

Asthma in Children –A Review

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Abstract

Introduction: Asthma is the most common chronic childhood disease and it is the obstruction of the airways due to a reaction to immunological stimulants created as a result of epithelial damages, sub-endothelial collagen deposits, and the hypertrophy of Smooth muscles and mucous glands. Asthma affects children of all ages, and its negative impacts on the quality of life and educational performance as well as its direct and indirect expenses on the society are significant.

Method: The present study was conducted by searching Persian and English databases such as magiran, SID, Google scholars, and science direct pub med by using key words such as asthma and children's asthma. At first, a large number of studies was found from the databases on children's asthma, and then the studies less related to the present study were excluded.

Result: Asthma is a heterogeneous disease, and genetic as well as environmental factors are effective in its formation and progress. Almost 90% of asthmatic cases occur in childhood indicating the role of external as well as internal factors of asthma in childhood or before birth. Among the internal factors, we can refer to genetic predisposition, airways hyper-responsiveness, atopy, gender, and possibly race.

Conclusion: One can prevent the recurrence of the symptoms and control the disease by teaching the children how to use the drugs as well as providing the children with other trainings (by the medical staff and parents) about diets, correct way of taking drugs. However, the medical staff and parents need to make sure that the children have learnt the proper method of using the drugs they take.

Keywords: Asthma, children, review

INTRODUCTION

Asthma is the most common chronic childhood disease and it is the obstruction of the airways due to a reaction to immunological stimulants created as a result of epithelial damages, sub-endothelial collagen deposits, and the hypertrophy of Smooth muscles and mucous glands. Asthma affects children of all ages, and its negative impacts on the quality of life and educational performance as well as its direct and indirect expenses on the society are significant. The prevalence of asthma is growing in all societies especially developing countries and children and it has to do with the development of urbanization and its subsequent changes. The changes of life style and life conditions in developing countries over the last 30 years especially in urban societies, the role of nutrition, and changes in people's dietary habits in recent decades are among the factors affecting the prevalence of allergic diseases. The prevalence of childhood asthma in our country ranges from 2.7% to 35.4% and the average prevalence of asthma symptoms is 13.4% in Iran (1, 2, and 3). Asthma is one of the growing general health diseases. The causes of this disease is chronic inflammation and increasing airway responses that brings about symptoms such as wheezing, coughing, and shortness of breath at frequent times. The prevalence of asthma in children has been doubled in the last 20 years and it is the most common reason for visiting the emergency departments and children's absence from school (4). Given the report given by GINA (Global Initiative for Asthma), it has been estimated that 300 million people suffer from this disease all over the world, and it is estimated by the year 2025, another 100 million people will join to the above-mentioned group. The prevalence of asthma among

preschool children is more frequent than adults. Of every 10 children, one suffers from asthma (5). One of the most important causes of asthma attacks is upper respiratory infections especially viral infections that exacerbates the symptoms of the disease especially in children among whom these infections are prevalent (6). The clinical spectrum of the disease is quite diverse and different patterns are observed in the cellular level of the disease. However, the inflammation of airways is a constant characteristic across the disease spectrum, allergic asthma, non-allergic asthma, asthma caused by acetaminophen in all ages. Although this inflammation is observed from nose to end bronchioles, physiologically speaking inflammation is more dominant in bronchioles than other parts of the respiratory system (7). The prevalence of asthma depends on various factors including geographical, racial, and ethnic factors. Lifestyle and behavioral factors are known to affect asthma as well (8, 9). Despite the breakthroughs made toward asthma control and treatment, increased awareness, and improved diagnostic methods, asthma in children is growing. The hypothesis provided in this regard is the increasing trend of asthma prevalence is owing to the movement of societies towards modern western lifestyle, and the changes of the environment and behavioral patterns such as dietary changes, physical inactivity, and obesity affect asthma lifestyle (10). Moreover, asthma in children is followed by numerous complications including sinusitis that has been proved to be related to asthma. Furthermore, the complications arising from taking drugs such as dry mouth and tooth decay (resulting from using asthma sprays) are more prevalent in children (2, 11). Inhaled corticosteroids are known to be the first choice for treating bronchial asthma of children. In comparison to old inhaled

steroids, the advantage of these drugs is better efficacy and fewer complications. However, the management and control of asthma is difficult owing to factors such as lack of direct supervision on drug use by the children in school (11, 12). Given the high prevalence of asthma, the highly chronic nature of this disease in childhood, the involvement of different factors in creating and developing of this disease, and the necessity for recognizing these factors by the medical staff, parents, and their families, it was attempted to conduct a systematic study on this disease in children and its different aspects such as causes of the disease, its features, and ..., so that asthmatic children's parents and the medical staff are provided with an appropriate source of asthma.

