

# The impact of salivary mutans streptococci and sugar consumption on caries experience in 6-year olds and 12-year olds in Riga

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## SUMMARY

**Objective.** To assess possible relationship between caries experience, salivary cariogenic microflora and free sugar consumption in 6 year and 12 year old children in Riga, to evaluate these variables in risk assessment.

**Materials and methods.** 79 children aged 6 and 96 children aged 12 were examined clinically and by bitewing X-ray for caries diagnosis. Also all children or their parents were questioned about number of tea spoons containing sugar used per cup and frequency of cups used daily. Salivary mutans streptococci (MS) and lactobacilli (LB) (CRT-bacteria; Ivoclar; Vivadent; Liechtenstein) were determined only for children with dmft/DMFT > 4: 27.8% at the age of 6, 40.6% at the age of 12. All data were statistically analyzed using frequency tables and analysis of variance. Statistical significance of differences in proportions was tested using chi-square test, Analysis included evaluation of how changes in variables such as free sugar consumption affects caries in particular age group.

**Results.** Mean number of tea spoons containing sugar used per cup was 1.47 in 6 year olds and 1.86 in 12 year olds, but daily amount of tea spoons containing sugar was 2.71 and 4.36 in each age group accordingly. Tea spoons of sugar per cup were associated with caries experience only in 6 year olds ( $p=0.098$ ). A significant association was observed between caries experience, salivary MS and an amount of tea spoons containing sugar used per cup in both age groups (for 6 y.o.  $p=0.037$ , for 12 y.o.  $p=0.037$ ). Also caries experience was strongly associated with salivary MS and daily amount of tea spoons containing sugar, but only in 12 year olds ( $p=0.041$ ).

**Conclusions.** The information of free sugar consumption per cup or daily gives the possibility to control free sugar use in order to reduce caries development in 6 year old and 12 year old children in Riga.

**Key words:** caries experience, salivary microflora, sugar consumption.

## INTRODUCTION

Despite the known decline in dental caries in developed countries during last 30 years, the caries experience remains still high. [1]. Dental caries experience among 12 year olds in US DMFT is 3,0; in Europe DMFT – 2,6. [2]. Notwithstanding the decline in caries development over the last century in the world, this disease is still affecting children's population, and can be only supervised to a definite level, but not eradicated [2]. In developing countries, dental caries experience among 12 year olds was

rather low, for example in African countries DMFT was 1,7 [2], but it starts to increase due to the frequent usage of sugars and inadequate exposure to fluorides [2-4]. Lithuania also showed little tendency towards a decline in the prevalence of dental caries [5]. Despite the progress in reduction of caries development in 6-7 year old and 12 year old children in Riga, the aims proclaimed by the WHO for 2000 year as 55% in 5-6 year olds should be caries-free and  $DMFT \leq 3$  in 12 year olds [6] have not been achieved in Riga.

Dental caries occurs due to demineralization of enamel and dentin under the impact of organic acids anaerobically metabolized by bacteria in dental plaque from dietary sugars [1]. A lot of research including human studies, animal experiments, and experimental studies showed that sugars are the most important factor promoting caries development [1]. The aim of this study was to assess possible relation-

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ship between caries experience, salivary cariogenic microflora and free sugar consumption in 6 year and 12 year old children in Riga, to evaluate these variables in risk assessment

## MATERIALS AND METHODS

The study was performed at the Institute of Stomatology, in Riga. Data were collected during the period of 2006-2008. The study population comprised of 6 and 12 years old children, inhabitants of Riga, who visited the Institute of Stomatology. All patients were volunteers, with permission to take part in this study from their parents. This study was approved by the Ethical Committee of the Riga Stradin's University. None of participants refused to take part in this study. For the purpose of analysis study population was divided into 2 age groups: 6- and 12-year olds.

Caries experience was evaluated using dmft/DMFT, also dmfs/DMFS in both age groups. Caries was detected clinically and using Bitewing X-rays.

The study population comprised of 79 children aged 6 and 96 children aged 12.

Salivary mutans streptococci (MS) and lactobacilli (LB) (CRT – bacteria, Ivoclar, Vivadent, Lichtenstein) was assessed only for children with caries experience higher than moderate level (dmft/DMFT>4): 27.8% at the age of 6, 40.6% at the age of 12.

All children reported number of tea spoons containing sugar per cup while drinking tea and the frequencies of cups used daily.

All data were statistically analyzed using frequency tables and analysis of variance. Statistical significance of differences in proportions was tested using chi-square test, Analysis included evaluation of how changes in variables such as free sugar consumption affects caries in particular age group. Level of statistical significance was assumed at  $p < 0.05$ .

