Status Asthmaticus
In Infancy and Childhood

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بسم الله الرحمن الرحيم

(ربنا إننا سمعنا مناديا ينادى للإيمان أن آمنوا بربكم فآمنا ربنا فاغفر لنا ذنوبنا وكفر عنا سيئاتنا وتوفنا مع الأبرار)

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Historical review

The word 'asthma' is derived from the Greek aazein**,** meaning "sharp breath." The word first appears in Homer's Iliad **(Marketos and Ballas, 1982)**. Hippocrates was the first to use it in reference to the medical condition, in 450 BC. Hippocrates thought that the spasms associated with asthma were more likely to occur in tailors, anglers, and metal workers. Six centuries later, Galen wrote much about asthma, noting that it was caused by partial or complete bronchial obstruction. In 1190 AD, Moses Maimonides, an influential medieval rabbi, philosopher, and physician, wrote a treatise on asthma, describing its prevention, diagnosis, and treatment. In the 17th century, Bernardino Ramazzini noticed that there is a connection between asthma and organic dust. The use of bronchodilators started in 1901, but it was not until the 1960s that the inflammatory component of asthma was recognized, and anti-inflammatory medications were added to the regimens **(Rosner, 1981**). Asthma becomes a public health problem only in the last 35 years, it was increased dramatically in prevalence and now recognized as a major cause of disability, medical expense and death **(Beasley et al., 2004)**.

Definition

Asthma is a chronic disease of the respiratory system in which the airway occasionally constricts, becomes inflamed, and is lined with excessive amounts of mucus, often in response to one or more triggers. These episodes may be triggered by such things as exposure to an allergen, cold air, exercise , exertion, or emotional stress. In children, the most common triggers are viral illnesses such as those cause common cold. This airway narrowing causes symptoms such as wheezing, shortness of breath, chest tightness, and coughing, which respond to bronchodilators. Between episodes, most patients feel mostly well but can have a slight problem feeling out of breath for longer periods of time **(Helfaer et al., 1996)**.

Asthma is a chronic or recurring inflammatory condition in which the airway develops increased responsiveness to various stimuli, characterized by bronchial hyper-responsiveness, inflammation, increased mucus production, and intermittent airway obstruction. The symptoms of asthma, which can range from mild to life threatenings, can be usually controlled with a combination of drugs and environmental changes. Public attention in the developed world has recently focused on asthma because of its rapidly increasing prevalence, affecting up to one in four urban children **(Martinez et al., 2006)**.

Epidemiology of pediatric asthma

- **Internationally**

Asthma affects 5-10% of the population of an estimated 14-15 million persons, including 5 million children. The prevalence rate of exercis indused asthma (EIA) is 3-10% of the general population if persons who do not have asthma or allergy are excluded, but the rate increases to 12-15% of the general population if patients with asthma are included. The rate of exercise-induced symptoms in persons with asthma has been reported to vary from 40-90 % (**Smith , 2007)**. Asthma is common in industrialized nations such as Canada, England, Australia, Germany and New Zealand, where much of the data have been collected. The prevalence rate of severe asthma in industrialized countries ranges from 2-10%. Recent trends suggest an increase in both the prevalence and morbidity of the disease, especially in children younger than 6 years. Factors that have been implicated include urbanization, air pollution, passive smoking and change in exposure to environmental allergens **(Hartert and Peebles , 2006)**.

- **Epidemiology of pediatric asthma in Egypt**

In Egypt , 23.2 of wheezy infant were proved to be real asthmatics . Ashma prevelance among school children aged 5-15 years was found to be 8.2 % half of which are graded as moderate and severe **(El Lawindi, et al., 2003)**. **Abdel Latief,(2000)** studied the prevelance of asthma among 2321 secondary school students (13 – 20 years old) in four randomly selected districts (Miser El Gedida , Helwan , Shoubra and Abbaseia) and reported a prevelance of

pediatric asthma of 5.6%. In Port Said the prevalence of asthma in children aged 0 – 12 years was found to be 11.4% , the incidence of asthma among school children aged 5-15 years old was found to be 8.2 % **(Abo El-Maati , 2007)**.

Mortality and Morbidity of pediatric asthma

The estimate of lost work and school time from asthma is approximately 100 million days of restricted activity. More than 1.8 million emergency department visits occur annually. The figures from the 1997 National Institutes of Health report indicate an estimated 500,000 hospitalizations and 5000 deaths annually. International asthma mortality is reported as high as 0.86 deaths per 100,000 persons in some countries. Mortality is primarily related to lung function, with an eight fold increase in low socially economic patients, but has also been linked with management failure, especially in young persons. Other factors that impact mortality include blood eosinophilia and forced expiratory volume in one second (FEV_1) of 40-69% predicted **(Smith , 2007)**.