MATERIALS AND METHODS

The present study was conducted by searching Persian and English databases such as Magiran, SID, Google scholars, and Science Direct Pub Med by using key words such as asthma and children's asthma. At first, a large number of studies was found from the databases on children's asthma, and then the studies less related to the present study were excluded. In the present study, it was attempted to use those studies that were more related to the subject of the present study. Thus, it was attempted to study the causes of asthma, methods of disease control, complications of asthma in children, barriers of disease management in children, and the strategies existing for improving and controlling the symptoms of asthma.

FINDINGS

Asthma is a heterogeneous disease, and genetic as well as environmental factors are effective in its formation and progress. Almost 90% of asthmatic cases occur in childhood indicating the role of external as well as internal factors of asthma in childhood or before birth. Among the internal factors, we can refer to genetic predisposition, airways hyper-responsiveness, atopy, gender, and possibly race. Among the environmental factors effective in the etiology of asthma, we can refer to the allergens both inside and outside the house (place of residence), occupational sensitizers, passive smoking, infections of the respiratory system, and possibly early life obesity and viral infection (1, 13). This disease has a higher prevalence in families with a low socioeconomic status and religious minorities. The prevalence of asthma among boys in puberty is almost twice as that of girls, but the prevalence of asthma in boys will be equal to that of girls after puberty (5). Based on its severity, asthma is divided into different kinds including mild intermittent, mild persistent, moderate persistent, and severe persistent. Moderate asthmatics are patients that show daily symptoms of more than 3 days and less than 7 days a week. They show night symptoms of more than one night a week, and have relative limitations for their daily activities. Spirometry indicates that the maximum forced expiratory volume of the first second (FEV1) is between 60-80% (4). Asthma in children suffering from intermittent asthma is observed by the daily symptoms of less than two days a week and night symptoms of less than two nights a month that creates no limitation for their activities. Asthma

attacks follows the viral respiratory infections and these infections cause the exacerbated inflammation of airways, exacerbation of the disease, disease progression, and disease persistence (6). The risk factors of this disease in children are divided into maternal risk factors, childhood risk factors, and socioeconomic risk factors. More specifically, one can refer to factors such as environmental pollutants, allergenic materials of birds, and upper respiratory system infections. Moreover, other factors including gender, mother's diet, child's exclusive breastfeeding until six months, smoking at home by one of the family members, and the history of respiratory sensitivity in the family have to do with the prevalence of asthma in children (7, 9). The extensive study of asthma as well as other allergic diseases in the world was first conducted by using the standardized questionnaire provided by the International Study of Asthma and Allergies in Childhood (ISAAC). Over the past few years, the prevalence of asthma as well as other allergic diseases in Iran has been reported to be 2.7-35.3%. The lowest frequency of asthma symptoms in children belongs to Kerman (2.7%) and Mashhad (2.8%). Moreover, the highest frequency belongs to Tehran (14, 15); the environmental pollutants and air pollution are possibly involved in the prevalence of this disease in a big city like Tehran. Sincerely, children's allergic asthma occurs through immunoglobulin E (IgE), there is a relationship between IgE serum level with increased responsiveness of airways and asthma. With the increase of asthma severity, the level of IgE greatly increases as well. Thus, it seems that studying the IgE level in children can be an appropriate diagnostic method for identifying the severity of asthma in children (8). Asthma brings about numerous complications in children. The relationship between asthma and sinusitis has been discussed since Galen's time. In a study conducted it was shown that 80% of asthmatic patients suffer from rhinitis, and more than 50% of the patients with sinus involvement suffer from asthma. Sinus involvement is likely owing to lack of control or bad control of asthma. There are different hypotheses on the relationship between sinusitis and asthma. The first theory is direct aspiration through upper airways to the lower ones. Next theory indicates Sino-bronchial reflex that is stimulated by cholinergic pathway (2). The studies conducted indicate that asthma brings about reduced salivary pH. Moreover, the inhaled drugs available for treating asthma result in dry mouth. Tooth decay is more frequently seen in asthmatic children than the others. The studies indicate that children who don't know how to use the inhaled drugs correctly will have more particles of the drugs in their mouths while using them, and this will lead to tooth decay (5). The National Asthma Education and Prevention Program (NAEPP), national cardiac and lung institutes, and national institutes of national health attempted to prevent asthmatic acute attacks and reduce children's visits to emergency departments by providing a scientific description of diagnostic instructions and treatments for the patients such as long-term strategies for asthma supervision and control and preventing its complications. The studies indicate that from 11 A.M to 7 P.M, the highest number of visits to emergency

