

DENTAL HEALTH IN ASTHMATICS TREATED WITH INHALED CORTICOSTEROIDS AND LONG-ACTING SYMPATHICOMIMETICS

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SUMMARY:

There is not enough evidence in literature for the effect of inhaled corticosteroids and long-acting sympathicomimetics on dental health in asthmatics. The aim of the study is to follow up the changes in dental plaque pH and dental health in asthmatics with mild persistent asthma, treated with different combinations of inhaled corticosteroids and long-acting sympathicomimetics.

Seventy patients of both sexes, from 20 to 55 years old participated in the study. Changes in plaque pH and dental status are evaluated in two visits, in six months interval.

There are no significant differences between asthmatics and controls when plaque pH values are compared. Substantially lower pH values are determined for maxillary teeth in both groups.

DMFT index is significantly higher in asthmatics than in the controls. It increases substantially at their second visit. Significantly higher mean levels of DMFT index for each jaw are found out in asthmatic group.

Key words: asthma, inhaled corticosteroids, inhaled long-acting sympathicomimetics, plaque pH, dental health

INTRODUCTION:

Dental caries is a chronic disease involving localized destruction of specific sites of tooth surface. It is a multifactorial dynamic process that is modified by oral protective factors. [26, 27]

Predominantly, appearance of dental caries is associated with frequency of sugar intake. Sucrose is the most important representative of this group, followed by glucose, fructose and lactose. Sucrose freely diffuses in dental plaque and is easily metabolized by oral bacteria. Organic acids concentration increases to levels that can lower plaque pH to a degree adequate for demineralization of tooth enamel. [25, 27]

Production of plaque acids depends on type of carbohydrates (simple sugars and sucrose), microbial composition (acidogenic and aciduric microorganisms) and the level of diffusion of substrate in the plaque and the

metabolic products out of it. When the plaque is with low thickness, exchange with oral environment is very quick and saliva bicarbonate buffering system can neutralize acid production. As the plaque thickness grows, saliva can't neutralize plaque acidity and pH levels remain low. [2, 5, 21, 27]

Combinations of inhaled corticosteroids and long-acting sympathicomimetics are up-to-date treatment of bronchial asthma. Some of them are in aerosol form (MDI), others – in powder form (DPI). DPI are devices containing gustatory correctors in different quantities (Fluticasone propionate + Salmeterol – 12.5 mg Lactose monohydrate, Budesonide + Formoterol - 0.730 mg Lactose monohydrate, Beclometasone + Formoterol - without correctors).

There is little evidence in literature for the association between dental health in asthmatics and their treatment. Most of the studies are carried out on kids and the obtained results are contradictory. [4, 8, 18, 20]

MATERIAL AND METHODS:

Seventy patients of both sexes, from 20 to 55 years old, participate in the study. Thirty of them suffer from mild persistent asthma and are systematically treated with combinations of inhaled corticosteroids and long-acting sympathicomimetics. All patients with bad oral hygiene, parodontal diseases and accompanying diseases and treatment, affecting saliva quantity and acidity are excluded from the investigation. Plaque acidity and dental status are compared with control group of healthy patients at the same age, with good oral hygiene and without parodontal diseases (n=40).

The investigation is carried out in the morning, between 8 and 11 o'clock. The patients are not allowed to eat, drink, smoke, brush their teeth and take medicines an hour before the visit.

Measurements of dental plaque pH (for the whole mouth and for each jaw) are made with Dental Beetrode NMPH3 and pH meter Hanna 211 in the region of 14, 24, 34 and 44 teeth.

Decayed, missing and filled teeth are determined with the help of D-, M-, F- and DMFT indexes (after the standards

of WHO). Loss of teeth because of trauma and orthodontic reasons are not counted.

Changes in plaque pH and dental status are evaluated in two visits, in six months interval.

Data analyses are conducted using statistical software program SPSS 15.0.

