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## Dental Caries-Associated Microorganisms in Asthmatic Children

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### ABSTRACT

**Background:** According to several studies, asthma medications especially  $\beta_2$ -agonists and corticosteroids have harmful effects on the dentition. This study was conducted to evaluate the prevalence of dental caries in asthmatic children in comparison with healthy controls. Some potential confounders of oral health were also evaluated.

**Materials and Methods:** Asthmatic children aged 5-15 years under the care of the Pediatric Pulmonary Clinic of Masih Daneshvari Hospital were studied. DMFT index (decay, missing, filling teeth) was assessed in them by using the visual-tactile technique. Also, saliva samples were taken from each child and the number of *Streptococcus mutans* and *Lactobacilli* colonies in the samples was counted. Similar data were collected from the healthy controls.

**Results:** Forty-five asthmatic (mean age  $10.90 \pm 3.16$  yrs) and 46 healthy children (mean age  $11.03 \pm 0.59$  yrs) were studied. Mean DMFT was  $3.98 \pm 2.53$  in the control group and  $4.30 \pm 2.81$  in the study group which revealed a significant difference between the two groups regarding DMFT index. The number of *Lactobacilli* colonies was  $8171.3 \pm 11956.0$  and  $16078.4 \pm 24305.5$  in asthmatic and non-asthmatic groups, respectively which demonstrated no significant difference in this regard. Whereas, the number of *Streptococcus mutans* colonies was significantly different between the two groups ( $32331.7 \pm 46258.9$  colonies in the control group versus  $80883.4 \pm 74799.9$  colonies in the study group;  $p$ -value  $< 0.05$ ). Multivariable analysis revealed that asthmatic children receiving anti-asthmatic medication including  $\beta_2$ -agonists and corticosteroids had a higher DMFT index.

**Conclusion:** According to our study the prevalence of dental caries was higher in asthmatic children as compared to the healthy controls. Also, a significant correlation was detected between the saliva pathogens and dental caries. Dental caries were more prevalent in children receiving  $\beta_2$ -agonists alone than in those receiving both corticosteroids and  $\beta_2$ -agonists. Our study concluded that a more comprehensive precise oral health training program needs to be established by complete evaluation of the dental caries status in asthmatic children and also by training them regarding the technique of using inhalers with a spacer to lower the complications and costs of dental caries. (Tanaffos 2007; 6(4): 42-46)

**Key words:** Asthma, Children, Dental caries, *Streptococcus mutans*

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## INTRODUCTION

According to several studies, anti-asthma medications including  $\beta_2$ -agonists and corticosteroids can have harmful effects on teeth. Inhaled  $\beta_2$  agonists can provide an optimal environment for the growth and proliferation of microorganisms responsible for dental caries (*Streptococcus mutans* and *Lactobacilli*) through decreasing salivary secretion (1,2).

Various studies have demonstrated that the prevalence of dental caries is higher in asthmatic children as compared with the healthy controls. Therefore, asthma is considered a risk factor for dental caries (3).

Reddy and colleagues in 2003 assessed the caries status of asthmatic children and reported that dental caries were more prevalent in these children as compared to the normal population (4).

On the contrary, Meldrum and coworkers in a study in 2001 did not find any significant difference in terms of dental caries status (5).

A study performed in a South Carolina Medical School on 655 children aged 1 to 5 years evaluated the correlation between dental caries and asthma. (6). In this study, 125 asthmatic children were examined. DMFT scores in these children were significantly higher than those of non-asthmatic controls. Also inhaled bronchodilators (salbutamol) that are frequently used by asthmatic children decreased the secretion of saliva.

This study was conducted to assess the dental caries status in Iranian asthmatic children receiving inhaled drugs to evaluate the potential risk factors in this regard. The potential confounding factors related with oral health were assessed as well.

## MATERIALS AND METHODS

Asthmatic children aged 5 to 15 years under the care of the Pediatric Pulmonary Clinic of Masih Daneshvari Hospital were studied. DMFT index was

evaluated by using the visual-tactile technique. Also, saliva samples were taken from each child and were collected in sterile McCartney tubes with 2 ml capacity. The samples were Gram-stained and cultured. Afterwards, the number of *Streptococcus mutans* and *Lactobacilli* colonies in the saliva samples was counted. Similar data were collected from the non-asthmatic controls. Demographic data along with the medical records containing age, sex, family income, parents' level of education, type of the medication, duration of drug use and the method of using the spray were recorded. Data were analyzed by using Mann-Whitney test, Kendall's rank correlation test, chi-square test, Fisher's exact test and t-test. P-value <0.05 was considered significant. All data collected, were categorized and entered in SPSS and Excel softwares and analyzed.

## RESULTS

A total of 91 children enrolled in the study. Forty-five asthmatic children with a mean age of  $10.90 \pm 3.16$  years (the study group) and 46 non-asthmatic children with a mean age of  $11.03 \pm 0.59$  years (the control group) were studied. Assessment of DMFT scores in asthmatic children revealed that as the child grows the DMFT score improves ( $p=0.03$ ) and the DMFT score in female asthmatic children was higher than the affected males ( $p=0.03$ ). Regarding the technique of using the spray, it was found that children using the inhalers by spacers have lower DMFT scores ( $p=0.04$ ). DMFT values were lower in those with a higher family income ( $p=0.02$ ). Also, DMFT scores were lower in children whose mothers had a higher educational level. According to our study results, there was a significant correlation between the DMFT scores and type of medication and duration of pharmacotherapy. Mean DMFT scores and the statistical comparison between the two groups are summarized in Table 1.

