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Asthma and smoking

research report **ash.**
action on smoking and health

Definition and summary

Asthma is a condition which affects a person's airways. When a person with asthma is exposed to an asthma trigger, the airway lining becomes inflamed and begins to swell, making it difficult to breathe. The disease can vary in severity from one person to another and for each individual over time. A person having an asthma "attack" will often feel short of breath, tight-chested and may cough or wheeze. Asthmatic triggers are anything that irritates the airways to cause the symptoms of asthma and can include animal hair, exercise, food, dust-mites, medicines, pollen, the weather and tobacco smoke.^{1,2,3}

Exposure to tobacco smoke either through active smoking or by secondhand smoke (SHS) can cause and/or exacerbate an asthma attack or asthma symptoms.^{4,5,6} People exposed to SHS in the home have a five-fold increased risk of developing asthma.^{7,8} Since the introduction of smokefree legislation in England in 2007, there has been a substantial decline in the number of hospital admissions for childhood asthma.⁹

The development of asthma is thought to be a combination of genetic disposition and exposure to environmental factors in early childhood.¹⁰ People can also develop asthma in adulthood, known as adult-onset asthma. Adult-onset asthma usually develops after a viral infection or as a result of exposure to irritants in the work place, including certain chemicals and types of dust.¹¹ There is also some evidence to suggest that obesity may have a role to play in the development of asthma although the mechanisms are not yet understood.¹²

In the UK, 5.4 million people live with asthma which is one of the highest asthma rates in Europe.¹³ The World Health Organization has estimated that globally there are 300 million people with asthma, and 250,000 people die of the disease every year.¹⁴

Morbidity and mortality

On average three people die from asthma every day in the UK,¹⁵ with up to nine in ten of those deaths being preventable.¹³ Approximately three quarters of hospital admissions for asthma are avoidable.¹³ Asthma has been estimated to cost the National Health Service (NHS) around £1 billion annually.¹³

Asthma has a significant impact on the quality of life of many people and exposure to SHS is known to aggravate symptoms. Numerous studies have shown that people with allergies and/or asthma experience more nasal symptoms, headaches, cough, wheezing, sore throat, hoarseness, eye irritation and a general aggravation of asthma symptoms when exposed to tobacco smoke.^{16,17,18}

Incidence of Asthma

Asthma in adults

Asthma is often thought of as a childhood disease, but it can affect people at any age. The severity and impact of the disease can change over the course of a person's life time. There are currently around 4.3 million adults (around 1 in 12) receiving treatment for asthma in the UK.¹⁹

Recent evidence suggests that people with a hereditary disposition to asthma are at added risk of developing asthma in adulthood when they are exposed to SHS.²⁰

It can sometimes be difficult to distinguish the difference between asthma and other conditions such as bronchitis, emphysema and chronic obstructive pulmonary disease (COPD).²¹ For some people, shortness of breath may be the only symptom of asthma. Consequently a diagnosis of asthma is often difficult to pinpoint in adults. However asthma can develop at any stage in a person's life so it is important that people seek medical treatment if they are having difficulty with their breathing.

Asthma in children

Asthma is the most common chronic disease of childhood. There are approximately 1.1 million children receiving treatment for asthma in the UK.²² Exposure to SHS has been found to trigger the development of asthma and exacerbate symptoms.²³ There is also research which suggests that asthma is a leading cause of school absenteeism.^{24,25,26,27}

A 2006 study found that regular cigarette smoking by adolescents increased the risk of asthma in teenagers with no lifetime history of asthma or wheezing. Teenagers who smoked regularly were four times more likely to develop asthma over the next eight years than nonsmokers.²⁸ This shows that the health consequences of smoking emerge quickly and that tobacco smoking can cause asthma.

