

Asthma In Children- A Dental Perspective

Dr. Milind Wasnik¹, Dr. Ankita Moon², Dr. Shweta Bhayade³, Dr. Yogesh Bande⁴,
Dr. Prajakta Wankhede⁵, Dr. Miranda George⁶

¹Reader, Department of Pedodontics and Preventive Dentistry, Swargiya Dadasaheb Kalmegh Smruti Dental College and Hospital, Wanadongri, Nagpur, Maharashtra, India.

²Senior Lecturer, Department of Pedodontics and Preventive Dentistry, Dr. R.R. Kambe Dental College and Hospital, Akola, Maharashtra, India.

³Reader, Department of Pedodontics and Preventive Dentistry, Nanded Rural Dental College and Research Centre, Nanded, Maharashtra, India.

⁴Senior Lecturer, Department of Pedodontics and Preventive Dentistry, Nanded Rural Dental College and Research Centre, Nanded, Maharashtra, India.

⁵Senior Lecturer, Department of Pedodontics and Preventive Dentistry, Nanded Rural Dental College and Research Centre, Nanded, Maharashtra, India.

⁶Senior Lecturer, Department of Pedodontics and Preventive Dentistry, Pushpagiri College of Dental Sciences, Thiruvalla, India

ABSTRACT

Asthma is considered as the most common form of chronic childhood disease. The prevalence of asthma is more in children. It is commonly associated with a family history of atopy which includes problem with immune system which makes more prone to allergic diseases. The symptoms and exacerbations of asthma are frequently aggravated by a wide range of trigger factors which includes viral infections, outdoor allergens, indoor allergens and tobacco smoke. Asthma generally affects people of all ages but most commonly it occurs in childhood with peak prevalence between 6 to 11 years of age. Asthma is more common in boys than in girls until puberty, but after puberty the incidence is almost equal. A link between dental caries and asthma has biological reliability. Although there is increasing prevalence of asthma, only a few numbers of studies have investigated the relation of caries experience in asthmatic children during the last 30 years, and the results are somewhat conflicting.

KEYWORDS: Asthma, Dental Caries, Pediatric Dentistry.

INTRODUCTION

Preserving Asthma is considered as the most common form of chronic childhood disease. The prevalence of asthma is more in children. It is commonly associated with a family history of atopy which includes problem with immune system which makes more prone to allergic diseases.¹

Over the last decades, the prevalence of asthma has increased especially in children², but there is still no exact explanation for this increase in prevalence of asthma⁴. Asthma includes wide variety of symptoms such as recurrent wheezing, coughing, dyspnea, chest tightness, with symptoms being more prevalent in early morning and night time and often the quality of life is greatly reduced³. It occurs mainly when a child is having lower respiratory tract infection, and since a proper clinical diagnosis of asthma usually can be made with certainty by age 5, the early diagnosis, monitoring and treatment of respiratory symptoms are essential.¹

Majority of the children who developed initial signs of asthma will stopped wheezing by the age of six but almost 40% of children will continue to wheeze, who already developed asthma or who are in developing asthma phase at a later stage in life. In most of the children having mild asthma, the severity of symptoms reduces at an early puberty stage and may even fade away altogether. However, in children with severe asthma it is widely known and accepted that symptoms may continue to remain or return in early adulthood if they have disappeared in early stage⁵. There are three different patterns of recurrent wheeze which is generally observed in pediatric patients⁶ but recently a fourth wheezing pattern was described⁷. It should be noted that the wheezing patterns 1 and 2 can only be discriminated retrospectively. These patterns are not

suitable for use when treating the child.

