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SHORT REVIEW

Why are hospital admissions of children with acute asthma increasing?

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Why are hospital admissions of children with acute asthma increasing? E.A. Mitchell, K.P. Dawson.
ABSTRACT: The hospital admission rate for asthma has increased in many countries. Particularly prominent has been the increase for children, especially male children under five yrs. The increased admission rate refers to increased number of individuals and to increased frequency per individual. The moderate increase in asthma prevalence does not account for the large increase in admissions. Various other factors are discussed here, such as changes in admission criteria, medical management, and/or clinical expression of the disease.
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Asthma poses a major health problem. This is well illustrated by the high mortality rate in adults [1], although fortunately an uncommon event in children [2]; the rising hospital admission rates for acute asthma at all ages [3–5]; and the significant morbidity as measured by days lost from school or work [6].

Hospital admission rates for asthma in New Zealand have increased notably in all age groups since the mid 1960's [3]. In five yrs (1976–1981) national admission rates have almost doubled, and this increase has occurred uniformly throughout the country [7]. The increase is not restricted to New Zealand, but is an international phenomenon, although New Zealand and Australia show the most striking increases [8–9]. Particularly prominent has been the increase in admission rates for children, especially male children under five yrs [10–12].

Hospital admissions refer to events rather than individual patients. Therefore, these trends could possibly be explained by a tendency to more frequent admissions to hospital of those children who have established asthma and have an exacerbation, thus boosting the admission rates by numerous re-admissions. There is some evidence from studies in New Zealand and England that this is partially so, but the change is insufficient to account for the total increase in numbers [4, 11].

There have been many attempts, over several years, to establish prevalence rates for asthma. The surveys have used a wide variety of methodologies, which reflect the lack of a firm definition of the condition. The diagnosis of asthma has been variously based on questionnaire, examination, lung function tests and bronchial challenge tests. Unfortunately, the original hope that bronchial challenge tests would be the gold standard for the diagnosis of asthma has not been fulfilled [13].

Further confusion exists between "wheezing" and "asthma" [14]. Several studies have suggested that only a third of all children with histories of recurrent wheeze have been labelled as having asthma [15–17]. The prevalence of recurrent wheezing in western populations has been variously reported as between 2 and 39% and of asthma between 2 and 18% [18]. SMITH [19, 20] has reported an increase in prevalence in Birmingham, England from 1.8% in 1957 to 6.3% in 1975, but this increase could have been caused by a change of definition. In Lower Hutt, New Zealand, an increase in the reported prevalence from 7.1% in 1969 [21] to 13.5% in 1982 was found in the same two intermediate schools using the same questionnaire [22]. Although this study suggests that prevalence has increased it is not definite, as "asthma" may now be better recognized by the family practitioner and parent than was the case in 1969. However, even if the prevalence has increased it does not readily explain the huge increase in admissions.

Admission patterns could be influenced by change in the criteria for admission to hospital as perceived by the general practitioner or parents, such that more children with mild asthma are now referred for admission. This has been studied, retrospectively, in both New Zealand and England. Two of the studies suggested that the threshold for admission has remained unchanged

[10, 23]. One study suggested that the threshold has increased, so that not only are there more children admitted to hospital but they tend to be more severely affected [24]. A recent study, using a clinical scoring method for measuring severity, determined that in New Zealand significantly more asthma admissions could be graded as severe or very severe [25], compared with a similar study in the UK after the application of the same scoring method [26]. Mild cases were, therefore, not admitted disproportionately.

A further factor which has been implicated as the cause for increasing severity and increasing hospital admission rates is change in the medical management of asthma [27, 28]. There has been an impressive increase in asthma drug sales in many countries [29]. There have also been major improvements in asthma treatment in children, with better understanding of the pharmacokinetics of asthma drugs, improved formulations and better delivery systems. However, paradoxically this group has shown the greatest increase in hospitalization. There is now a real concern that sympathomimetics, whilst excellent for treating the acute episode, may in fact be making asthma worse in the long run by increasing bronchial hyperresponsiveness [30–32].

The evidence presented here suggests that there has been a small increase in asthma prevalence in children with a dramatic increase in the number of children with severe asthma requiring hospitalization. This could be explained by either an increase in the proportion of the population susceptible to asthma or by an increase in the clinical expression of the disease by those who are susceptible. This is illustrated in figure 1. A shift in the curve to the right (A to B) causes a small increase in the proportion of the population (area under the curve) with mild asthma but a much larger increase in the proportion with severe asthma.