Potential risk factors for asthma

Age

Asthma prevalence is increased in very young persons and very old persons because of airway responsiveness and lower levels of lung function. The disease starts during the first year of life in at least 30 percent of pediatric patients, in over 50 percent before 2 years of age, and in about 80 percent by the time they reach school age. Approximately half of all children diagnosed with asthma have a decrease or disappearance of symptoms by early adulthood. The diagnosis of EIA is made more often in children and young adults than in older adults and is related to high levels of physical activity. It can be observed in persons of any age based on the level of underlying airway reactivity and the level of physical exertion **(Hartert and Peebles , 2006)**.

Race

Asthma occurs in persons of all races worldwide. In the United States, asthma prevalence especially morbidity and mortality are higher in blacks than in whites. Although genetic factors are of major importance in determining a predisposition to the development of asthma, environmental factors play a greater role than racial factors in the onset of the disease. National concern is that some of the increased morbidity is due to differences in treatment afforded certain minority groups **(Smith , 2007)**.

Sex

Asthma predominantly occurs in boys during childhood, with a male to female ratio of 2:1 until puberty, when the male to female ratio becomes 1:1. Boys are more likely than girls to experience a decrease in symptoms by late adolescence **(Smith, 2007)**. Epidemiological studies of both incidence and prevelance, have reported male predominence of asthma and atopic conditions before puberty and female predominence after puberty. There is evidence that airway development is different between sexes, with relative slow pace of air way development compared with growth of lung volumes in males. So called dysnaptic lung growth. In females, there is propotionate growth of airways to lung volume and as a sequence greater air flow rates at fixed portions of total lung capacity. Boyes have lower expiratory air flow rates at all comparaple lung volumes **(Osman, 2003)**.

Genetic factors

The understanding of the gene control that lead to the development of asthma is essential to its proper diagnosis and management. Results from twin studies have consistently found evidence that genetic factors contribute importantly to asthma **(Koeppen-Schomerus et al, 2001)**. Asthma is caused by multiple interacting genes, some having a protective effect and others contributing to the disease pathogenesis. Five potential asthma susceptibility genes or complexes have been identified using a positional approach.These are A desintergrin and metalloproteinase 33 (ADAM33), Dipeplidyl peptidase 10 (DPP10), Plant homeodomain zinc finger protein 11 (PHF11), SET domain

Bifurcated 2, G-protein related receptor for asthma (GPRA) and serine protease inhibitor Kazal type 5 (SPlNK5) **(Huang, 2005)**.

In 2002, Van Eerdewegh et al. reported the line mapping of the ADAM33 as an asthma and airway hyperresponsiveness (AHR) gene on chromosome 20P13. A survey of 35 single nucleondepolymorphism (SNPs) in genes showed that the ADAM33 variant might directly impact lung architechure and function **(Cookson, 2003)**. **Raby et al., (2004)** did not demonstrate the association of ADAM33 SNPs with asthma or airway responsiveness. The severity of asthma and response to treatment have been also suggested to be dependent on genetic modulators such as polymorphism of the β_2 receptors 9 found on chromosome 5 which is involved in bronchodilator response to β_2 agonist **(liggett , 2000)**.

Socioeconomic status

Asthma is a worldwide problem and occurs in all races, but its prevalence varies from less than 1% in developing countries to as high as 30% in different developed countries **(Beal, 2004).** Asthma is an expanded problem that has been considered to be more common in the more affluent and developed countries than the less affluent and developing countries **(Aligne and Weitzman, 2003)**.

Infections

There is evidence that viral infections in early childhood may also act on the immune system to modify the subsequent risk of allergic sensitization or asthma. Data from Africa indicate that measles infection in early life reduce the risk of allergen sensitization. Japanese school children, who develop a strong positive tuberculin skin test after Bacillus Calmette Guerin (BCG) vaccination, possibly signifying exposure to tuberculosis, also have reduced rates of allergy and asthma **(Shirakawa et al.,1997 and Lemanske, 1999)**. Finally, serological evidence of hepatitis A in Italian military recruits was associated with a reduced rate of allergy and asthma **(Matricardi et al., 1997)**.

Children in developing countries that still have higher rates of infectious diseases and lower immunization rates may be protected against the development of atopy, whereas those in countries that have better immunization, more access to antibiotics and better housing may actually increase their risk for development of allergic disease **(Rakes et al., 2004)**. However, in children with established asthma, the frequency of respiratory infections per year was found to be correlated to the degree of impairment in spirometric indices as FEV1, PEF 25-75 and PEFR **(El Falaki and Mansour, 2000)**.