

Original research article

Dental caries assessment among asthmatic and asthma free children- a comparative study

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Abstract

Aim: Dental caries assessment among asthmatic and asthma free children.

Material and methods: A Comparative, observational study was conducted in the Department of Dentistry, Narayan Medical College and Hospital, Sasaram, Bihar, India, for 12 months. 100 patients were included in this study. The participants were divided into two groups. Group I - the study group included 50 children diagnosed with asthma by the pediatrician and Group II consisted of 50 children with asthma free. The teeth were examined under artificial light and DMFT and dmft score were recorded. All examinations were conducted by a single trained examiner and an assistant assisted the examiner in the survey.

Results: The asthmatic children had a higher mean DMFT/dmft score ($0.56 \pm 0.84/2.81 \pm 2.62$) when compared to asthma-free children. When t test was applied, this difference was found to be statistically significant for permanent teeth ($t=2.245$; $p\text{-value}=0.031$) as well as deciduous teeth ($t=4.674$; $p\text{-value}=0.001$). In this study, asthma was categorized based on its severity as intermittent, mild persistent, moderate persistent, and severe persistent. When dental caries status DMF was assessed based on this asthma severity, a higher percentage of children suffering from moderate persistent asthma, had decayed teeth (D) and filled teeth (F), and the similar result was found when dental caries status dmf was assessed based on this asthma severity, a higher percentage of children suffering from moderate persistent asthma, had decayed teeth (D), missing (M), and filled teeth (F).

Conclusion: We concluded that the high prevalence of dental caries in both permanent and deciduous. The results of this study show that there is a high prevalence of dental caries in both permanent and deciduous teeth in asthmatic children in the surveyed population.

Keywords: Asthma, bronchodilator, inhaler

Introduction

Asthma is a chronic airway disease characterized by inflammation and bronchoconstriction.^{1,2} It is one of the most common chronic diseases and a serious global health problem affecting more than 300 million people worldwide and most of the countries reported that the prevalence has increased during the past two decades.³ In India, the prevalence of asthma is 15–20 million.⁴ Although it affects people of all age groups, peak prevalence exists between ages of 6 and 11 years.⁵ In childhood asthma, there is a male-to-female ratio of 2:1 although the disease in adults does not have the same wide disparity in prevalence between the two gender groups.⁶ Studies investigating the association of asthma and dental caries are

conflicting While similar caries prevalence with healthy individuals is reported in some studies.^{7,8} Most of the others have suggested that asthmatic children are at higher risk for oral disease than nonasthmatic children due to either their disease or their pharmacotherapy.⁹⁻¹¹ It is suggested that increase in caries prevalence in asthmatic children was associated with prolonged use of β_2 -agonist which leads to decrease in salivary flow and salivary pH. This salivary flow reduction is associated with concomitant increase in *Lactobacillus* and *Streptococcus mutans*, the pathogenic microorganism of dental caries.¹² Asthmatic participants also showed a decrease in output per minute of total protein, amylase, hexosamine, salivary peroxidase, lysozyme, and secretory IgA in stimulated parotid saliva. These components of saliva are protective in nature for oral health.¹⁰ Asthmatic patients also experience gingivitis that could be attributed to an altered immune response and dehydration of oral mucosa due to mouth breathing.¹³ It is found that in asthmatic children, a large proportion of inhaled drug is retained in the oropharynx, ranging from 80% with metered dose of inhaler and 60% with dry-powder inhaler with extension tube. In addition, some dry-powder inhaler and pressurized metered-dose inhaler contain sugar so that the patient can tolerate the taste of the drug when it is delivered. Frequent oral inhalation of sugar combined with a decrease in salivary flow rate and a decrease in pH of saliva may contribute to increase in caries.¹⁴ Hence, the study was conducted to assess the prevalence of dental caries in asthmatic children of age group 4 to 15 years and to evaluate and compare the dental caries status among asthmatic and asthma-free children.

Material and methods

A Comparative, observational study was conducted in the Department of Dentistry, Narayan Medical College and Hospital, Sasaram, Bihar, India, for 12 months, after taking the approval of the protocol review committee and institutional ethics committee.

Methodology

To assess the prevalence of dental caries in asthmatic children of age group 4 to 17 years and then evaluate and compare the dental caries status among asthmatic and asthma-free children. The participants were divided into two groups. Group I - the study group included 50 children diagnosed with asthma by the pediatrician and Group II consisted of 50 children with asthma free.

Presence of any other systemic disease and deformity, such as physically handicapped and mentally challenged children, presence of any orthodontic appliance, and children who had taken antibiotics within the month prior to the study were excluded from this study.

The following instruments and materials were used in this study:

Plain mouth mirror, WHO probe, tweezers, kidney tray, cotton rolls, cotton holder, disposable mouth masks, sterile gloves, Dettol (disinfectant), dermafilm hand sanitizer, and enamel tray. For control group clinical examination was carried out in the institute's medical room or classroom under artificial light. Children were seated in an ordinary chair in an upright position. A sterile mouth mirror and ball-ended dental probe were used to examine each child and to record the DMFT and dmft index scores. For asthma group, general questionnaire/information related to personal, medical, and dental history was recorded for all the children with the assistance of their parents or legal guardians. The children were examined at the hospital outpatient department, seated on an ordinary chair in an upright position. The teeth were examined under artificial light and DMFT and dmft score were recorded. All examinations were conducted by a single trained examiner and an assistant assisted the examiner in the survey.