departments has been due to asthma attacks. The crisis of asthma is more prevalent among boys and children living in rural areas (16). Inhaled corticosteroids and beta adrenergic are used as the most important drugs to control asthma in children (17). Over the recent years, a number of inhaled corticosteroids with pharmacokinetic, pharmacodynamics and low efficacy and bio-availability have been provided. According to the findings, using the inhaled corticosteroids has resulted in reduced hospitalization period as well as reduced asthma deaths (12). However, controlling the symptoms of the asthma and its management in children is highly difficult and challenging.

DISCUSSION

Asthma has become a serious and prevalent problem in both Iran and other parts of the world. In a meta-analysis study conducted in Iran, the prevalence of wheezing for 6-to-7-year-old and 13-to-14-year-old children has been reported to be 7.6% and 10.7% respectively (4). In a comprehensive study, according to the patients themselves, the prevalence of wheezing in 13-to-14-year-old children has ranged from 2.1% in Indonesia to 32.2% in England. Moreover, according to asthmatic children's parents, the prevalence of wheezing among 6-to-7-year-old children during a 12-month period varies from 4.1% in Indonesia to 32.1% in Costa Rica (11). In Iran, the highest frequency of asthma symptoms in children is reported to be for Tehran (35.4%) followed by Gorgan (28.2%). Moreover, the prevalence of asthma in Rasht, Sanandaj, Isfahan, Urmia, and Ahvaz has been reported to be 16.4%, 11.9%, 3.9%, 9.4%, and 9.8% respectively. The prevalence of asthma in 6-to-7-year-old and 13-to-14-year-old children living Asaluyeh has been reported to be 5.8% and 15.2% respectively (14, 15). There are significant evidences indicating that prenatal maternal stress disrupts the infant's immune responses, and this is likely to make him/her susceptible to diseases such as asthma through disrupting his/her innate immune system (17). Moreover, factors such as mother's health status, exposure to different germs, cigarette and tobacco smoke, and consuming fruits, vegetables, and different antioxidants have been proved to be effective in this regard (18). Some studies have referred to the protective effects of breastfeeding on reducing rate of asthma; reducing the child's exclusive breastfeeding to less than 4 months is associated with an increased risk of suffering from asthma at the age of six. Breastfeeding has proved to provide different and significant effects on the evolution of the immune system, reduced infections of early life, and spacing between pregnancies and its effect on the incidence of asthma (7). In another study, respiratory sensitivity in siblings has been reported as the most significant risk factor related to asthma, and breastfeeding was reported to be the most important protective factor for asthma (9). Reduced consumption of foods rich in antioxidants (fruits and vegetables), increased consumption of vegetable oil (margarine), and reduced consumption of fish oil are all associated with increased incidence of asthma. Consuming fruits and vegetables more than 3 times a week will result in reduced risk of suffering from asthma in 2-to-8-year-old children (10). Moreover, consuming