A study presented in 2014 at the European Respiratory Society International Congress in Munich found that children whose fathers smoked before their conception are at up to three times the risk of developing asthma. Non-allergic asthma (minus hayfever) was 58 per cent more common in children with a father who smoked before conception and fathers who smoked before the age of 15 were three times as likely to have asthmatic children; this only dropped to 2.7 times for those who started early, but who stopped smoking five years before conceiving a child. Women who stopped smoking before conceiving were no more likely to have a child with asthma.²⁹

Occupational asthma

Prior to the implementation of smokefree legislation, tobacco smoke was an important trigger of asthma amongst adults in the workplace and in certain occupations exposure to tobacco smoke remains a risk factor.

According to the Health and Safety Executive, there were 177 new cases of occupational asthma diagnosed by chest physicians in 2013, of which 90 were assessed for disability benefit.³⁰ However these figures are likely to be an under representation as some cases will be diagnosed by a GP, not a specialist chest physician. On average, there have been 268 new cases of occupational asthma diagnosed in the UK every year over the last decade.³⁰

A recent investigation of data from 2006-2012 indicates that about 30% of the total number of work-place respiratory disease cases were asthma, and of these, about half were reported as aggravated by work with a further third reported as being caused by a particular workplace agent.³⁰

A systematic review undertaken by the British Occupational Health Research Foundation, reported that cigarette smoking increases the risk of occupational asthma in workers exposed to some sensitising agents.³¹ Although the mechanism is unclear, there are a number of studies which identify smoking as a factor which increases sensitisation.³¹

The Asthma UK Workplace Charter, which can be downloaded from the HSE website states that no one should have to work in an environment that makes them ill.³²

The impact of tobacco smoke on asthma

Active smoking in people with asthma

The *National Review of Asthma Deaths* examined data relating to 195 asthma deaths, occurring between February 2012 and January 2013 in the UK. The expert panels identified factors that could have avoided the death related to patients, their families and the environment in 126 (65%) of those who died. These included current tobacco smoking in 37 (19%), exposure to secondhand smoke in the home, non-adherence to medical advice and non-attendance at review appointments. Fifty-five (28%) of the 195 people who died from asthma were current smokers (39) or exposed to secondhand smoke (16).³³

Both the NHS and Asthma UK recommend that people with asthma avoid smoking.^{3,34} It has been estimated that 39% of people with asthma in Europe are current smokers,³⁵ although a population-based international cohort study focussing on Europe reported that 25% of people with asthma were smokers.³⁶

According to the Centers for Disease Control in the US, 21% of Americans with asthma are current smokers.³⁷ Statistics vary between states with the highest rates found in Kentucky where 32% of people with asthma are smokers. In American studies, younger age groups (18 to 35 years) reported higher levels of current smoking among those with asthma (27.6%) than those without (20.4%).³⁸ The study found no difference in the age of initiation to smoking, nor the duration of smoking years (length of time) or intensity of smoking (the number of cigarettes smoked) by people with asthma compared to those without.

Tobacco smoke not only damages the cilia in the lungs, the tiny hairs that help to sweep irritants such as dust, smoke and pollen from the airways,³⁹ but it can cause permanent damage to the airways. For people with asthma who smoke, there is both a heightened and a suppressed inflammatory response compared to those who do not smoke.⁴⁰

People with asthma who smoke

- are likely to experience higher rates of hospitalisation than those with asthma who do not smoke.⁴⁰ A study published by the British Thoracic Society in 2010 found that 33% of people with asthma attending hospital for urgent asthma care were current smokers and 18.8% said they were former smokers.⁴¹
- have worse symptoms and experience a more rapid decline in pulmonary function than those who have asthma but do not smoke. They are also more prone to chest infections because the body is unable to clean the lungs properly.⁴² A 2006 study found that, compared to non-smokers with asthma, smokers with asthma had a higher number of respiratory symptoms similar to the early stages of chronic obstructive pulmonary disease (COPD).⁴³ However, one cohort study found no additional decline in lung function amongst people with asthma who smoke compared to those who do not.⁴⁴