Results

A total of 100 children aged 4 to 17 years were examined in this study, of which 30 were male whereas 20 were female in the study group and in control group, 28 were male and 22 were female. Among 50 asthmatic children, there were 30 children from the age group 4 to 10 years and 20 from 11 to 17 years, whereas among the asthma-free children, 26 were from the age group 4 to 10 years and 24 were from the age group 11 to 17 years. When mean DMFT/dmft was calculated from asthmatic and asthma-free children, the asthmatic children had a higher mean DMFT/dmft score ($0.56 \pm 0.84/2.81 \pm 2.62$) when compared to asthma-free children. When t test was applied, this difference was found to be statistically significant for permanent teeth ($t = 2.245$; $p\text{-value} = 0.031$) as well as deciduous teeth ($t = 4.674$; $p\text{-value} = 0.001$) (Tables 1 and 2). In this study, asthma was categorized based on its severity as intermittent, mild persistent, moderate persistent, and severe persistent. When dental caries status DMF was assessed based on this asthma severity, a higher percentage of children suffering from moderate persistent asthma, had decayed teeth (D) and filled teeth (F), and the similar result was found when dental caries status dmft was assessed based on this asthma severity, a higher percentage of children suffering from moderate persistent asthma, had decayed teeth (D), missing (M), and filled teeth (F) (Tables 3 and 4). In this study, asthmatic children were under medication viz. syrup, tablet, inhaler, syrup and tablet, syrup and inhaler. We tried to assess whatever DMFT score varied among the different drug form. Chi-square analysis showed that the statistically significant difference existed for DMFT among the above five drug forms (chi-square = 61.455; $p\text{-value} = 0.001$) (Table 5), however, not statistically significant difference existed for dmft among the above five drug forms (chi-square = 35.498; $p\text{-value} = 0.722$) (Table 6). The choices of drugs for treating asthma were beta 2 agonists, steroids, and their combinations. In this study, it was assessed whether DMFT/dmft varied with these three prototypes. Chi-square test revealed that there was no statistically significant difference amongst the above three (for DMFT, $p\text{-value} = 0.142$ and for dmft, $p\text{-value} = 0.804$) (Tables 7 and 8). The results of this study show that there is a high prevalence of dental caries in both permanent and deciduous. The results of this study show that there is a high prevalence of dental caries in both permanent and deciduous teeth in asthmatic children in the surveyed population. When evaluated and compared the dental caries status among asthmatic and asthma-free children, it was found that the asthmatic children had a higher mean DMFT/dmft score when compared to asthma-free children, and the difference between the two groups was statistically significant.

Table 1: Comparison of dental caries status (DMFT) in asthma-free and asthmatic children

Group	DMFT (Mean \pm SD)	t-value p-value	Significance
Asthma-free	0.28 ± 0.96	2.245 0.031*	Statistically
Asthma	0.56 ± 0.84		significant

Table 2: Comparison of dental caries status (dmft) in asthma-free and asthmatic children

Group	dmft (Mean \pm SD)	t-value	p-value	Significance
Asthma-free	1.37 ± 1.53	4.674	0.001*	Statistically
Asthma	2.81 ± 2.62			significant

Table 3: Describes DMFT based on asthma severity in asthmatic children

Status	Intermittent	Mild persistent	Moderatepersistent	Severe persistent
Decayed (%)	4	6	14	8
Missing (%)	0	0	0	0
Filled (%)	4	4	8	4

Table 4: Describes dmft based on asthma severity in asthmatic children

Status	Intermittent	Mild persistent	Moderatepersistent	Severe persistent
Decayed (%)	4	14	46	10
Missing (%)	0	4	22	2
Filled (%)	0	2	2	0

Table 5: Dental caries status (DMFT) in asthmatic children based on drug form

Group	DMF = 0	DMF > 0	Chi-square	p-value	Significance
Syrup	10	5	61.455	0.001	Statistically significant
Tablet	2	0			
Inhaler	25	12			
Syrup and Tablet	0	2			
Syrup and Inhaler	13	10			

Table 6: Dental caries status (dmft) in asthmatic children based on drug form

Group	dmf = 0	dmf > 0	Chi-square	p-value
Syrup	10	6	35.498	0.722
Tablet	2	1		
Inhaler	14	22		
Syrup and Tablet	2	0		
Syrup and Inhaler	9	21		

Table 7: DMFT in asthmatic children based on drug consumed

Group	DMF = 0	DMF > 0	Chi-square	p-value
Beta-2 agonists	29	13	9.784	0.142
Steroids	12	7		
Combination	5	7		

Table 8: DMFT in asthmatic children based on drug consumed

Group	dmf = 0	Dmf > 0	Chi-square	p-value
Beta-2 agonists	15	40	14.683	0.804
Steroids	2	5		
Combination	2	5		

