



Childhood asthma diagnosis and use of asthma medication

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AIM

To determine the burden of asthma in children.

METHODS

A cross sectional, randomised, computer assisted telephone survey of a community based sample of 2020 children aged 5–14 years in western Sydney (New South Wales) over a 20 day period from June 2000 to July 2000.

RESULTS

Main outcome measures were carer reported history of asthma diagnosis, hospital presentation/admission for asthma, recent use of anti-asthma medications, and recent respiratory symptoms. Diagnosed asthma was reported in 31% (of whom 42% were diagnosed aged 2 years or under) and asthma medications used in the previous year by 21% of children. Factors significantly associated with a reported asthma diagnosis included: male gender (OR: 1.51), birth in Australia (OR: 1.64), living in an English speaking household (OR: 1.47), Aboriginality (OR: 2.32), possession of a health care card (OR: 1.28), previous pneumonia (OR: 2.4) or pertussis (OR: 2.0), and a recent episode of croup (OR: 1.9). Exposure to tobacco smoke and immunisation status were not significant.

DISCUSSION

We confirm a high prevalence of asthma and medication use for asthma. The high proportion of children diagnosed asthmatic at 2 years or under (when asthma cannot be diagnosed reliably) suggests overdiagnosis of asthma may contribute to the apparent high prevalence.

Asthma is the most common chronic illness reported in childhood.¹ Its prevalence varies considerably between countries, ranging from 2–37%.² Australia has the third highest prevalence of childhood asthma² and between 1982 and 1992 its prevalence increased by almost 20% in children aged 8–10 years.³ The reasons for this are not clear, but changing case definitions are at least partly responsible.⁴

Of the risk factors for asthma, family history (especially maternal) and atopy are important.^{5–8} Males are over represented.⁹ Whether poverty is associated with increased asthma is uncertain, as it may be confounded by maternal smoking, low birth weight, and overcrowding.^{9,10} The effect of immunisation status has conflicting evidence: exposure to diphtheria/tetanus/pertussis (DTP) and polio immunisations was associated with an increased prevalence.^{11,12} There is an association between lower respiratory tract infections and asthma, especially pneumonia.^{13–16} However, whether this relationship is causal remains unclear.¹³ Upper respiratory infection shows the reverse relationship, with a reduction in later asthma diagnosis following reported early recurrent viral infections.¹² We attempted to re-examine these factors using a different approach.

Methods

A cross sectional, randomised, computer assisted telephone interview was conducted in the Western Sydney Area Health Service (WSAHS) area of New South Wales; a population of 665 827 residents. Over one-fifth (148 000) of residents are aged 14 years or less, 33% are born overseas, 26% come from a non-English speaking background, and there is also an Aboriginal and Torres Strait Islander population.

Telephone questionnaire

The telephone survey was conducted over a 20 day period in the winter of 2000, by a structured questionnaire administered by trained telemarketing researchers to households with at least one child aged 5–14 years. They asked about asthma admissions, other general medical history (including immunisation history) and standard demographics.

Twenty households were chosen by modified random digit telephone dialling. When there was more than one eligible child, the child whose birth date was closest to the interview date was selected. No incentive was offered for participation. We estimated a sample size of 2000 with a power of 80% assuming a prevalence of prolonged cough symptoms of 5% in this population.

The interviewer asked to speak to the primary health decision maker ('carer', defined as the person who took the child for immunisations or to the doctor when ill), and asked for their consent to be interviewed. Non-English speaking carers were excluded.

We created dichotomous variables for various clinical, demographic and social variables and undertook univariate analysis. Logistic regression was performed using a reported life time diagnosis of asthma as the outcome.

Ethics approval was obtained from the ethics committees of both the WSAHS and Children's Hospital at Westmead, NSW.

Results

A total of 23 842 telephone numbers were dialled. Of these, 24% (5817) were not contactable, 12% (2802) refused to participate

without eligibility being ascertained, 49% (11 610) were ineligible as no child aged 5–14 years resided in the house, and 7% (1593) were ineligible due to language difficulties. A total of 2020 interviews were completed. The median age of study children was 9.0 years; 52% were male. A majority of 87% (1758) were Australian born, 2% (34) were Aboriginal or Torres Strait Islander. At least one household resident was in possession of a current health care card in 31% (68) of households, and 32% (654) of the children were exposed to household tobacco smoke.