RESULTS:

The mean values of plaque pH are 6.45 for asthmatics and 6.37 for the control group. There are no significant differences between them (t-test, $p=0.527$). Table 1

Table 1. Mean pH values of dental plaque in asthmatic patients and controls (n=70).

	n	Mean values	Str. Dev.	Str. Error Mean	Min	Max	Level of significance
Asthmatic patients	30	6,45	0,52	0,09	4,82	7,43	0,527
Control group	40	6,37	0,57	0,09	4,68	7,38	

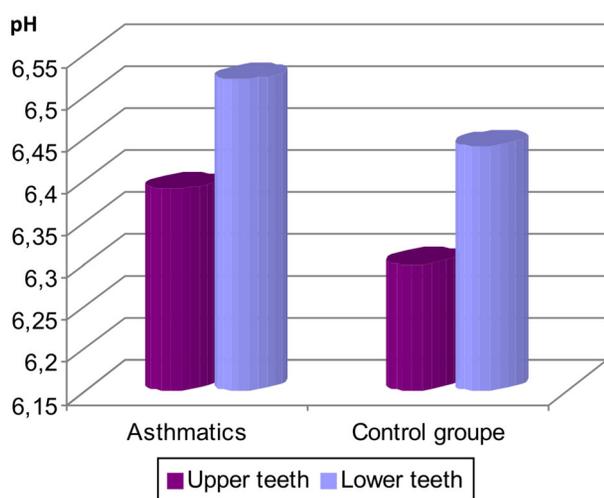
A slight increase of mean values of plaque pH is observed at the second visit of asthmatics when compared with their first visit results. Nevertheless, differences are not significant (paired simple t-test, $p=0.255$). **Table 2**

Table 2. Dental plaque pH values of in asthmatics in a six month period (n=30)

	Mean values	Str. Dev.	Str. Error Mean	Min	Max	Level of significance
First visit	6,40	0,55	0,07	4,68	7,43	0,255
Second visit	6,53	0,44	0,08	5,60	7,62	

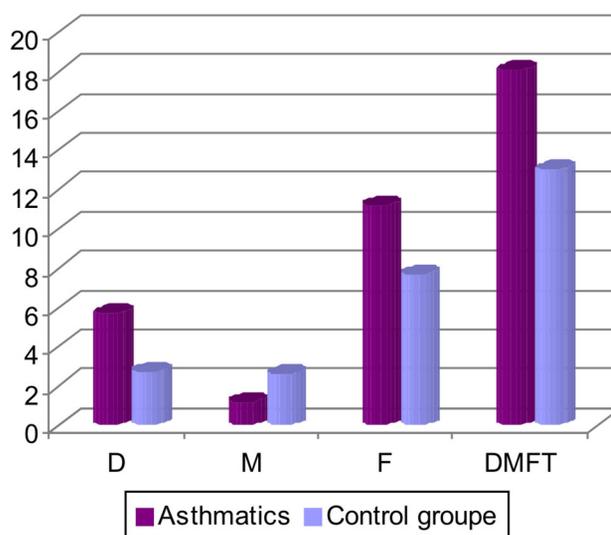
Comparison of mean pH values of dental plaque for the upper and lower jaw reveals considerably lower results for maxillary teeth in both groups: asthmatic patients and controls (paired simple t-test, $p<0.001$). **Fig.1**

Fig. 1. Comparison of mean pH values of dental plaque for upper and lower teeth



DMFT-index for asthmatic group is 18.07, while it is 13.00 for controls. The differences are statistically significant (t-test, $p=0.001$). **Fig. 2**

Fig. 2. D-, M-, F- and DMFT index in asthmatics and controls (n=70)