Discussion

Human body is affected by many systemic diseases; of which asthma is one of the serious health problems affecting more than 100 million people worldwide. Pediatric asthma is a serious global health problem. It accounts for a large number of lost school days.¹⁵ The prevalence of asthma has been increasing since the 1980s across all ages, gender, and racial groups and is higher among children than adults. Asthma and tooth decay are the two major

causes of school absenteeism.¹⁵ Asthma treatment has two main objectives: To control, as well as to reduce the airway inflammation, and reopen the airways. The treatment of asthma starts with avoidance of stimuli, however, controlling the symptoms with antiasthmatic medicines is the main component of most asthma treatments.¹⁶ In this study, a close relationship has been found between the oral and systemic condition which is emphasized by this findings that children with systemic diseases, such as asthma had significantly higher prevalence of dental caries than the healthy children. In this study, out of 100 children aged 4 to 17 years were examined in this study, of which 30 were male whereas 20 were female in the study group and in control group, 28 were male and 22 were female. Among 50 asthmatic children, there were 30 children from the age group 4 to 10 years and 20 from 11 to 17 years, whereas among the asthma-free children, 26 were from the age group 4 to 10 years and 24 were from the age group 11 to 17 years. Similar findings were reported by Jayakumar et al¹⁷ in Bangalore city. Kirstila et al¹⁸ reported female preponderance, which was attributed to the fact that living in ill-ventilated houses, use of cow-dung cakes and agriculture waste as fuel for cooking and girls always helping the mothers to cook in the kitchen lead to airway inflammation and asthma.

In this study, the asthmatic children had a higher mean DMFT/dmft score when compared to asthma-free children and the difference was found to be statistically significant. Similar study findings were by Khalilzadeh et al¹⁹ which showed higher (mean \pm SD) DMFT (3.3 ± 2.8) in asthmatic children as compared to the healthy controls. The possible cause of an increase in caries prevalence among asthmatic patients has been related to the use of beta 2-agonists in the treatment of asthma which leads to a reduction in the salivary flow. Stensson et al,²⁰ Shashikiran et al,²¹ and McDerra et al²² do not demonstrate a positive association between asthma and dental caries.

GINA has subdivided asthma by severity, based on the level of symptoms, airflow limitation, and lung function variability, into four categories: Intermittent, mild persistent, moderate persistent, or severe persistent (Table 9). Classification of asthma by the severity of symptoms is useful when decisions are being made about management at the initial assessment of a patient. Severity is not an invariable feature of an individual patient's asthma, however, may change over months or years.²³

In this study, when dental caries status DMF/dmft was assessed based on this asthma severity, a higher percentage of children suffering from moderate persistent asthma had decayed teeth whereas only a few percent- age of children in severe persistent asthma category had decayed teeth. Similar findings had been reported by Anandhan et al,²⁴ Stensson et al),²⁵ and Anjomshoa et al.²⁶ The increase in caries prevalence with the severity of asthma may be mainly due to the increase in the dosage and frequency of medication.²¹

In this study, it was seen that among the asthmatic children having decayed teeth, the more number of asthmatic children with decayed teeth were affected by using inhaler form of drug followed by combination of syrup and inhaler, syrup. Similar type of finding was seen in the study conducted by Reddy et al,²⁷ where (mean \pm SD) DMFT was found to be more in the asthmatic children using inhalers. The more number of asthmatic children with decayed teeth were affected by using inhaler form of drug, therefore, this might be attributed to long-term consumption of inhalers which contains fermentable carbohydrates, such as lactose monohydrate to improve the taste of the drug, and thus the tolerance of the patient to the same. Frequent consumption of these inhalers in combination with reduced secretion of saliva has a further negative effect of these drugs or increases the risk of caries.

Asthma is treated using many types of drugs. In this study, the choice of drugs for treating asthma was beta 2 agonists, steroids, and their combinations. In this study, it was assessed whether DMFT/dmft varied with these three prototypes. Results revealed that there was no statistically significant difference amongst the above three. However, the (mean \pm SD)

DMFT/dmft was more in beta 2 agonist than the steroids and combination of beta 2 agonist and steroids, however, not statistically significant. Findings were in agreement with the study conducted by Hamid et al.²⁸

The secretion rates of whole and parotid saliva is decreased by 25 and 35% respectively in asthmatic patients when compared with healthy control group. As reduced salivary flow is accompanied by concomitant increase in lactobacilli and streptococcus mutans in the oral cavity, it may be one of the major contributing factors for increase in caries rate. The intake of medication at night before retiring to bed is commonly seen due to poor patient awareness and also no oral hygiene measures were usually taken after medication. Diminution of salivation and lack of masticatory movements during the night might have further increased the cariogenic potential of medicines.

Conclusion

The results of this study have shown that patients living with asthma experience have higher dental caries. These findings suggest that the oral health assessment made was utilized to provide sufficient data to the consulting pediatrician to be aware of oral disease burden of asthmatic children. This would help to develop a need-based treatment protocol in asthma management so that due consideration is given to oral health while treating these asthmatic children. Asthmatic patients are recommended to adopt more precautionary oral hygiene practices and keep their caries activity under constant check.

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