A doctor had diagnosed asthma in 31% (616) of the children; 42% (256) when the child was aged 2 years or under, 70% (431) when aged 4 years or under. The median age at diagnosis was 3.0 years with a mean age of 6.8 years. Asthma medications were used in the previous year by 69% (616) of children with an asthma diagnosis, and 30% (184) reported hospital admission and/or emergency room care for asthma.

We compared children with asthma diagnosed to those without (*Table 1*). Being male, being born in Australia, originating from an English speaking background, being from low socioeconomic households (possessing a health care card), and having Aboriginal or Torres Strait Islander descent had a significantly higher likelihood of having asthma diagnosed. A diagnosis of croup in the previous year, and a history of pneumonia and pertussis were associated with past asthma. We found no significant association between the presence of older siblings in the household, carer reported exposure to household tobacco smoke, or full immunisation status.

Children receiving an asthma diagnosis aged 2 years or under were significantly more likely to be male ($p=0.034$). These children also had a significantly ($p=0.048$) lower reported use of asthma therapies in the year preceding interview (65%, 165/256) compared to children diagnosed at an older age (72%, 259/360). But this was not significantly associated with Aboriginal or Torres Strait Islander descent ($p=0.60$), exposure to household tobacco smoke ($p=0.75$), or possession of a health care card ($p=0.11$).

In a logistic regression analysis, male gender ($p<0.001$), an English speaking background ($p=0.001$), and possession of a health care card by at least one household resident(s) ($p=0.008$) were significantly related to diagnosed asthma, while Aboriginal or Torres Strait Islander descent had borderline significance ($p=0.052$).

Discussion

We found that a high percentage of children are labelled as having asthma aged 2 years or under, when asthma cannot be reliably diagnosed. Wheeze at or below the age of 2 years is a nonspecific symptom, does not necessarily correlate with a diagnosis of asthma at an older age, and probably represents transient respiratory tract conditions such as 'floppy' airway that disappear after the age of 3 years.^{8,17,18} It is also unlikely that formal testing of airway responsiveness accompanies diagnosis at such a young age. The use of asthma medication was high, but was significantly lower in children diagnosed with asthma under the age of 2 years. This supports possible overdiagnosis in this age group. If there is overdiagnosis it is of concern. While adverse side effects of inhaled corticosteroids are rare, adrenal insufficiency can be life threatening.¹⁹ Other adverse effects include pulmonary mycosis, growth impairment and Cushing syndrome.^{20,22} On the other hand, the reported prevalence of diagnosed asthma in this study was consistent with another Australian study which used highly specific diagnostic measures.^{13,23}

Some of the associations of asthma with pneumonia, pertussis and recent croup, have been shown previously.^{13–16} The mechanism for this is not known. Perhaps children with an asthmatic predisposition are more susceptible to lower respiratory tract infections rather than vice versa.¹²

We found no association between asthma and vaccination. A prospective cohort study of children born in 1977 in New Zealand found a positive correlation of immunisation with DTP vaccine and a subsequent asthma diagnosis.²⁴ However, this study had small numbers of unvaccinated children and there was no

Table 1. Univariate risk factors for asthma

Parameter	Frequency (%)		Odds ratio (95% CI)	<i>p</i> value
	Asthma (n=616)	No asthma (n=1404)		
Gender				
Male (n=1050)	364 (59)	718 (51)	1.5 (1.3–1.8)	<0.001
Female (n=970)	252 (41)	686 (49)		
Age (years)				
5–9 (n=1167)	357 (58)	810 (58)	1.0 (0.8–1.2)	0.48
10–14 (n=853)	259 (42)	594 (42)		
Birthplace				
Australia (n=1758)	558 (91)	1199 (85)	1.6 (1.2–2.3)	0.0014
Overseas (n=262)	58 (9)	205 (15)		
Background				
English speaking (n=1454)	476 (77)	979 (70)	1.5 (1.2–1.8)	<0.01
Non-English speaking (n=566)	140 (23)	424 (30)		
Older siblings in household				
Yes (n=946)	300 (49)	646 (46)	1.1 (0.9–1.4)	0.26
No (n=1074)	316 (51)	758 (54)		
Aboriginal and Torres Strait Islander origin				
Yes (n=34)	17 (3)	17 (1)	2.3 (1.2–4.6)	0.013
No (n=1986)	599 (97)	1387 (99)		
Health care card				
Yes (n=618)	211 (34)	407 (29)	1.3 (1.0–1.6)	0.01
No (n=1402)	405 (66)	997 (71)		
Household tobacco smoke				
Yes (n=654)	205 (33)	449 (32)	1.1 (0.9–1.3)	0.57
No (n=1366)	411 (67)	955 (68)		
Lifetime diagnosis of pneumonia				
Yes (n=137)	68 (11)	69 (5)	2.4 (1.7–3.5)	<0.001
No (n=1883)	548 (39)	1335 (95)		
Lifetime diagnosis of pertussis				
Yes (n=87)	40 (7)	47 (3)	2.0 (1.3–3.2)	0.0013
No (n=1933)	576 (93)	1357 (97)		
Recent croup diagnosis*				
Yes (n=102)	45 (7)	57 (4)	1.9 (1.2–8.0)	<0.01
No (n=1918)	571 (93)	1347 (96)		
Receipt of DTP vaccine				
1 dose received				
Yes (n=1077)	329 (53)	748 (53)	1.0 (0.8–1.2)	0.96
No (n=943)	287 (47)	656 (47)		
3 doses received				
Yes (n=867)	273 (44)	594 (42)	1.1 (0.90–1.3)	0.4
No (n=1153)	343 (56)	810 (58)		