**Table 1.** Mean DMFT scores in the study and the control groups.

Group	Mean DMFT
Control	3.98 ± 8.53
Study	4.30 ± 2.81

Also, the number of *Streptococcus mutans* colonies was higher in asthmatic children ( $p=0.001$ ). However, no significant difference was detected between the two groups regarding the number of Lactobacilli colonies. Tables 2 and 3 demonstrate the correlation between DMFT scores and number of colonies in the culture media.

**Table 2.** The correlation between the mean DMFT and number of Lactobacilli colonies according to Kendall's rank correlation test.

Group	Mean number of Lactobacilli	Mean DMFT	P-value
Study	8171.33± 11956.01	3.98 ± 2.53	0.14
Control	16078.37± 24305.54	4.30 ± 2.81	0.53

**Table 3.** The correlation between the mean DMFT and the number of *Streptococcus mutans* colonies according to Kendall's rank correlation test.

Group	Mean number of <i>Streptococcus mutans</i>	Mean DMFT	P-value
Study	32331.74 ± 46258.93	3.98 ± 2.53	0.04
Control	80883.40 ± 74798.95	4.30 ± 2.81	0.38

## DISCUSSION

According to the results of our study there was a significant difference in the mean DMFT values between the asthmatic children and the control group. Our results are consistent with those of Shulman (2001), Dugmore (2003) and Eloit (2004) who also found a correlation between the use of antihistamine, corticosteroids and anti asthma sprays with DMFT score (1, 7, 8).

In the Shulman study performed on severe

asthmatic children, these patients had lower DMFT scores as compared to the control group (1). However, Milano in 1999 reported different results. He detected significantly higher DMFT scores in asthmatic patients. Drinking-water fluoride in Milano's understudy population was below the optimal level ( 0.7 ppm) (9). Whereas, the amount of drinking-water fluoride in our understudy patients was 0.5 to 1 ppm. The difference in the rate of water fluoride may be one of the factors influencing the results. Our study results are similar to those of McDerra reporting that the prevalence of dental caries is higher in asthmatic children than in controls (10). In our study, asthmatic children only received anti-asthma inhalers including salbutamol and beclomethazone but McDerra's understudy population received both syrups and sprays. Syrups contain a high percentage of sugar which is a caries risk factor in children with chronic diseases. This study demonstrated that the number of *Streptococcus mutans* colonies are the major cause of dental caries. The growth of this aciduric and acidogenic microorganism is strongly related to the presence of carbohydrates in the environment. The number of *Streptococcus mutans* colonies was higher in the study group and the two groups showed a significant difference regarding the mean number of *Streptococcus mutans* colonies ( $p=0.0001$ ). This confirms the higher prevalence of caries in the asthmatic children.

Also, based on our study, a direct correlation was found between the mean DMFT scores and mean number of *Streptococcus mutans* colonies but no significant correlation was found between the number of Lactobacilli and DMFT scores. Several studies have been performed in this regard revealing a direct relation between DMFT score and number of Lactobacilli and *Streptococcus mutans* colonies

(11,12). Also, a study was conducted in India on 372 children aged 13-15 years aiming to estimate the number of *Streptococcus mutans* and Lactobacilli colonies in the saliva and evaluate the correlation between these two microorganisms and dental caries. Mean DMFT was 2.41 indicating a significant correlation between the number of Streptococcus mutans and DMFT but there was no correlation regarding the number of Lactobacilli and DMFT score (13). This finding was similar to our study results.

Another finding of this study was the effect of medication type on DMFT score. Children who received  $\beta_2$ -agonists alone had a higher prevalence of dental caries as compared to those using corticosteroids and  $\beta_2$ -agonists. This difference might be due to the fact that asthma is better managed in those receiving inhaled steroids. Therefore, the child's need for inhaled  $\beta_2$ -agonists (which are stronger xerostomic drugs compared to corticosteroids) will be decreased specially in the acute phase of disease. Decreased use of  $\beta_2$ -agonists causes less defect in saliva secretion in children under treatment with two drugs and lowers the DMFT score of these children more than those receiving  $\beta_2$ -agonists alone (14). Therefore, children receiving  $\beta_2$ -agonists are more susceptible to dental caries. Also, saliva secretion rate (SSR) in these children is lower than that of healthy controls. Saliva is the most important defensive factor against dental caries and presence of immunoglobulins and other glycoproteins in the saliva and also its viscosity play an important role in decay prevention (15). Since the dental management of asthmatic children requires special measures which make the treatment process more complicated, these children should be provided with particularly intensive preventive dental programs. Therefore, by evaluating the dental caries

status and oral health condition of asthmatic children and teaching them the correct method of using the inhaled drugs and comprehensive preventive dental programs may benefit this group of patients.

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