International symposium on reduction of salt and sugar in food

Sugar intake and dental caries

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Dental caries (tooth decay)

One of the most common chronic diseases globally and also in Hong Kong

Half of the older kindergarten children have untreated decayed teeth

One third of the middle aged and half of the elders have untreated decayed teeth
Cause of dental caries (decay)

Plaque bacteria + sugar $\rightarrow$ acid

Acid dissolves tooth $\rightarrow$ decay
Plaque pH change after sugar intake

10% Sucrose Rinse

Critical pH
Dissolution of tooth tissues (early caries)

\[ 8H^+ + Ca_{10}(PO_4)_6OH_2 \xrightarrow{\text{demineralization}} 6(HPO_4)^{2-} + 10Ca^{++} + 2H_2O \]

Undersaturated conditions in oral fluids
Different sugars cause different plaque pH change after intake

Sucrose > monosaccharides >> polysaccharides
Sugar and dental caries

Dental caries occurs on tooth surface.
Harm of sugar on tooth depends on:

- how much sugar stays on tooth surface
- how long it stays on tooth surface
- type of sugar
- form (sticky or not)
- mode of consumption
- frequency and time of intake
Systematic review


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**Sucrose and dental caries: a review of the evidence**

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**Summary**

The aim of this study was to conduct a review of the literature to assess the relationship between quantity and pattern of sucrose use and dental caries. Using hand and electronic methods (MEDLINE, EMBASE) the literature was searched for epidemiological papers concerning any relationship of sugars and dental caries published since 1856. Superficial hand searching was carried out between 1856 and 1940, detailed hand searching 1940-1966 and electronic 1966-2007. Selection criteria were set based on, but not confined to, Cochran style standards. Investigations were categorized as A, fulfilling all criteria; B1, relevant fulfilling 19 of 23 criteria; B2, relevant but fulfilling only 12 and 18 of the selection criteria; C, all other papers. There were 95 papers meeting most (more than 12) or all of the selected criteria. Only 1 paper was graded A; 31 as B1. There were in addition some 65 as B2 and all the rest as C, which were discarded. There were a wide variety of study designs and those graded A or B1 comprised 23 ecological cross-sectional, 7 cohort and 2 case control studies. Summary results showed that 6 papers found a positive, significant relationship of sugar quantity to dental caries, 19 of 31 studies reported a significant relationship of sugar frequency of use to dental caries. The balance of studies does not demonstrate a relationship between sugar quantity, but a moderately significant relationship of sugar frequency to dental caries.

**Keywords:** Dental caries, sugar.

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**Introduction**

The sweet taste is inherent in humans, and for centuries the main sweetener available was honey; sugar from sugar cane first showed experimentally the relationship of refined carbohydrates to caries, as the acidogenic theory, but in fact concentrated his work on potatoes. Since then, some authors have placed great importance on the role of sucrose in the caries process, including recommended the free...
Materials & method of the review

• systematic search of papers published in 1856 - 2007
• read by 2 researchers
• quality of papers assessed
• 95 papers retrieved
• only 31 papers were of sufficient quality and finally assessed
Main results of the review

Total consumption and caries
- Significant relationship – 6 papers
- No significant relationship – 9 papers

Frequency of consumption and caries
- Significant relationship – 19 papers
- No significant relationship – 12 papers
Authors’ conclusions

• No reliable relationship between quantity of sugar consumed and dental caries

• Significant relationship between frequency of sugar intake and dental caries
Systematic review


Obesity and dental caries in children: a systematic review and meta-analysis


Abstract — Objective: Obesity and dental caries have become increasingly prevalent challenges to public health. Research into the relationship between obesity and dental caries in children has been mixed and inconclusive. The aim of this review and meta-analysis was to provide evidence to quantify the relationship between obesity and dental caries in children using a systematic approach. Methods: A systematic search for papers between 1980 and 2010 addressing childhood obesity and dental caries was conducted and a random-effects model meta-analysis applied. Results: Twenty papers met the selection criteria. Overall, a significant relationship between childhood obesity and dental caries (effect size = 0.164, 95% CI: 0.13–0.19) was found. When analysed by dentition type (primary versus permanent), there was a non-significant association of obesity and dental caries in permanent and primary dentitions; yet, on accounting only for standardized definitions for assessment of child obesity using body mass index, a strong significant relationship was evident in children with permanent dentitions. Moderating for study country of origin (newly industrialized versus industrialized) showed a significant relationship between obesity and dental caries in children from industrialized but not newly industrialized countries. Cohorts such as age and socioeconomic class were significant moderators. Conclusion: Future analysis should investigate these confounding variables, helping shape the future of obesity management programmes and oral health interventions through determining common risk factors.