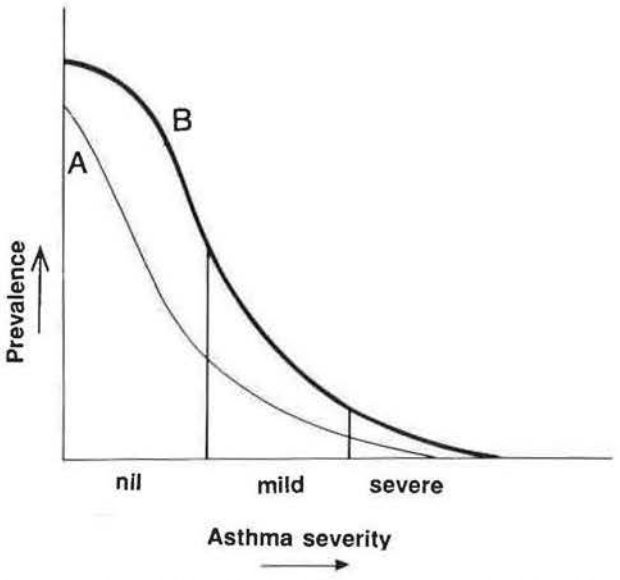

Fig. 1. – The effect on the prevalence of mild and severe asthma caused by a small change in the distribution of asthma (A to B).

The increase in hospital admissions for asthma in children is real and is not explained by diagnostic transfer, readmissions, or changes in admission criteria. The uniformity of the increase within New Zealand [7] and the smooth increase with time in all countries studied [8] suggests that whatever the factor, it is operating throughout the western world. Environmental factors such as pollution or airborne allergens, which may have produced this, seem unlikely culprits [33], but changes in diet cannot be excluded [34]. Medical management of asthma must be examined more closely. In particular, long-term trials are needed comparing asthmatics treated with regular sympathomimetics with those using sympathomimetics sparingly. The other major research need is to answer conclusively whether or not prevalence and severity of asthma is increasing.

References

1. Jackson RT, Beaglehole R, Rea HH. – Mortality from asthma: a new epidemic in New Zealand. *Br Med J*, 1982, 285, 771–774.
2. Sears MR, Rea HH, Fenwick T, *et al.* – Deaths from asthma in New Zealand. *Arch Dis Child*, 1986, 61, 6–10.
3. Jackson RT, Mitchell EA. – Trends in hospital admission rates and drug treatment of asthma in New Zealand. *NZ Med J*, 1983, 96, 727–729.
4. Anderson HR. – Increase in hospitalisation for childhood asthma. *Arch Dis Child*, 1978, 53, 295–300.
5. Khot A, Burn R, Evans N, Lenney W. – Seasonal variation and time trends in childhood asthma in England and Wales 1975–1981. *Br Med J*, 1984, 289, 235–237.
6. Anderson HR, Bailey PA, Cooper JS, Palmer JC, West S. – Medical care of asthma and wheezing illness in children: a community survey. *J Epidemiol Community Health*, 1983, 37, 180–186.
7. Mitchell EA, Borman B. – Demographic characteristics of asthma admissions to hospitals. *NZ Med J*, 1986, 99, 576–579.
8. Mitchell EA. – International trends in hospital admission rates for asthma. *Arch Dis Child*, 1985, 60, 376–378.
9. Halfon N, Newacheck PW. – Trends in the hospitalization for acute childhood asthma, 1970–1984. *Am J Public Health*, 1986, 76, 1308–1311.
10. Anderson HR, Bailey P, West S. – Trends in the hospital care of acute childhood asthma. *Br Med J*, 1980, 281, 1191–1194.
11. Mitchell EA, Cutler DR. – Paediatric admissions to Auckland Hospital for asthma from 1970–1980. *NZ Med J*, 1983, 96, 727–729.
12. Dawson KP, Allan J, Harwood LJ. – Trends in hospital admission with acute asthma in Christchurch, New Zealand 1974–1983. *Aust Paediatr J*, 1986, 22, 71–72.
13. Enarson DA, Vedal S, Schulzer M, Dybuncia A, Chan-Yeung M. – Asthma, asthma-like symptoms, chronic bronchitis, and the degree of bronchial hyperresponsiveness in epidemiologic surveys. *Am Rev Respir Dis*, 1987, 136, 613–617.
14. Williams HE, McNicol KN. – Prevalence, natural history and relationship of wheezy bronchitis to asthma in children. An epidemiological study. *Brit Med J*, 1969, 4, 321–325.