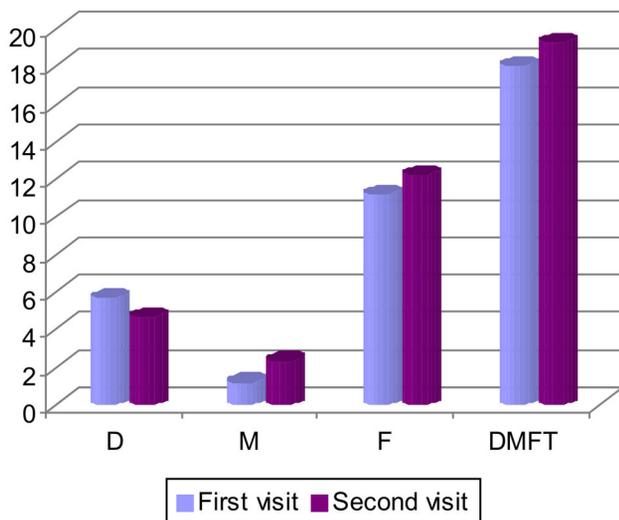


Comparison of D-, M- and F- indexes for both groups reveals higher levels of D-index (5.67) and F-index (11.2) in asthmatics when compared with the control group (respectively 2.73 and 7.7). Conversely, M-index is higher for controls (controls – 2.58, asthmatics – 1.2).

The parallel of dental status in asthmatics at both visits reveals an increase in the number of extracted teeth (first visit – 1.20, second visit – 2.33) and filled ones (first visit – 11.2, second visit – 12.27). Number of decayed teeth decreases for the period of investigation (first visit – 5.67, second visit – 4.7).

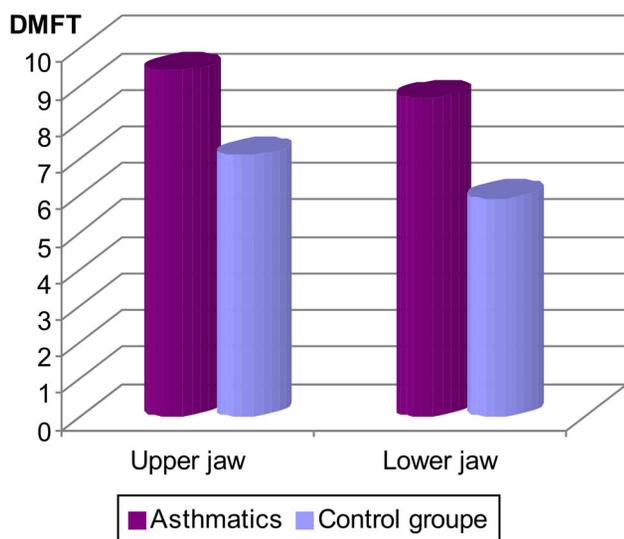
DMFT index increases from 18.07 to 19.30 at the second visit of asthmatics. Differences are statistically significant (paired simple t-test, $p < 0.001$). **Fig. 3**

Fig. 3. D-, M-, F- and DMFT index in asthmatics in a 6 months period (n=30)



A comparison of dental status for upper and lower jaw in both groups is made. Substantially higher mean levels of DMFT index for each jaw are found out in asthmatic group when compared with controls (t-test, $p = 0.024$, $p < 0.001$). **Fig. 4**

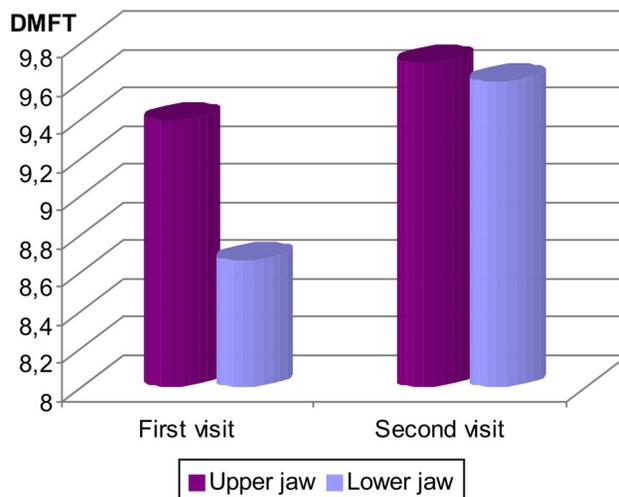
Fig. 4. DMFT index for upper and lower jaw in asthmatics and controls (n=70)