* Diagnosis of croup within 12 month period of survey

homogeneity between the immunised and unimmunised groups. More recently, studies conducted in England and in the USA reported no relationship of DTP vaccination and later asthma diagnosis.^{25,26}

The presence of an older sibling in the household has been reported to be protective against an asthma diagnosis,²⁸ with presence of older siblings in the household thought to be a proxy measure of childhood viral infection which has been shown to be protective against asthma diagnosis.⁷ However, we did not find such an association.

The International Study of Asthma and Allergies in Childhood (ISAAC) reported an increased prevalence of asthma in English speaking western countries.² This reflected our finding that diagnosed asthma was significantly higher in children from English speaking backgrounds. Possible reasons include lifestyle changes which predispose to the development of asthma and removal of protective environmental factors.

We found a significant association between the reported possession of a health care card (a measure of low socioeconomic status) and a lifetime diagnosis of asthma. The impact of socioeconomic status on asthma has been investigated in different countries.^{10,27} A New Zealand case control study of children aged 7–9 years for risk factors of asthma reported a low socioeconomic status significantly related to asthma.¹⁰ One study found that while low socioeconomic status was not directly related to increased asthma prevalence, it was associated with a reduced length of breastfeeding, increased frequency of parental smoking in the infant's first year of life, and a significantly higher report of parental difficulties; all of which were associated with asthma diagnosis.²⁷ Aboriginality was also associated with asthma diagnosis, but whether this is due to socioeconomic factors or other factors is unclear.

Interestingly, exposure to household tobacco smoke was not found to be related to reported diagnosed asthma. We were limited in the details of household smoke exposure, which may partly explain the lack of association. However, an Australian survey

of New South Wales school children found that while exposure to maternal tobacco smoke increased the incidence of current wheeze, it did not have an effect on airway hyperresponsiveness.²⁸

This study had a number of limitations, including recall bias. Parents of asthmatic children are more likely to report increased disability which would produce a greater perceived burden of disease in this cohort. However, asthma prevalence in our study is similar to that found in other Australian studies.^{3,23} Also, parental recall has been shown to be valid for clinical illness.²⁹ Questions about 'wheeze' and 'asthma' have good to excellent reproducibility, and self reported asthma diagnosis has been shown to be valid.^{30,31}

Our results suggest that asthma may be over diagnosed in young children. This may lead to overtreatment and unnecessary exposure to potentially dangerous medications. Our findings suggest that a revision of the current Australian practice in asthma diagnosis is required, and the need for educational support for general practitioners assessed. There is a need for clinical practice guidelines for the diagnosis of asthma and use of anti-asthma medications, particularly in children aged 2 years or under, where nonspecific wheezing is common.

Implications of this study for general practice

- Australia has a high prevalence of reported childhood asthma.
- Trends show a continued increase in the prevalence of this disease.
- We confirm the high prevalence of childhood asthma in western Sydney.
- Many children were diagnosed asthmatic aged 2 years or under, when asthma cannot be reliably diagnosed.
- Perhaps overdiagnosis of asthma contributes, in part, to the apparent high prevalence of childhood asthma.
- Many children aged 2 years or under were using asthma medications. These medications can have side effects and should only be prescribed when a definitive diagnosis of asthma is made.

Conflict of interest: none declared.

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