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Thunderstorm asthma: a paediatric emergency department experience in London

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ABSTRACT

The aim of this study was to characterise paediatric emergency department presentations during the 2023 thunderstorm asthma (TA) epidemic, characterised by a sudden surge in wheeze presentations, with analysis of environmental factors.

Wheeze presentations totalled 50 (28%) on 12 June and 18 (19%) 13 June. There was no prior asthma in 39 (57%) and no atopic disorders in 30 (44%). There was neither asthma nor atopic disorders in 8 (12%). 44 (65%) were severe or life-threatening. There were no endotracheal intubations and no deaths. High pollen and air pollution warnings were issued.

TA poses a significant, sudden health threat, often in children without asthma. A surge strategy is required.

Asthma exacerbations occur more commonly during the autumn and winter months but rarely during the summer.[1] We describe a period of unexpected presentations of wheeze to the paediatric emergency department (PED) in summer associated with a thunderstorm. The aim of this study was to characterise patients attending with wheeze during the thunderstorm asthma (TA) epidemic and to evaluate associated environmental factors.

A list of total PED attendances between 5 June 2023 and 14 June 2023 was generated using our electronic patient record system, the thunderstorm occurring 12 June. Data were extracted on wheeze presentations on 12 June and 13 June including demographics; asthma severity scores, atopic disorders and outcomes. Asthma severity was scored using the National Institute for Health and Care Excellence guideline (NG80). Basic statistical analysis was performed using Microsoft Excel.

The UK Met Office database was consulted for information on atmospheric pressure, pollen counts, air pollution and rainfall during the TA period.

There was an increase in patients presenting with wheeze on 12 June and 13 June, comprising 28% (n=50) and 19% (n=19) of PED attendances, respectively (figure 1).

The mean age of patients with wheeze was 8 years, 5 months. Median was 8 years with a range of 2–15 years. Males predominated (n=51, 75%).

There was no prior asthma in 39 (57%), there was a history of eczema or hay fever in 30 (44%) and allergy in 7 (10 %). There was neither asthma nor atopy in 8 (12%).

Regarding presentations with wheeze 24 (35%) were moderate, 40 (59%) severe and 4 (6%) life-threatening. There were 50 presentations on 12 June and 18 the following day only 8 (11%) were admitted and there was one reattendance. There were no endotracheal intubations and no deaths.

From 5 June to 16 June, there were air pollution[2] and pollen warnings (figure 2). On 11 June and 12 June, thunderstorms were forecast which correlated with UK health surveillance systems showing an increase in asthma symptoms and PED attendances.[3]

TA has been recognised since occurring in Birmingham, England, in 1983,[4] reoccurring 5 times in the UK and only 26 times globally until 2023.[5] Medical personnel are often unaware and so underprepared for TA resulting in a strain on acute medical services.

TA occurs during the spring or early summer months, when aeroallergens counts are higher. Research suggests that grass pollen grains, normally too large to be inhaled, get broken down into smaller particles. This happens by (1) lightning promoting electrical rupture of pollen grains and (2) rain causing osmotic rupture of pollen grains. The resultant 'pollen bomb' causes the release of allergenic starch granules at ground-level capable of penetrating lung epithelium, inducing an allergic reaction in susceptible individuals.[6]

The TA epidemic in London in 2023 was preceded by high pollen count and air pollution warnings, however, there was no prewarning of TA. Further TA was not widely acknowledged until patients began presenting in large numbers. 50 patients presented with wheeze of which 40% were severe with 18 presenting the

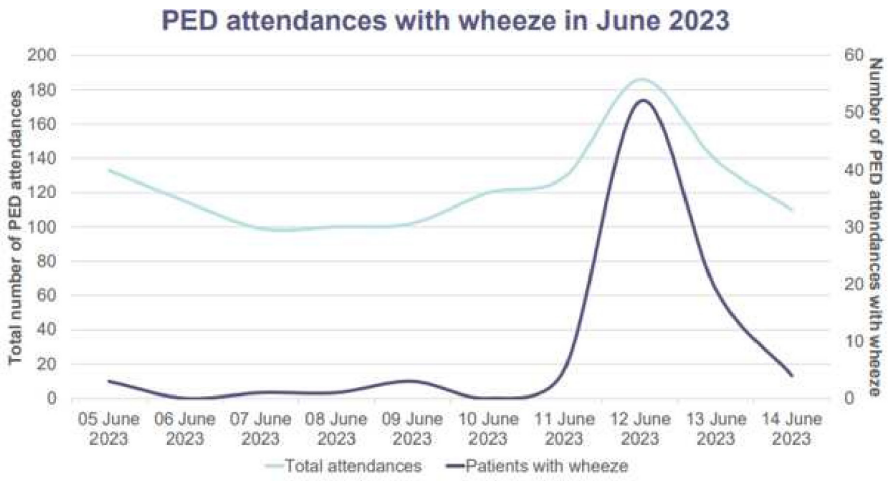

Figure 1 Total PED attendances and PED attendances with wheeze. PED, paediatric emergency department.

next day. This upswing in emergency department activity was recorded on a national scale.[2] 39 (57%) had never wheezed previously and although coexisting atopic disorders were found in 30 (44%) patients, 8 (12%) presented with no prior wheeze, eczema or hay fever. It is, therefore, crucial that TA warnings are given to the general populous. Actions to minimise risk to individuals may include mask-wearing, inhaled corticosteroids use as part of an asthma plan, taking antihistamines or even staying indoors

Emergency services preparedness is crucial when responding to TA with resource allocation key to avoiding catastrophe; in our study, most patients recovered well, however, in other TA epidemics, fatalities have occurred.[5] Therefore, resources should be available from preagreed clinical areas supplying medical, nursing and support professionals, medications and equipment.

This retrospective study is limited by reliance on the accuracy of documentation, however, we feel there are clear lessons for teams involved in children's emergency services. By working with public health, we can aim to more accurately predict the occurrence of TA and empower emergency services to better tackle this phenomenon with education given to all children not just those with a prior history of asthma.

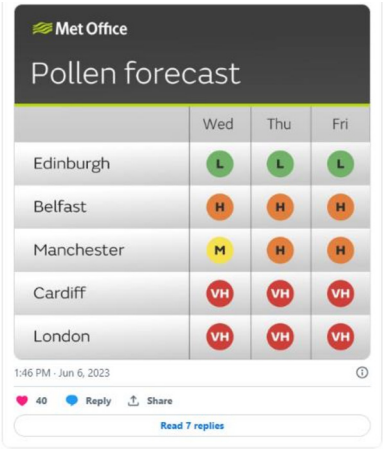

Figure 2 Met office pollen warning.

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