Calculation of DMFT index for each jaw in asthmatic group is made. Higher values for upper jaw are found out in

both visits (first visit – 9.4 versus 8.67, second visit – 9.7 versus 9.6). All differences are statistically insignificant ($p = 0.209$ and $p = 0.858$). **Fig. 5**

Fig. 5. DMFT index for each jaw in asthmatics in a 6 months period (n=30)



DISCUSSION:

Comparison of plaque pH levels for whole mouth in asthmatics and controls finds out insignificant differences. Inessential increase of plaque pH is recorded at the second visit of asthmatics. Similar results are obtained by Roberts I. et al. [14] and Lenander-Lumikari M. et al.[6]. Conversely, the teams of Kargul B.[5], O’Sullivan E.[11] and Sunitha S. [21], detect substantial decrease in plaque pH for asthmatics.

Much more explicit results are obtained when plaque pH levels for each jaw are compared. These for the upper teeth are significantly lower than the mandibular ones both in asthmatic and control group. This result is expected because it’s known that saliva has better cleaning and protective abilities towards lower teeth. Risk for upper teeth is increased additionally because of the decrease of saliva quantity in asthmatics treated with inhaled sympathicomimetics. Some of the asthmatic patients has less saliva because of mouth breathing and nasal polyps. [3, 8, 12, 17, 19]

Results from dental status investigation reveal highly injured dental tissues in asthmatic patients. Probably these results can be explained with the prolonged use of drugs which affect negatively oral cavity environment and its protective functions and favour the process of enamel demineralization.

Results for an impaired dental status are obtained by a lot of other investigators. Most frequently objects of their surveillance are kids at different age, with temporary or permanent dentition. [1, 2, 9, 10, 13, 20, 23]

According to Ryberg et al.[15, 16] prolonged use of

sympathomimetics in asthmatic patients leads to decrease of salivary quantity and increases dental caries incidence. Compared with the controls they have significantly more initial ($p < 0.01$) and developed caries ($p < 0.05$).

Mazzoleni S. et al.[7] state greater risk for oral health in asthmatic children treated with short-acting sympathomimetics. Their permanent dentition is significantly more damaged than that of the control group.

Kankaala et al.[4] believe that bronchial asthma, itself, and its systematic treatment have negative influence on dental status of children.

The team of McDerra [8] explains the increased caries incidence with the negative influence of the inhaled drugs on salivary quantity and functions, with increased intake of cariogenic drinks, with increased plaque quantity and the less attention of parents towards oral health of their children in comparison with asthma disease.

Wierchola B et al.[24] come to the conclusion that asthmatics are with increased caries risk and have to be an object of special prophylactic programmes.

Some investigators do not find out impaired dental status in asthmatic children treated with inhaled corticosteroids.[18, 22]

The examination of DMFT index of both jaws in asthmatics determines higher mean values for upper teeth. Without being significant, DMFT index increases at the second visit. The obtained results can be explained with the decreased quantity and protective functions of saliva as a result of the prescribed treatment and with the lower plaque pH values for upper teeth.

McDerra et al.[8] find out, as well, impaired dental status in asthmatics and more damaged labial surfaces of upper incisors and occlusal surfaces of molars.

CONCLUSIONS:

- Dental plaque pH values for whole mouth do not change significantly in the course of asthma treatment. However, mean pH values for upper teeth in both examined groups are significantly lower than for mandibular ones.
- Treatment with inhaled corticosteroids and long-acting sympathomimetics increases risk for dental health in asthmatics. DMFT index in asthmatic group is significantly higher when compared with the controls.
- As a result of the prolonged treatment of bronchial asthma mean values of DMFT index increase. Upper teeth are more affected than lower ones.

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