Transient Wheezing (Children who generally wheeze during the first 3 years of life, but they do not wheeze after that age)

Non-atopic Wheezing (It is mainly associated with triggering factor which includes viral infection)

Persistent Asthma: (Wheezing which is associated with the following manifestations)

- Clinical manifestations of atopy which includes either eczema, allergic rhinitis or conjunctivitis, food allergy).
- Clinical manifestations of blood eosinophilia, and/or elevated total immunoglobulin E (IgE)
- Definitive IgE-mediated sensitization related to different foods in infancy and early childhood, and also the IgE-mediated sensitization to common inhaled allergens.⁸⁻¹¹
- Inhalant allergen sensitization which is prior to 3 years of age, particularly due to high levels of exposure to specific persistent allergens in the home.¹²
- History of asthma in parents⁹

Severe intermittent wheezing⁷: It consists of acute wheezing episodes which are infrequent and are associated with the following:

Respiratory tract illness associated with minimal morbidity.

Atopic characteristics which includes allergic sensitization, eczema and peripheral blood eosinophilia

PREVALENCE

Worldwide there are great variations in the prevalence of asthma. The International Study of Asthma and Allergies in Childhood¹³ in the mid 1990s showed that the highest rates are found in Peru, Australia, Singapore, United Kingdom and New Zealand while the lowest are in Russia and Albania. Prevalence rates are high in economically developed countries with a moderate climate, whereas the prevalence is low in rural subsistence and the communities which are economically developing. This study was repeated in 56 countries in children aged 13–14 years after an interval of 5–10 years and also in 37 countries in children aged 6–7 years.¹⁴ The findings associated with the study indicated that there is reduced international differences in prevalence of asthma, particularly in the 13–14-year age group. Asthma affects the people of all ages but most frequently the cases of asthma occur in childhood with significant peak prevalence between the ages of 6 and 11 years.¹⁵ Asthma is more common in boys as compared to girls until puberty but after puberty the incidence in both boys and girls is equal.¹⁶

ASTHMA and DENTAL CARIES

As the prevalence of asthma is increasing mostly in the pediatric population, it becomes essential to examine how this disease also affects other areas of health care and most remarkably the oral health.¹⁷ Mostly in children as the parents give more attention to their general asthmatic condition oral hygiene of these children is being neglected. Therefore, asthma is mostly considered as an important risk factor for the development of dental caries.^{18,19} A link between dental caries and asthma has biological reliability.²⁰ In spite of the fact that there is increase prevalence of dental caries in asthma, only a little numbers of studies have investigated the relation of caries experience in asthmatic children during the last 30 years, and mostly the results showed by this study are somewhat conflicting. Some authors have reported that there is a correlation between asthma and dental caries in children. These findings are basically obtained from studies done on small scale on children and adolescents.²¹⁻²⁵ While some of the studies have shown that there is no such connection between dental caries and asthma.²⁶⁻³⁰

DISCUSSION

Severity and length of the disease

It is very difficult to evaluate the relationship between asthma and caries experience in children due to factors such as its severity, and also due to fluctuation in its pharmacotherapy over time according to the seasons.²² According to *Eloot et al*³⁰ there is no significant effect on the risk of developing caries or

gingivitis in 3-17-year-old children with severe asthma. Similarly *Stensson et al*²² and *Ersin et al*³¹ did a study and were unable to demonstrate any correlation between the severities which are associated with asthma and period of exposure to medications with the caries prevalence in children. Whereas, in a study by *Milano et al*¹⁷ contradictory results were found where he concluded that prolonged use of asthmatic medication, in children with mixed dentition there was decreased likelihood of caries experience.

*Reddy et al*¹⁹ in his study however found a significant difference associated in both the primary and mixed dentitions of asthmatic children who are treated with various anti-asthma medications. The study also explained the statistically significant association between increasing prevalence of dental caries with increasing severity of asthma and it was most likely due to the enlarged dosage and also the frequency of medication which are required to treat severe asthma.

Medication

There are various effect of medication which are used during treatment of asthma in children. They can be discussed from several aspects which include:

Xerostomia:- There are three medications which are most commonly used in treatment of asthma which includes anti-histamines, corticosteroids and antiasthmatic inhalers. These medications have known to have xerostomic effects. The xerostomic effect is due to reduced salivary gland function and reduced salivary flow.²⁶ The resultant xerostomia will cause increase in caries risk which is frequently associated with long-term use of these medications used in treatment of asthma.