**Table 1.** Mean values of caries experience in 6 year old and 12 year old children

	df	DMFT
6 year olds	5.75	0.5
12 year olds	2.4	4.45

**Table 2.** Mean number of sugar containing tea spoons used per cup and daily amount in 6 year old and 12 year old children

	Tea spoons per cup	Daily amount of tea spoons
6 year olds	1.47	1.86
12 year olds	2.71	4.36

## RESULTS

Mean caries experience in primary dentition (dft) was 5.75 in 6 year olds, and 2.4 in 12 year olds. Mean caries experience in permanent dentition (DMFT) of examined children was 0.5 in 6 year olds, and 4.45 in 12 year olds (Table 1). Analyzing obtained data about a number of sugar containing tea spoons per cup the mean number of sugar containing tea spoons per cup 1.47 in 6 year olds and 1.86 in 12 year olds, but daily amount of tea spoons containing sugar was 2.71 and 4.36 in each age group accordingly (Table 2). Tea spoons of sugar per cup were associated with caries experience only in 6 year olds ( $p=0.098$ ) (Fig. 1). A significant association was observed between caries experience, salivary MS and an amount of tea spoons containing sugar used per cup in both age groups (for 6 y.o.  $p=0.037$ , for 12 y.o.  $p=0.037$ ) (Fig 2, 3). Also caries experience was strongly associated with salivary MS and daily amount of tea spoons containing sugar, but only in 12 year olds ( $p=0.041$ ) (Fig. 4).

## DISCUSSION

Dental caries is a microbial disease [6-8]. Sugar exposure is an important etiologic factor influencing caries development [9-11]. If patients are consuming a lot of sugar, and using fluoride protection, their teeth may be not so damaged as they would be, if they have low fluoride intake [8, 9].

Tea with sugar is a very popular drink in Riga and Latvia with children, and it is frequently consumed with multiple tea spoons of sugar, making this source of sugar to be the main in a diet. Sugar consumption was measured by sugar tea spoons per cup, and frequency of cups used daily in both age groups in Riga. Using this parameter the mean number of sugar tea spoons per cup was 1.47 in 6 y. olds and 1.86 in 12 y. olds, and mean daily amount was 2.71 and 4.36 accordingly (Table 2). Research has been done to establish whether salivary mutans streptococci (MS) and lactobacilli (LB) influence caries development, and if they are a caries risk predictors [12-23]. Repeated changes in plaque pH due to frequent carbohydrate intake will promote the growth of cariogenic microflora and will results in the development of lesions on caries-prone surfaces [7, 24]. The results gained by our study have shown strong statistically significant influence of sugar consumption on caries development even drinking one cup of tea in 6 year olds (Fig. 1), with salivary MS in both age groups. (Figures 2, 3). Also our results have found that daily amount of sugar tea spoons drinking tea raise risk of caries development in 12 year olds (Fig. 4).

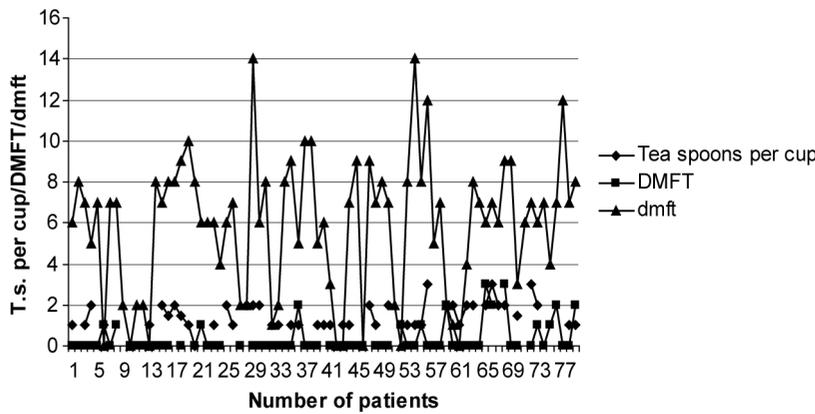


Fig. 1. Tea spoons of sugar per cup and caries experience in 6 y.o.

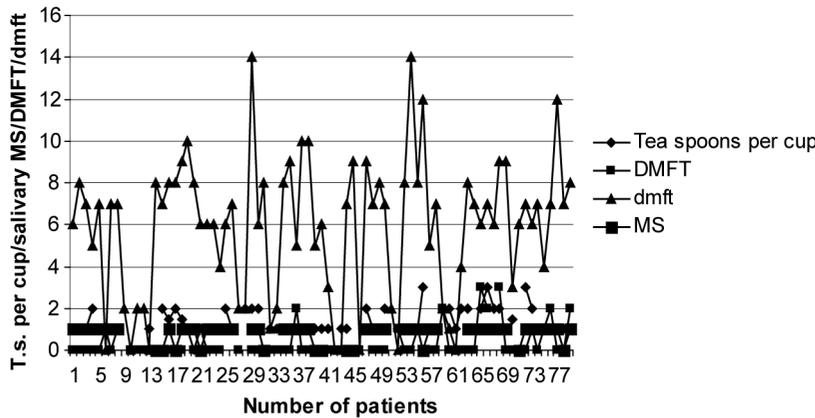


Fig. 2. Tea spoons of sugar per cup, salivary MS and caries experience in 6 y.o.

