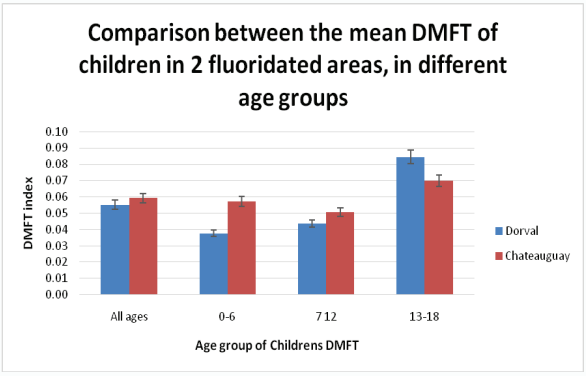

Figure 8B: Comparison of children's DMFT scores within age groups of the children, between the two fluoridated areas. There were no significant differences between these two low scores.
Note: The I-bars on the graphs show ± SD's [5].

investigators. Registered general dental practitioners are obligated to record in detail their findings from patient examinations. Some sources still object to fluoridating municipal drinking water as a method to reduce the prevalence of dental decay [7]. Adding fluoride into potable municipal water at 0.71 ppm Fl concentration, significantly reduces prevalence of decay, without leading to any fluoride toxicity. Opposition claims fluoridated water at any concentration level is causally related to dental fluorosis, bone fractures, skeletal brittleness, endocrine disruption, Intelligence Quotient (IQ) changes, and other abstruse psychological, physiological and neurological effects (e.g. Attention deficiency disorder ADHD, and Alzheimer's disease). The spurious flawed rationale of these criticisms are discussed and debunked elsewhere [2]. Most serious informed world authorities do not agree with the afore mentioned opposition to using fluoridated water to prevent dental decay [1,5,8-10]. The results reported here are highly significant ($p<0.01$) accurate, transparent and reproducible. These findings are consistent and in concordance with conclusions reported by Department of Health and Human Services Federal Panel on Community Water Fluoridation, U.S. Public Health Services [2]. These reported data supports the theory that fluoridation of municipal supplied water significantly reduces tooth-decay in children.

Conclusion

These results reaffirm that potable municipal water, [fluoridated at 0.71 ppm] is an effective, if not essential, desirable, responsible and successful method of improving dental health by reducing the prevalence of tooth decay.

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