

Childhood asthma

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Abstract

Asthma is the most common chronic disease of South African children, affecting growth and development and quality of life. Features supporting the diagnosis are a family or personal history of atopy, night cough, exercise-induced cough and/or wheeze and seasonal variation in symptoms. Asthma is on the increase in both developed and developing countries, in both rural and urban communities. The first part of this series aims to give a brief overview of the epidemiology, pathophysiology and diagnosis of childhood asthma.

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Introduction

Asthma is the most common chronic disease of South African children, affecting 10-20% of the population. Chronic asthma affects the growth and development of children and adversely affects their quality of life. Children with asthma are often absent from school and their school performance and learning may suffer. This results in many children having to pay a price for having asthma for the rest of their lives.

Definition

Asthma is clinically defined as a disease with symptoms of recurrent reversible lower airway obstruction. Presenting complaints are recurrent wheeze with or without cough triggered by multiple stimuli, including viral infections, allergens, irritants (pollution), exercise and sudden emotional changes (e.g. crying, laughing). These symptoms of bronchial hyperresponsiveness demonstrate reversibility in that they respond to an inhaled bronchodilator. Features supporting the diagnosis are a family or personal history of atopy, night cough, exercise-induced cough and/or wheeze and seasonal variation in symptoms.

Epidemiology

Asthma is on the increase in both the developed and developing countries of the world. In South Africa, its prevalence in children in Cape Town (measured by exercise challenge) was only three per cent in 1979. The International Study of Asthma and Allergies in childhood (ISAAC) showed an increase in all questionnaire measures of asthma (wheezing, exercise-induced wheeze, nocturnal cough, sleep disturbance due to wheeze and severe wheeze)

between 1995 and 2002, with a prevalence of wheezing of 20% and doctor-diagnosed asthma of 14.4% in 2002. Although South Africa was ranked 25th worldwide in the prevalence of clinical asthma, it ranked fourth in asthma mortality among the five to 34-year-old age group, and fifth for asthma case-fatality rates, with an estimated rate of 18.5 per 100 000 asthmatics.

Studies on asthma prevalence are based on two methodologies: those that measure asthma symptoms or self-reported asthma, and those that measure non-specific bronchial hyperactivity. Despite lack of standardisation of the methods used, a number of studies have indicated an increase in prevalence over time in both rural and urban communities. Yet, differences still persist between rural and urban populations and within urban areas by socioeconomic class. In addition, some of the data on self-reported symptoms or diagnosis of asthma may be clouded by differences in terminology used by respondents, depending on which language they speak or differing models of disease.

The increasing prevalence of asthma in children all over the world is a cause for concern. A great deal of research is being done to identify possible reasons for this. A so-called "Western lifestyle" has commonly been used to explain the increase. A westernised lifestyle implies a way of life in which children are exposed to a wide range of processed foods, indoor and outdoor allergens, and irritants, such as motor vehicle pollution, from early infancy. Until recently, children in many African countries, including South Africa, lived mainly in rural areas and were not exposed to the effects of a Western lifestyle. Early studies in a number of African countries showed an extremely low rural prevalence

of asthma, especially where children lived according to a traditional lifestyle. These same studies showed that asthma was not uncommon in urbanised African children. There has been an increasing tendency over the past 30 years for people in rural communities to move to the larger urban centres. Recent childhood asthma prevalence studies, particularly those from Ghana, Kenya and South Africa, have confirmed the urban-rural differences, but have shown a much narrower gap between them (Table I). This may be explained in part by possible exposure of rural children to agricultural chemicals and pesticides in the air, as well as to motor vehicle pollution, especially diesel particulates. There is an increasing tendency to acquire Western-style bedding and carpeting in homes in the rural areas that often harbour house dust mites.

Another proposition for the increase has been popularly called "the hygiene hypothesis". Naturally occurring infections and microbial exposure (e.g. children coming into contact with farm animals and manure) appear to protect against developing asthma. Reductions in these exposures over the past century as a result of increasing urbanisation, immunisation, improved household hygiene and early use of antibiotics appear to alter the immune system towards an allergic profile, rather than having its normal protective function. The majority of children with asthma are allergic individuals and exposure to common inhaled allergens such as house dust mite, certain pollens or cat dander will aggravate their symptoms.

Pathophysiology

There is clear evidence that asthma is associated with airway inflammation in which eosinophils and mast cells play a prominent role. This finding was previously based on adult experience, but recently, studies employing bronchoalveolar lavage in infants and young children have found that allergic asthmatics have increased eosinophils in the lavage fluid. Eosinophils are at relatively low levels in infants younger than 30 months. Furthermore, increased neutrophil numbers have been found in lavage fluid in children with asthma of greater persistence and longer duration.

Table I: Bronchial hyperresponsiveness in urban and rural black children and adolescents

First author, year of study enrolment	Population	Method of assessment of ^a BHR	BHR percentage
Levin 2005	Urban	Methacholine	15.5%
Mashalane 2002	Urban	Exercise	7.3%
Calvert 2000	Rural	Exercise	8.9%
	Urban	Exercise	14.9%
Steinman 1998	Rural	Histamine	17%
	Urban	Histamine	34.4%
Vermeulen 1990	Rural	Histamine	14.2%
Van Niekerk 1976	Rural	Exercise	0.14%
	Urban	Exercise	3.17%

a = bronchial hyperresponsiveness

Inflammatory changes mainly affect the airway mucous membrane lining. In addition to the inflammatory changes, goblet cells in the mucous membrane produce increased amounts of thick sticky mucus. A third component influencing airway narrowing is smooth muscle contraction of the bronchial wall, leading to bronchospasm and bronchoconstriction.

Airway inflammation is responsible for the characteristic feature of bronchial hyperreactivity, making the child with asthma vulnerable to weather changes, humidity, cold air, mist, non-specific irritants, and exercise-induced bronchospasm.

Diagnosing childhood asthma

The clinical history must enquire about the characteristic symptoms of wheezing and cough, especially at night. However, there are many other causes of wheezing apart from asthma. Multiple-trigger wheezers show symptoms between episodes, triggered not only by viruses but also by other precipitants such as allergens, exercise or cigarette smoke. Patients with this form of wheezing, associated allergic conditions such as eczema and allergic rhinitis, and a family history of allergies are far more likely to be true asthmatics and to require long-term therapy.

Symptoms and lung function tests serve to classify the child into intermittent and persistent asthma to guide the initial choice of therapy. Subsequent management requires assessment of asthma control.

Treating childhood asthma

Optimal treatment of asthma requires an understanding of the central concept of asthma control and how this is used to modify treatment. Environmental control and intermittent reliever therapy is all that is necessary for intermittent asthma. Persistent asthma requires regular anti-inflammatory controller therapy. Inadequate adherence and poor technique are more usual causes for treatment failure than incorrect drug selection. The patient's adherence must be assessed and technique of drug administration witnessed at every visit. The National Asthma Education

Programme (www.asthma.co.za) provides free patient and doctor educational materials and runs an asthma certificate course to teach doctors and nurses how to assess asthma, and to educate patients about medication use to achieve perfect asthma control.