Medication frequency and time of day:- Children, who are medicated more often, have a greater risk of developing dental caries as their teeth are expose to a higher dosage of sugar-containing medications. Also the time of the day which includes if medication taken in the evening, before going to bed at night, and without mouth rinsing may also cause a significant risk for development of dental caries since salivation decreases at night time and ultimately reducing the protection against the medication.¹⁷

Medication type:- *Khalilzadeh et al*³² studied the effect of various medication type used in children with asthma on the DMFT score. He concluded that in children who are receiving only β 2- agonists alone had a greater prevalence of dental caries as compared to those children who are using corticosteroids along with β 2-agonists.

Mode of delivery:- The inhalation method is the most common mode of administering the asthma medications is by the use of a metered dose inhaler (MDI). Inhaled medications used in the treatment of asthma are delivered in a carrier powder which may contain a sugar to aid the child in recognizing the delivery of their medication by taste. Corticosteroids inhalers such as Becodisk (beclomethasone dipropionate) and also the Flixotide Rotadisk (fluticasone propionate) contain as much as 25 mg of large particle lactose per dose.³³

Salivary factors

Salivary flow rate:- The effect of reduced salivary flow has been explained in several studies.^{35,36} *Ryberg et al*²⁵ found that there exist a relationship between increased caries incidence and the regular use of inhaled β 2-agonists.

Salivary pH:- *Kargul et al*³⁷ found that there is a considerable decrease in both plaque as well as the saliva pH value over 30 min following the use of inhaler. This considerable decrease in pH value was below the critical value of 5.5 which ultimately leads to enamel demineralization. *Ersin et al*³¹ demonstrated that both the salivary flow rate and pH value were statistically lower in the children with asthma. There was a considerable negative correlation between the salivary flow rate and development of dental caries. (P= 0.023). Although the salivary pH was statistically lower in asthmatics group as compared to non-asthmatics group but it was not below the critical pH value.

Buffering capacity:- Various studies after doing the saliva analysis^{38,39} concluded that there was lower buffer capacity and increased bacteria load in the saliva of the asthmatic children as compared to the children in the control group, eventually supporting the hypothesis that the presence of asthma may increase the risk of caries.

Salivary composition:- Few studies^{40,41} indicated that, in asthmatic patients there is alteration in salivary composition. These alterations include low salivary buffering capacity, low calcium and phosphate, and also the low specific IgA which have less pronounced relation to increased risk of dental caries. In addition, the concentrations of total protein and amylase level in stimulated whole saliva were found to be lower in the asthmatic children, but it was not statistically significant.³¹

CONCLUSION

Children with asthma should be targeted for frequent dental examinations for preventive dental services. It is essential to develop an individualized and intensive preventive dental program for the asthmatic children according to their age as they are at higher risk for development of dental caries.