Exposure to tobacco smoke either directly or indirectly can have a substantial impact on treatments for asthma:

- Inhaled corticosteroids are the most effective treatment currently available for chronic asthma but their efficacy is impaired by smoking.^{8,45} The reason for this is not entirely understood. However, it is thought that smoking interferes with the anti-

inflammatory action of the steroids. This could be due to increased mucus secretion and airway restriction in the smokers, or, alternatively, cigarette smoking may alter the molecular mode of action of the steroids. Further investigation is needed in this area.⁸

- It appears that smoking also impairs the efficacy of oral corticosteroids.⁴⁶
- Coupled with reduced lung function, tobacco smoke has been found to block the effectiveness of asthma medication.⁴⁷ One study found that, in smokers with mild asthma, increased doses of the inhaled corticosteroids were required to treat the disease.⁴⁸

Quitting smoking

The NHS, the US Centers for Disease Control and Prevention (US) and Asthma UK all advise smokers with asthma to quit smoking.^{49,50,51} Stopping smoking can improve the health of people with asthma and therefore every effort should be made to encourage those with asthma who smoke to stop.^{51,52} A 2006 study showed improved lung function and a fall in sputum neutrophil (phlegm) levels when people quit smoking for 6 weeks compared to those people who continued to smoke.⁵²

Secondhand smoke exposure in adults with asthma

Since 2007, smoking in indoor public places has been prohibited in the UK. However non-smokers can still be exposed to SHS at home, in outdoor workplaces (such as the patios of bars and restaurants), in private vehicles or in outdoor social settings.

The airways of a person with asthma are very sensitive to triggers. Tobacco smoke has been found to be a major asthma trigger and it can also affect the severity of an attack.^{53,54} Those with asthma should avoid exposure to tobacco smoke.

There is a growing body of evidence to show that SHS is a cause of asthma in adults.^{7,8,55} Research by the International Agency for Research on Cancer (IARC) shows the strongest causal effect of SHS exposure is chronic respiratory symptoms in adults.¹⁶ In addition, there is strong evidence that SHS causes asthma attacks⁵⁶ and exacerbates the symptoms.^{23,57,58}

Following the introduction of smokefree legislation in the UK, improvements in the respiratory health of people with asthma occurred rapidly. For example, in Scotland bar workers with asthma had reduced airway inflammation within three months of smoke-free legislation being implemented⁵⁹ and a larger national study of Scottish bar workers found that self-reported improvements in respiratory and sensory symptoms persisted after twelve months.⁶⁰

Secondhand smoke exposure in children with asthma

Children are especially vulnerable to SHS as they breathe more rapidly and inhale more pollutants per pound of body weight (a higher relative ventilation rate) than adults.⁶¹

Research suggests that an effective means of preventing asthma is to reduce exposure to SHS.^{23,62} One study found that parental smoking is a causal factor of asthma in children and the prevalence of asthma increases with the number of smokers in the home.⁶²

A review of 79 studies reported that exposure to pre- or post-natal SHS was associated with between 30-70% increased risk of incidents of wheeze, and 21-85% increased risk of

asthma in children.⁶³ The review concluded that the effects of SHS exposure on incident wheeze and asthma are substantially higher than previous estimates, and the authors argued that SHS exposure is an important risk factor for both conditions throughout childhood.⁶³ A further review of 20 studies found that exposure to SHS was associated with a 30% increased risk of physician-diagnosed asthma in childhood.⁶⁴

The Royal College of Physicians estimates that 15,400 new cases of asthma in 3-16 year olds are caused by passive smoking each year.⁶⁵ The College further estimates that exposure to secondhand smoke is responsible for over 100,000 GP consultations for asthma in the UK each year among 3-16 year olds, costing over £3 million. Additionally, it is estimated that there are over 1,400 hospital admissions of children aged 0-14 in England attributable to passive smoke exposure, at a cost of over £1.5m.⁶⁵