15. Sears MR, Jones DT, Silva PA, Simpson A, Williams SM. – Asthma in seven year old children: a report from the Dunedin Multidisciplinary Child Development Study. *NZ Med J*, 1982, 95, 533–536.
16. Peckham C, Butler N. – A national study of asthma in childhood. *J Epidemiol Community Health*, 1978, 32, 79–85.
17. Speight ANP, Lee DA, Hey EN. – Under-diagnosis and under-treatment of asthma in childhood. *Br Med J*, 1983, 286, 1253–1256.
18. Gregg I. – Epidemiological aspects. *In:* Asthma. T.J.H. Clark and S. Godfrey eds, Chapman and Hall, London, 1983, pp. 222–284.
19. Smith JM. – Prevalence and natural history of asthma in school children. *Br Med J*, 1961, 1, 711–713.
20. Smith JM. – The prevalence of asthma and wheezing in children. *Brit J Dis Chest*, 1976, 70, 73–77.
21. Milne GA. – The incidence of asthma in Lower Hutt. *NZ Med J*, 1969, 70, 27–29.
22. Mitchell EA. – Increasing prevalence of asthma. *NZ Med J*, 1983, 96, 463–464.
23. Mitchell EA. – The severity of asthma in children admitted to hospital. *NZ Med J*, 1987, 100, 638 (letter).
24. Dawson KP. – Admission of children to hospital with acute asthma: a 20 year review. *NZ Med J*, 1987, 100, 520–521.
25. Dawson KP. – The severity of acute asthma attacks in children admitted to hospital. *Aust Paediatr J*, 1987, 23, 167–168.
26. Conway SP, Littlewood JM. – Admission to hospital with asthma. *Arch Dis Child*, 1985, 60, 636–639.
27. Roe W. – Science in the practice of medicine: its limitations and dangers as exemplified by a study of the natural history of acute bronchial asthma in children. *Perspect Biol Med*, 1984, 27, 386–400.
28. McKay RJ, van der Westhuyzen JH. – The severity of asthma in children admitted to hospital. *NZ Med J*, 1987, 100, 638–639 (letter).
29. Keating G, Mitchell EA, Jackson R, Beaglehole R, Rea HH. – Trends in sales of drugs for asthma in New Zealand, Australia, and the United Kingdom, 1975–1981. *Br Med J*, 1984, 289, 348–351.
30. Kraan J, Koeter GH, van der Mark TW, Sluiter HJ, de Vries K. – Changes in bronchial reactivity induced by four weeks of treatment with anti-asthmatic drugs in patients with allergic asthma: a comparison between budesonide and terbutaline. *J Allergy Clin Immunol*, 1985, 76, 628–636.
31. Kerrebijn KF, van Essen-Zandvlier EEM, Neijens HJ. – Effect of long-term treatment with inhaled corticosteroids and beta-agonists on the bronchial responsiveness in children with asthma. *J Allergy Clin Immunol*, 1987, 79, 653–659.
32. Vathenen AS, Knox AJ, Higgins BG, Britton JR, Tattersfield AE. – Rebound increase in bronchial responsiveness after treatment with inhaled terbutaline. *Lancet*, 1988, i, 554–558.
33. Khan AU. – The role of air pollution and weather changes in childhood asthma. *Ann Allergy*, 1977, 39, 397–400.
34. Burney P. – A diet in sodium may potentiate asthma. Epidemiological evidence for a new hypothesis. *Chest*, 1987, 91 (Suppl. 6), 143s–148s.

Pourquoi les hospitalisations d'enfants atteints d'asthme aigu augmentent-elles? E.A. Mitchell, K.P. Dawson.

RÉSUMÉ: Le taux d'hospitalisation pour asthme a augmenté dans de nombreux pays. Ceci fut particulièrement le cas pour les enfants surtout de sexe masculin et âgés de moins de 5 ans. L'augmentation du taux d'admission se rapporte à la fois à un nombre accru d'individus et à une fréquence accrue par individu. L'augmentation modérée de la prévalence de l'asthme ne rend pas compte de la forte augmentation des hospitalisations. D'autres facteurs, tels que les modifications des critères d'admission, l'approche médicale, et l'expression clinique de la maladie, sont envisagés.

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