REFERENCES

1. Bacharier et al. Diagnosis and treatment of asthma in childhood: a PRACTALL consensus report. Review article. *Allergy* 2008; 63: 5–34.
2. W. Eder, M. J. Ege, and E. Von Mutius, “The asthma epidemic,” *New England Journal of Medicine*, vol. 355, no. 21, pp. 2226–2235, 2006.
3. W. M. C. Van Aalderen, G. G. Meijer, Y. Oosterhoff, and A. O. Bron, “Epidemiology and the concept of underlying mechanisms of nocturnal asthma,” *Respiratory Medicine*, vol. 87, pp. 37–39, 1993.
4. F. D. Martinez, A. L. Wright, L. M. Taussig et al., “Asthma and wheezing in the first six years of life,” *New England Journal of Medicine*, vol. 332, no. 3, pp. 133–138, 1995.
5. J. Gerritsen, “Follow-up studies of asthma from childhood to adulthood,” *Paediatric Respiratory Reviews*, vol. 3, no. 3, pp. 184–192, 2002.
6. Taussig LM, Wright AL, Holberg CJ, Halonen M, Morgan WJ, Martinez FD. Tucson Children’s Respiratory Study: 1980 to present. *J Allergy Clin Immunol* 2003;111:661–675.
7. Bacharier LB, Phillips BR, Bloomberg GR, Zeiger RS, Paul IM, Krawiec M et al. Severe intermittent wheezing in preschool children: a distinct phenotype. *J Allergy Clin Immunol* 2007;119:604–610.
8. Rhodes HL, Thomas P, Sporik R, Holgate ST, Cogswell JJ. A birth cohort study of subjects at risk of atopy: twenty-two-year follow-up of wheeze and atopic status. *Am J Respir Crit Care Med* 2002;165:176–180.
9. Castro-Rodriguez JA, Holberg CJ, Wright AL, Martinez FD. A clinical index to define risk of asthma in young children with recurrent wheezing. *Am J Respir Crit Care Med* 2000;162:1403–1406.
10. de Marco R, Pattaro C, Locatelli F, Svanes C. Influence of early life exposures on incidence and remission of asthma throughout life. *J Allergy Clin Immunol* 2004;113:845–852.
11. Phelan PD, Robertson CF, Olinsky A. The Melbourne Asthma Study: 1964–1999. *J Allergy Clin Immunol* 2002;109:189–194.
12. Illi S, von ME, Lau S, Niggemann B, Gruber C, Wahn U. Perennial allergen sensitisation early in life and chronic asthma in children: a birth cohort study. *Lancet* 2006;368:763–770.
13. The International Study of Asthma and Allergies in Childhood (ISAAC) Steering Committee. Worldwide variations in the prevalence of asthma symptoms: the International Study of Asthma and Allergies in Childhood (ISAAC). *Eur Respir J*, 12: 315–335, 1998.
14. Pearce N, Ait-Khaled N, Beasley R, et al. Worldwide trends in the prevalence of asthma symptoms: phase III of the International Study of Asthma and Allergies in Childhood (ISAAC). *Thorax*, 62: 758–766, 2007.
15. Taylor WR, Newacheck PW. Impact of childhood asthma on health. *Pediatrics*, 90: 657–662, 1992.