Childhood obesity has become a global health problem and is associated with precursors of adult illnesses (including cardiovascular disease) and although limited, there is evidence to suggest that the problem extends beyond the periurban of the developed world into some developing countries.
Materials & method of the review

• systematic search of papers published in 1980 - 2010
• read by 3 researchers
• quality of papers assessed
• 38 papers retrieved
• only 14 papers met inclusion criteria and included in the meta-analysis
• BMI used for categorization, “obese” vs “normal” (“underweight” not included)
Main results of the review

BMI category and dental caries

- significant for permanent teeth
- not significant for primary teeth
- overall significant (positive association)
Main results of the review

Moderating factors

• significant (positive) relationship found in children from industrialized but not newly industrialized countries

• age of children

• socioeconomic class
Authors’ conclusion and recommendation

• Positive association between obesity and dental caries in permanent teeth

• Use a common risk factor approach to promote healthy eating to prevent obesity and dental caries
**Effect on Caries of Restricting Sugars Intake: Systematic Review to Inform WHO Guidelines**

**INTRODUCTION**

Historically, numerous independent expert and consensus reports have concluded that sugars are the most important dietary factor in the development of dental caries (Sheihah, 2001; WHO/FAO, 2003). However, recommendations have not yet been developed through systematic review of the evidence.

In 2010, the World Health Organization (WHO) launched a Guideline Development Process defining a protocol for the process of revising and issuing dietary recommendations for populations (WHO, 2010). To update the recommendations for sugars through this process, WHO commissioned a systematic literature review. The objectives were to systematically review all available published data relating to the amount of sugars consumption and levels of dental caries and to report the findings for both adults and children. The WHO guideline development group formulated questions relating to the effects of sugars on dental caries (Table 1). These questions pertained to whether increasing or decreasing the amount of sugars intake affected measures of dental caries and whether the evidence supports a threshold for intake.

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**ABSTRACT**

A systematic review of studies in humans was conducted to update evidence on the association between the amount of sugars intake and dental caries and on the effect of restricting sugars intake to < 10% and < 5% energy (E) on caries to inform the updating of World Health Organization guidelines on sugars consumption. Data sources included MEDLINE, EMBASE, Cochrane Database, Cochrane Central Register of Controlled Trials, Latin American and Caribbean Health Sciences, China National Knowledge Infrastructure, Wanfang, and South African Department of Health. Eligible studies reported the absolute amount of sugars and dental caries, measured as prevalence, incidence, or severity. The review was conducted and reported in accordance with the PRISMA statement, and the evidence was assessed according to GRADE.

**CLINICAL REVIEW**

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Materials & method of the review

- papers published in 1950 - 2011
- read by 2 researchers
- quality of papers assessed
- 116 papers retrieved
- 55 studies (65 papers) were finally included
  - 3 intervention studies
  - 8 cohort studies
  - 20 population studies
  - 24 cross-sectional studies
Main results of the review

• 7 out of the 8 cohort studies reported higher dental caries with higher sugar intake

• 18 out of the 20 population studies showed a positive association between dental caries and sugar intake

• 5/5 cohort and 9/10 population studies found higher dental caries when sugar intake accounted for >10% of energy intake
Authors’ conclusion

• Consistent evidence of moderate quality supporting a relationship between amount of sugar consumed and dental caries

• Evidence of moderate quality showing that dental caries is lower when free-sugar intake is <10% energy

• May be benefit in limiting sugar intake to <5% energy
Tooth friendly food

Snacks that do not lower pH of plaque below 5.7 for up to 30 minutes after consumption
FDI  World Dental Federation  
policy statement on sugar substitutes

• many sugar substitutes are non-cariogenic

• when sugars are replaced with sugar substitutes in foods and drinks, risk of dental caries is reduced

• when used in confectionary and chewing gum, risk of dental caries is reduced