materials such as chocolate, chips, puffs, eggs, and fast foods will result in increased wheezing in children suffering from asthma (5). Global Initiative for Asthma (GINA) recommends the following drugs for asthma control: short-acting beta agonists (SABA), inhaled corticosteroids (ICS), long-acting beta-agonists (LABA), Leukotriene receptor antagonists (LTRA), systemic corticosteroids (SCS), and immunomodulators (anti-IGE) (19). The most effective and standard treatment for controlling severe asthma and asthma attacks is corticosteroids that are taken in two forms of systemic and inhaled, and the patients respond well to these drugs. Moreover, these drugs improves responsiveness to other drugs as well (20, 21). However, despite taking effective drugs, there are numerous cases of recurring the symptoms of the disease in children, and children are still suffering from asthma crises. Asthma management in children is challenging; it involves understanding the causes and avoiding the factors and both are multifactorial and unique to individuals. The children's understanding toward a disease and its factors are also quite different from those of the parents. Moreover, the individual's immediate environment is closely related to controlling asthma that is not permanently supervised by doctors. Given that most of the children spend most of their time at home, it can be said that the most significant factor for controlling asthma and its recurrence is the home environment (22). Obviously, the children are highly dependent on their parents, especially their mothers, to conduct the activities that have to do with taking care of themselves and they cannot manage to take care of themselves on their own and conduct activities such as correct use of medications. Parents as well as healthcare providers are the most important people for controlling and treating asthma in children. Children's presence in school, costs arising from the treatment, and the undesirable effects of the disease on family life are among the factors disrupting asthma management in children. For example, when the children spend their time at school and need to use inhaled drugs, they are not able to do so properly (15). Thus, controlling of asthma factors is possibly reduced. Furthermore, the problems and complications arising from using drugs improperly are much more in children than adults (23). Factors that are possibly effective for the incidence of asthma in children and are not given due attention include prenatal maternal anxiety, history of allergic diseases in siblings, lack of breastfeeding, and reduced consumption of anti-oxidants by the mother (5, 9, and 17). In this regard simple and cheap measures can be taken such as: teaching mothers to provide exclusive breastfeeding; conducting special techniques to reduce prenatal maternal anxiety; encouraging people to consume materials rich in antioxidant (such as fruits and vegetables); reducing the consumption of materials such as eggs, puffs, and chips, and screening children who has a sibling with a history of allergic diseases. By taking the above-mentioned measures, one can reduce the incidence of this disease in early childhood or at least prevent the exacerbation of its symptoms, and thus prevents the treatment expenses, children's physical and mental problems, and imposing additional burden on the society. Moreover, although

controlling the symptoms of the disease is improved through taking inhaled and systemic drugs (20), the management of asthma faces some difficulties for reasons such as children's lack of an appropriate understanding about the disease, their failure to use the drugs properly, and lack of conducting appropriate supervision by the medical staff and parents (22). One can prevent the recurrence of the symptoms and control the disease by teaching the children how to use the drugs as well as providing the children with other trainings (by the medical staff and parents) about diets, correct way of taking drugs. However, the medical staff and parents need to make sure that the children have learnt the proper method of using the drugs they take.

REFERENCES:

