Allergol Immunopathol (Madr). 2018;46(2):196–200

Allergologia et immunopathologia

Sociedad Española de Inmunología Clínica, Alergología y Asma Pediátrica

www.elsevier.es/ai

ORIGINAL ARTICLE

Effect of inhaled medication on dental caries index in asthmatic children

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Received 4 March 2017; accepted 13 September 2017

KEYWORDS
Dental caries;
Asthma;
Dmft

Abstract
Introduction: Asthma is a chronic inflammatory disease of airways with a high prevalence among children in pre-school ages. Considering controversial results in different studies about the effect of this disease on the indices of dental caries, the aim of this study was to compare dmft (decay, missing, filling teeth) situation in asthmatic and non-asthmatic 6–12-year-old children.
Methods: This was a case-control study on 46 asthmatic and 47 non-asthmatic children aged 6–12 years. In asthmatic children, the severity of disease, type and dose of the administered inhalational drug, duration of drug consumption, times and technique of drug administration, and washing the mouth after drug consumption was assessed. The index of primary teeth decay or dmft, dental plaque and gingival inflammation were recorded in both groups. Data were analysed by SPSS (ver. 22) using Student's *T*-test, chi-square test and linear regression.
Findings: dmft in case and control groups was 5.25 ± 2.25 and 4.15 ± 3.27, respectively and the difference was not statistically significant ($P = 0.062$). None of the variables related to asthma affected dmft ($P > 0.05$).
Conclusion: Suffering from asthma does not affect the risk of decay in primary teeth.

Introduction

Asthma is a chronic inflammatory disease of airways that is triggered by various factors such as infections, domestic or occupational allergens, tobacco smoke, exercise and stress and some drugs. Asthma causes reversible narrowing and inflammation of airways and increased mucous secretions. In some chronic cases, fibrosis and irreversible changes may ensue. It is a periodic disorder with acute exacerbations interspersed by symptomless periods. The disease is determined by a triad of dyspnoea, cough and wheezing.[1] According to the report of Global Initiative for Asthma (GINA), it is estimated that 300 million people suffer from this disease,[1] and its prevalence is increasing worldwide.[2] Entezari et al. showed that the prevalence of asthma symptoms in Iran is higher than the global report.[3] The prevalence of asthma is higher among pre-school children than adults. One out of ten children suffer from asthma.[4] Before puberty,

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https://doi.org/10.1016/j.aller.2017.09.019
0301-0546/

the prevalence in males is twice that in females, although the prevalence after puberty is similar in both genders.[5]

Previous studies on the prevalence of dental caries in asthmatic children were controversial. Some studies showed that the risk of dental caries increased in asthmatic children,[6–11] and that the prevalence of decay was higher among these children compared with healthy ones[6,13]; and that asthma significantly decreases salivary flow and PH and there is a positive association between the duration of disease and streptococcus mutans count in saliva.[12] These studies considered asthma as a risk factor for dental caries. Although some other studies rejected this association and found that the prevalence of dental caries was not significantly different between asthmatic and healthy children,[4,13,14] some studies showed that the prevalence of dental caries was lower in asthmatic patients (although not significant).[15,16]

Based on studies that consider asthma as a risk factor for dental caries, Drugs use in asthma, especially those consumed via inhalational route can cause mouth dryness which may predispose the individual to dental caries.[4] β2-agonists, corticosteroids and sodium cromoglycates alone or in combination are used via inhalational route to control asthma. Repeated consumption of anti-asthma drugs, disease severity and combination therapy can significantly change the characteristics of saliva in asthmatic children.[13] According to some of these studies, regardless of the drug type, the technique of drug consumption may also affect dental caries. If the patient is not aware of the correct method of using inhaler drugs, a larger amount of drug particles remain in the mouth, which may aggravate dental caries in these patients.[17] Khalizadeh et al. showed a lower risk of dental caries in patients trained for the technique of consuming inhaler drug.[18]

Due to these controversies this study was designed to assess and compare dmft (decay-missing-filled teeth) index in asthmatic and non-asthmatic 6–12-year-old children in Yazd, Iran.

