

## **Chapter 2: Asthma and factors affecting it**

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### **Introduction**

Although physicians first recognised asthma over 1800 years ago, over the last four decades our understanding of underlying pathophysiology and different clinical presentations has developed rapidly.

During the 20<sup>th</sup> century, researchers thought that constriction of airway smooth muscle and excessive sensitivity of the airway to external stimuli (hyper-responsiveness) was the key feature of asthma. In the 1980s, it was recognised that airway inflammation was a cardinal feature, with structural changes in the airway (remodelling) present early in the development of disease.

Asthma remains one of the most important non-communicable diseases. It is a cause of substantial disability and death worldwide. As such, asthma requires global attention and commitment to lessen its burden.

### **Defining asthma**

The definition and classification of asthma has also evolved. The Global Initiative for Asthma (GINA) describes asthma as “a heterogeneous disease, usually characterised by chronic airway inflammation. It is defined by the history of respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary over time and in intensity, together with variable expiratory airflow limitation”. Although not strictly a definition, this description captures the essential features for clinical purposes.

For population-based studies, where doctor diagnosis is not practicable, questionnaires are the tool of choice. Questions about more recent symptoms (in the past 12 months) are more reliable than questions about symptoms in the past, reducing errors of recall. The most commonly used standard question is “Have you [has your child] had wheezing or whistling in the chest in the past 12 months?”; when the answer is ‘yes’, the term ‘current wheeze’ is commonly used, or ‘current asthma symptoms’. However, asthma can also cause shortness of breath, chest tightness and cough.

In 2018, a Lancet Commission suggested a range of new ways of thinking about asthma, its mechanisms and its treatment, challenging conventional concepts of asthma as a single disease and proposing a more targeted approach. Notwithstanding these novel ideas, it remains clear that most people with asthma symptoms improve with asthma medicines. The use of the term asthma as a clinical diagnosis is still useful in most patients because it opens the door to appropriate management to reduce disease burden; however in low- and middle-income countries (LMICs), where most of the people with asthma live, this basic asthma care may still be non-existent or out of reach.

### **Asthma medicines**

The two key essential asthma medicines are: (i) bronchodilators (most commonly  $\beta$ -agonists) that reverse airway narrowing by relaxing airway smooth muscle, and (ii) corticosteroids, which treat the underlying airway inflammation; inhaled corticosteroids (ICS) are known as preventers (called “controllers” by GINA). The inhaled route, with the use of a spacer, is the best way to administer both of these classes of medicines. Inhalation is more effective and has fewer side effects than the oral route. In 2017 the World Health Organization added an ICS/long-acting  $\beta$ -agonist (LABA)

combination to its Essential Medicines List. Approaches to management with these medicines are discussed in Chapters 5 and 13

### ***Course of asthma over the lifespan***

It is not possible to define a single natural history for asthma and it can develop at any stage in life, including adulthood. However, asthma symptoms most commonly develop for the first time in early childhood. Young children of pre-school age often wheeze with viral infection, but only about half of them go on to have characteristic asthma at school age. Children who have frequent or persistent wheeze are more likely to have evidence of airway inflammation and remodelling, impaired lung function, and persistently troublesome symptoms into adulthood. Some reports raise the possibility that childhood asthma, persisting into adulthood, may predispose people to chronic obstructive pulmonary disease (COPD).

### ***Factors affecting asthma***

Asthma is often described as an allergic disease in which allergens or certain workplace exposures can trigger attacks of airway narrowing and, through continued exposure, lead to airway inflammation and enhanced airway responsiveness. However, this paradigm came from observations predominantly in western high-income countries, and the association between allergy and asthma is much weaker in LMICs (see figure); overall allergic mechanisms are involved in half, or less, of the people with asthma. Some occupational causes of asthma do not appear to involve allergy. In many people, asthma probably involves non-allergic inflammation of the airways, although we do not understand well the mechanisms involved.

Research has found that both genetic and non-genetic factors affect asthma. Asthma attacks are often triggered by upper respiratory tract infections, including common colds. Other factors that may provoke asthma attacks include inhaled allergens (dust mites, animal fur, cockroaches, pollens, moulds, allergens in the workplace), inhaled irritants (cigarette smoke, fumes from cooking, heating or vehicle exhausts, cosmetics, aerosol sprays), medicines (including aspirin), exercise, emotional stress, and certain foods or beverages.

However, there is no recognised cause, either biological or environmental, for the underlying asthmatic process. However influencers include genetic susceptibility, environmental tobacco smoke, air pollution, mould and damp, animals, antibiotics and paracetamol (acetaminophen), some occupational exposures, diet and obesity, and (lack of) breastfeeding. Repeated exposure to triggers or influencers can contribute to the severity and persistence of asthma.

### **Conclusion**

The understanding of asthma has developed since the 1980s, with new ways of thinking about asthma recently proposed. It is vital that asthma essential medicines are accessible for all people who have asthma symptoms. At the same time, commitment to research that increases the understanding of asthma and its causes, and leads to improvements in asthma management are essential. Environmental factors are much more likely than genetic factors to have caused the increases in asthma prevalence in some regions of the world, but we still do not know all the factors and how they interact with each other and with genes. Some of these factors may act in different ways in affluent and non-affluent countries.

### **Box statement**

Although many causes and biological mechanisms may lead to asthma, the clinical diagnosis of asthma is useful in the majority of patients because it will open the door to appropriate management to reduce disease burden.

In low- and middle-income countries the proportion of people with non-allergic asthma is greater than in high-income countries. Also, environmental factors may act differently in these settings.

### **Recommendations**

Governments need to ensure all people with asthma can access essential asthma medicines.

Governments should commit to research that increases the understanding of asthma, its causes, and leads to improvements in management.

Governmental policies, such as those reducing tobacco consumption, encouraging healthy eating and reducing exposure to potentially harmful chemicals, smoke and dust, should be strengthened.

Governments should also support further research into known asthma triggers and identifying the causes of asthma.

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**Figure:** Odds ratios (OR) with confidence intervals for the association of current wheeze with skin prick test reactivity. Source: Weinmayr et al (2007)