The principal source of exposure to SHS for children is the home. Before the introduction of smokefree legislation in the UK, around 2 million children were estimated to be regularly exposed to SHS in the home,⁶⁶ with approximately 40% of all children reported to be living in a household where at least one person smokes.⁶⁷ The 2012 Smoking, Drinking and Drug Use Survey of 11-15 year olds in England revealed that 67% of children continue to be exposed to SHS.⁶⁸

Exposure to SHS increases the severity and frequency of asthma attacks in children.⁶⁹ Children with asthma, whose parents smoke, are at least twice as likely to suffer asthma symptoms all year round compared to children of non-smokers. Wheeze and physician-diagnosed asthma are more common in children who live with a smoker and the prevalence of asthma increases with the number of smokers living in the home.²³ Children with asthma are also likely to have an impaired recovery after hospitalisation for acute asthma if returning to a home where there is a smoker.⁷⁰

An effective means of preventing asthma overall is to reduce the person's exposure to SHS.^{26,71} Smokefree legislation has helped to protect children from the dangers of SHS and reduced the risk of asthma attacks. For example, in England, the smokefree law resulted in a significant reduction in hospital admissions for childhood asthma.⁷² Similarly, in the US, a study of the impact of Arizona's 2007 statewide smoking ban revealed a significant reduction in hospital admissions for asthma.⁷³

Prenatal exposure to secondhand smoke and asthma

The adverse health effects of prenatal smoking have been reported in several countries and for several health outcomes. According to the Royal College of Physicians, maternal smoking during pregnancy is the leading preventable cause of foetal and infant ill health and death.⁷⁴ The College's 2010 report found that prenatal maternal smoking increases the risk of developing asthma in the first two years by around 90%.⁶⁵

Health outcomes of smoking or being exposed to SHS whilst pregnant include asthma, wheeze, bronchitis and nocturnal cough. Smoking during pregnancy also affects lung size formation of the foetus.

Results from a large study of over 50,000 children confirm the long-lasting harmful effects of smoking during pregnancy, independent of smoking later in the child's life.⁷⁵

Maternal smoking during pregnancy, known as in-utero exposure, has been associated with significant deficits in lung function and early onset asthma in offspring. One study showed that the deficits in lung function persisted into adolescence and were essentially unchanged after adjustments for lifetime SHS exposure and personal smoking.⁷⁶

Research suggests that the effects of in utero exposure appear to be independent from the effects of post-natal exposure to SHS. Early onset asthma contributes to significant deficits in lung function. The additional effect of in-utero exposure may produce a group of people who are at high risk for chronic respiratory diseases throughout their lives.⁷⁷

Conclusion

- The health of people with asthma is significantly affected by tobacco smoke.
- Tobacco smoke, both via active smoking and through exposure to secondhand smoke, has been found to be a cause of asthma.
- Smoking by people with asthma makes their asthma symptoms worse and their medication less effective.
- Parental smoking is associated with an increased prevalence of asthma and respiratory systems in children. For children with asthma, exposure to SHS, primarily by their parents, is associated with more frequent and more severe asthma attacks.
- Scientific research overwhelmingly shows that tobacco smoke increases asthma attacks and asthma symptoms both for people with asthma who are smokers and those people with asthma who are nonsmokers. Therefore, tobacco should be avoided.
- The cost of asthma to the NHS is borne largely by primary care. However, in addition to established costs such as medication and GP visits, there are hidden costs for both individuals with asthma and society at large. These include time off work following asthma attacks and restrictions on people's lives which are more difficult to quantify.
- The passing of smokefree legislation in the United Kingdom has helped remove one of the leading triggers for asthma and the health benefits of smokefree environments are now beginning to be felt both for people with or without asthma.

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[e enquiries@ash.org.uk](mailto:enquiries@ash.org.uk)

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