- Faghihi nia J, Sohrabian N, Asadian A. Relationship between body mass index and asthma in children. *Journal of Isfahan Medical School*.2009;27(98):468-477.
- Safari M, Mohebi N. The prevalence of sinusitis in children under the age of 12 years with asthma in Hamedan. *The Iranian Journal of Otorhinolaryngology*.2010;21(57):133-138.
- Karimi M, Mirzaei M, Akhondzardini R .Consumption of food and the prevalence of asthma symptoms and allergies in children. **Journal of Shahid Sadoughi University of Medical Sciences**.2011;19(1):35-44.
- Ghaffari Javad, Abbaskhanian Ali, Jalili Masoumeh. Evaluation of Intelligence quotient of children with moderate asthma compared to healthy children in 2011: Sari-Iran. *Medical Journal of Mashhad University of Medical Sciences*.2014;57(2):505-511
- Bahrololoomi Z, Bemanian M, Ghafourifard R, Ahmadi B. Evaluation and Comparison of DMFT in Asthmatic and non-asthmatic 6-12 Year Old Children in Yazd. *JSSU*. 2016; 24 (1) :23-33.
- Ahanchian H, Jafari S, Behmanesh F, Motavali hagi N, khakshour A. Evaluation the clinical effects of short -course montelukast on asthma symptoms due to viral upper respiratory tract infection in children with intermittent Asthma. *JNKUMS*. 2013; 5 (1) :17-23
- Oshnooi S, Salari lak S, Khalkhali H, Karamiyar M, Rahimi rad M H. ASSOCIATION BETWEEN DURATION OF BREAST FEEDING AND ASTHMA AT CHILDREN BETWEEN AT AGE 2 -8 YEARS. *J Urmia Univ Med Sci*. 2012; 23 (1) :1-6
- Hashemzadeh A, Heidarian F, Hashemzadeh S. Total IgE and number of eosinophils in children with asthma. *Horizon of knowledge*.2004;10(4):23-27.
- Rajaeifard A, Moosavi Zadeh A, Pourmahmoudi A, Naeimi E, Hadinia A, Karimi A. Evaluation of Prevalence and Related Factors of Pediatric Asthma in Children Under Six Years Old With Logistic Regression and Probit . *Armaghane danesh*. 2011; 16 (3) :272-281
- Oshnoyi S, Khalkhali H, Salarilak S, RahimiRad M H, Karmiyar M. The association between fruit, vegetable consumptions and childhood asthma at 2-8 years: A case-control study. *Koomesh*. 2014; 15 (2) :191-196
- Amirabadi F, M Khosravi. Comparison between Asthmatic and Healthy Children in ECC Frequency. *Journal of mashhad Medical School*.2013;37(4):271-280
- Khalilzadeh S, Bloorasaz M, Safavi A, Masjedi M R. Efficacy and safety of inhaled steroids in children with asthma: a comparison of Fluticasone Propionate with Beclomethasone. *Research in Medicine*. 2006; 30 (3) :201-205
- Cantani A. Pediatric Allergy, Asthma and Immunology. *Heidelberg*.2008; 725-873
- Gooya M, Shirvani A, Tahmasebi R, Omrani A, Gheybi M K, Darabi H et al . Prevalence of Asthma and Allergic Diseases and Its Risk Factors in School Children Aged (6-7 and 13-14 Years) in Assalouyeh City, Bushehr Province Based on III ISAAC Protocol Phase I, in 2014. *Iran South Med J*. 2017; 20 (1) :57-69
- Assadi T, Gheybi M, Shirvani A, Movahed A, Khoddami S, Ashourinejad A et al . Study of Prevalence and Risk Factors of Asthma and Allergic Diseases Among School Children (6-7 and 13-14 years) Based on ISAAC Protocol in Jam City, Bushehr Province in 2014. *Iran South Med J*. 2017; 19 (6) :972-981
- Nath JB, Hsia RY. Children's Emergency Department Use for Asthma, 2001-2010. *Academic pediatrics*. 2015;15(2):225-230.
- Searle A, Jago R, Henderson J, Turner KM. Children's, parents' and health professionals' views on the management of childhood asthma: a qualitative study. *NPJ Primary Care Respiratory Medicine*. 2017;27:53.
- Douros K, Moustaki M, Tsaouri S, Papadopoulou A, Papadopoulou M, Priftis KN. Prenatal Maternal Stress and the Risk of Asthma in Children. *Frontiers in Pediatrics*. 2017;5:202.
- Leung JS, Johnson DW, Sperou AJ, et al. A systematic review of adverse drug events associated with administration of common asthma medications in children. *Choonara I, ed. PLoS ONE*. 2017;12(8)
- Salam MT, Avoundjian T, Knight WM, Gilliland FD. Genetic Ancestry and Asthma and Rhinitis Occurrence in Hispanic Children: Findings from the Southern California Children's Health Study. *Calafell F, ed. PLoS ONE*. 2015;10(8).
- Zhang X, Jocelyn M, Biagini M, Veda K, Ashley U, Xiaoting Ch. Nasal DNA methylation differentiates corticosteroid treatment response in pediatric asthma: A pilot study. *PLOS ONE* .2017.
- Utkarshani J, Banerjee T, Romine W , Thirunarayan K, Sheth A , Kalra M. Investigation of an Indoor Air Quality Sensor for Asthma Management in Children.HHS Public Access.2012;1(2)
- Yoshihara S, Kikuchi Y, Saitou M, et al. Efficacy of a leukotriene receptor antagonist for pediatric cedar pollen allergy complicated by asthma. *Experimental and Therapeutic Medicine*. 2017;14(4):3233-3238.
- Zheng S, Yu Q, Zeng X, Sun W, Sun Y, Li M. The influence of inhaled corticosteroid discontinuation in children with well-controlled asthma. *Bhatt. GC, ed. Medicine*. 2017;96(35):7848.