Materials and methods

In this case-control study, 46 asthmatic and 47 healthy children entered the study. At first all parents were given accurate information about how we do the study and were assured that at any moment that they want they could exclude their children from the study and that we do not use any x-ray beam or harmful drugs in this study, their written informed consent was taken. The study was approved by the ethics committee of Shahid Sadoughi University of Medical Sciences, Yazd, Iran (code: 45637). The subjects in the case group were randomly selected from those referred to a private dental office in Yazd. Those children who suffered from asthma confirmed by an asthma-allergy subspecialist entered the study. Exclusion criteria were: mental retardation, chronic systemic disease, long-term antibiotic consumption, and respiratory diseases other than asthma. The children in the control group were randomly selected from those referring to the community – dentistry department in the dental school of Shahid Sadoughi University of Medical Sciences, Yazd, Iran for their routine dental examinations. The children in the control group were similar to the cases regarding demographic and socio-economic characteristics. Considering dental caries as a multifactorial disease affected by different factors such as salivary features, oral hygiene and nutrition, the subjects were randomly selected by a table of random digits in order to minimise the effect of these factors. Demographic data including age and gender and information about asthma (severity, duration, administered drug, times of daily drug consumption, drug dose, use of spacer, and washing mouth after drug consumption), and history of gastrointestinal reflux, adenoid hypertrophy, and allergic rhinitis were gathered and recorded by the examiner. Asthmatic children are classified according to GINA classification into intermittent and persistent (1). The children in this study suffered from persistent asthma with different disease severities, i.e. mild, moderate and severe and were treated for at least six months and maximum five years continuously and non-stop by corticosteroid inhalers including: budesonide/formoterol fumarate (160 μg/4.5 μg and 320 μg/9 μg), salmeterol/fluticasone propionate (25 μg/125 μg and 25 μg/250 mg), beclomethasone propionate monohydrate (50 mg and 100 mg), fluticasone propionate (125 mg and 250 mg). The children had used salbutamol in asthma attacks, but in the study only continuous use of corticosteroids was considered. In order to match the daily amount of consumed drug, dose × times of daily inhaler use was calculated and children were categorised as low, moderate and high regarding inhaler use according to GINA guidelines.

In this study, children were divided into three groups, i.e. high-risk, moderate-risk and low-risk, according to guidelines of American Academy of Paediatric Dentistry (AAPD) and Caries Risk Assessment Tool (CAT).[19] During dental examination, necessary data about the objectives of the study was explained for the parents and an informed consent was obtained for each participant. Oral examination was performed by a dental student according to World Health Organisation (WHO) criteria in the sitting position, with appropriate lighting including looking into the mouth and use of tactile test by mouth mirror and tongue blade.[20] Oral examination included assessment of dmft, presence of plaque (visible plaque or without plaque), gingival inflammation (exist or not exist), and mouth breathing. Clinical diagnosis of mouth breathing was done by assessment of night-time snoring, sleeping with open mouth and continuous or intermittent nasal congestion. Data were analysed by SPSS (ver. 22). Kolmogorov–Smirnov test was used to assess the normal distribution of data. For comparing demographic variables between two groups, Student's *T*-test and chi square test were used. In order to assess the effect of asthma variables on dmft, linear regression was used. Level of significance was set at $P < 0.05$.

Results

In the current study, 93 children were assessed: 46 children with asthma in the case group, 34 boys (73.9) and 12 girls (26.1) with mean age of 8.58 ± 1.82 years, and 47 matched children in the control group, 21 boys (44.7) 26 girls (55.3) with mean age of 8.21 ± 1.51 years. Indices of oral hygiene including times of tooth brushing, and using dental floss were not significantly different between the two groups ($P = 0.185$