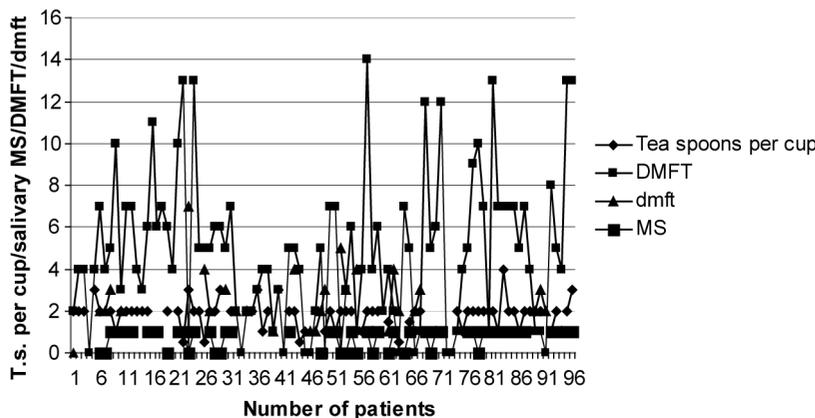


Fig. 3. Tea spoons of sugar per cup, salivary MS and caries experience in 12.y.o.

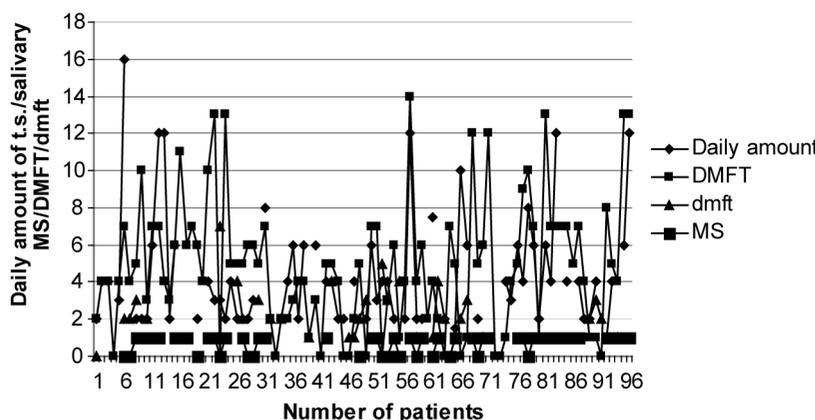


Fig. 4. Daily amount of sugar tea spoons, salivary MS and caries experience in 12.y.o.

Notwithstanding, that sugar amount per cup in 6 y. olds was less than in 12 y. olds, gained results showed that less sugar amount in 6 y. olds cause caries development, compared to 12 y. olds. This fact could be, possibly, explained by the lack of mineralization of primary teeth in 6 y. olds compared to permanent ones in 12 y. olds.

It is necessary to stress, that knowing the sugar amount per cup and daily, patients could have controlled themselves, because it is difficult to determine sugar content in every grocery or snack consumed.

Our study has suggested that rather high caries experience in both age groups – mean dft was 5.75 in 6 y. olds and DMFT was 4.5 in 12 y. olds (Table 1) was due not only to uncontrolled intake of sugar while drinking tea during whole day long, but, most probably, also to inadequate fluoride exposure. Talking about mean values of caries experience it is difficult to judge whether there was any reduction in caries development compared to previously performed studies [25], cause the amount of examined children in our study is rather small and didn't reflect the whole population of Riga.

Talking about dietary and hygiene habits socioeconomic factor shouldn't be forgotten, influencing indirectly also on the attitude to the dental health, but some studies showed no influence of socioeconomic factor on caries development [26, 27]. It should be reminded that low level of free sugar consumption is less than 10 kg/person/year the level of caries is low [28, 29]. When consumption of sugars is higher than 15 kg/person/year caries experience is increasing, but the adequate usage of fluorides as protective measure could widen the safe level to 20 kg/ person/year [1]. WHO has recommended that countries with low intake of free sugar do not increase intake in order to prevent caries development [1].

### CONCLUSIONS

- The habit to drink tea with multiple sugar containing tea spoons influ-

ence caries development with or without salivary MS as a caries promoting factor, in both age groups in Riga.

- Talking about habit to drink tea with multiple sugar containing tea spoons parents could control not only their children, but also themselves

in order to improve oral health in both age groups in Riga.

- The information of free sugar consumption per cup or daily gives the possibility to control free sugar use in order to reduce caries development in 6 year old and 12 year old children in Riga.

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