16. Nicolai T, Pereszlenyiova-Bliznakova L, Illi S, Reinhardt D, von Mutius E. Longitudinal follow-up of the changing gender ratio in asthma from childhood to adulthood: role of delayed manifestation in girls. *Pediatr Allergy Immunol*, 14: 280–283, 2003.
17. Milano M, Lee JY, Donovan K, Chen JW. A cross-sectional study of medication-related factors and caries experience in asthmatic children. *Pediatr Dent*, 28: 415–419, 2006.
18. Al-Dlaigan YH, Shaw L, Smith AJ. Is there a relationship between asthma and dental erosion? A case control study. *Int J Paediatr Dent*, 12: 189–200, 2002.
19. Reddy DK, Hegde AM, Munshi AK. Dental caries status of children with bronchial asthma. *J Clin Pediatr Dent*, 27: 293–295, 2003.
20. Meldrum AM, Thomson WM, Drummond BK, Sears MR. Is asthma a risk factor for dental caries? Finding from a cohort study. *Caries Res*, 35: 235–239, 2001.
21. Shashikiran ND, Reddy VV, Raju PK. Effect of antiasthmatic medication on dental disease: dental caries and periodontal disease. *J Indian Soc Pedod Prev Dent*, 25: 65–68, 2007.
22. Stensson M, Wendt LK, Koch G, Oldaeus G, Birkhed D. Oral health in preschool children with asthma. *Int J Paediatr Dent*, 18: 243–250, 2008.
23. Arnrup K, Lundin SA, Dahllof G. Analysis of paediatric dental services provided at a regional hospital in Sweden. Dental treatment need in medically compromised children referred for dental consultation. *Swed Dent J*, 17: 255–259, 1993.
24. Wierchola B, Emerich K, Adamowicz-Klepalska B. The association between bronchial asthma and dental caries in children of the developmental age. *Eur J Paediatr Dent*, 7: 142–145, 2006.
25. Ryberg M, Moller C, Ericson T. Effect of beta 2-adrenoceptor agonists on saliva proteins and dental caries in asthmatic children. *J Dent Res*, 66: 1404–1406, 1987.
26. Shulman JD, Taylor SE, Nunn ME. The association between asthma and dental caries in children and adolescents: A population-based casecontrol study. *Caries Res*, 35: 240–246, 2001.
27. Tanaka K, Miyake Y, Arakawa M, Sasaki S, Ohya Y. Dental caries and allergic disorders in Japanese children: the Ryukyus Child Health Study. *J Asthma*, 45: 795–799, 2008.
28. Bjerkeborn K, Dahllof G, Hedlin G, Lindell M, Modeer T. Effect of disease severity and pharmacotherapy of asthma on oral health in asthmatic children. *Scand J Dent Res*, 95: 159–164, 1987.
29. Hyyppa T, Paunio K. Oral health and salivary factors in children with asthma. *Proc Finn Dent Soc*, 75: 7–10, 1979.
30. Eloot AK, Vanobbergen JN, De Baets F, Martens LC. Oral health and habits in children with asthma related to severity and duration of condition. *Eur J Paediatr Dent*, 5: 210–215, 2004.
31. Ersin NK, Gulen F, Eronat N, et al. Oral and dental manifestations of young asthmatics related to medication, severity and duration of condition. *Pediatr Int*, 48: 549–554, 2006.
32. Khalilzadeh S, Salamzadeh J, Salem F, Salem K, Vala M. Dental Caries-Associated Microorganisms in Asthmatic Children. *Tanaffos*, 6: 42–46, 2007.
33. O'Sullivan EA, Curzon MEJ. Drug treatments for asthma may cause erosive tooth damage. *BMJ*, 317: 820, 1998.
34. Arnrup K, Lundin SA, Dahllof G. Analysis of paediatric dental services provided at a regional hospital in Sweden. Dental treatment need in medically compromised children referred for dental consultation. *Swed Dent J*, 17: 255–259, 1993.
35. Lenander-Lumikari M, Laurikainen K, Kuusisto P, Vilja P. Stimulated salivary flow rate and composition in asthmatic and non-asthmatic adults. *Arch Oral Biol*, 43: 151–156, 1998.
36. Laurikainen K, Kuusisto P. Comparison of the oral health status and salivary flow rate of asthmatic patients with those of nonasthmatic adults—results of a pilot study. *Allergy*, 53: 316–319, 1998.
37. Kargul B, Tanboga I, Ergeneli S, Karakoc F, Dagli E. Inhaler medicament effects on saliva and plaque pH in asthmatic children. *J Clin Pediatr Dent*, 22: 137–140, 1998.
38. Tootla R, Toumba KJ, Duggal MS. An evaluation of the acidogenic potential of asthma inhalers. *Arch Oral Biol*, 49: 275–283, 2004.
39. Mazzoleni S, Stellini E, Cavaleri E, et al. Dental caries in children with asthma undergoing treatment with short-acting beta2-agonists. *Eur J Paediatr Dent*, 9: 132–138, 2008.

40. Leone CW, Oppenheim FG. Physical and chemical aspects of saliva as indicators of risk for dental caries in humans. *J Dent Educ*, 65:1054–1062, 2001.
41. Sag C, Ozden FO, Acikgoz G, Anlar FY. The effects of combination treatment with a long-acting beta2-agonist and a corticosteroid on salivary flow rate, secretory immunoglobulin A, and oral health in children and adolescents with moderate asthma: a 1-month, single-blind clinical study. *Clin Ther*, 29: 2236–2242, 2007.