

# Prevalence of Wheeze, Night Cough and Doctor-Diagnosed Asthma in Pre-School Children in Kota Bharu

Ban Seng Quah<sup>1</sup>, Abdul Rasid Mazidah<sup>1</sup>, Ag Mat Hamzah<sup>2</sup>, Hamish Simpson<sup>1</sup>

In developed countries, asthma is the most common chronic disease of childhood, causing substantial morbidity, school absenteeism and disruption of family activities.<sup>1</sup> In addition, the rates of hospital admission<sup>2</sup> and attendance at general practitioners<sup>3</sup> for asthma in childhood have been increasing. Epidemiological studies in countries using standard methodologies support the impression that the prevalence of asthma and other atopic disorders is increasing.<sup>4,5</sup> Available data from Asian countries, though less comprehensive, suggest similar prevalence trends for these conditions.<sup>6</sup> The 12-month prevalence of wheeze in schoolchildren in Kuala Lumpur, Malaysia increased from 8% in 1990<sup>7</sup> to 12.3% in 1995.<sup>8</sup> Even though both surveys were conducted in the same geographical area, the questionnaires were different; the ATS-DLD-78C respiratory questionnaire in 1990 and the International Study of Asthma and Allergies in Children (ISAAC) questionnaire in

**SUMMARY** While many studies of the prevalence of wheeze have been conducted in schoolchildren, there have been few in pre-school children. Most children with asthma develop symptoms before the age of 5 years and many pre-school wheezers continue to wheeze in the early school years. Among the latter, those children who continue to wheeze at school age have poorer lung function than those who don't. It is thus appropriate to enquire more fully about wheeze in this age-group where its incidence is high and its relation with asthma less well defined. The objective of this study was to investigate the prevalences of wheeze, night cough and doctor diagnosed asthma in pre-school children. A cross-sectional study was conducted in five primary health clinics in the district of Kota Bharu from April to October 1998. Nurses from these clinics distributed Bahasa Malaysia questionnaires containing questions on asthma symptoms to pre-school children aged 1-5 years during their home visits. The respondents were parent(s) or carer(s) of the child.

The response rate was 100% and a total of 2,878 responses were analysed. The prevalence of symptoms and doctor diagnosed asthma were as follows: ever wheezed 9.4% (95% confidence interval (CI) 8.3-10.4%); current wheeze 6.2% (95% CI 5.2 to 7.0%); night cough 10.2% (95% CI 9.1 to 11.4%); and doctor diagnosed asthma 7.1% (95% CI 6.2 to 8.0%). There were no significant differences in prevalence between males and females, or among age groups. The prevalence of night cough in children with no history of wheeze was 6.9%. The cumulative and current prevalences of wheeze were similar to, and those of night cough and doctor-diagnosed asthma significantly lower than, those reported for Kelantan schoolchildren. These findings provide a baseline for assessing future symptoms trends, and perhaps also the validity of diagnosing asthma in this age group.

1995. The only epidemiological study of current wheeze in Kota Bharu used the ISAAC questionnaire and found prevalence rate of 5.4% in 5-7 years old and 6.8% in

From the <sup>1</sup>Department of Paediatrics, School of Medical Sciences, Universiti Sains Malaysia, Kubang Kerian, Kelantan, <sup>2</sup>District Medical Officer of Health, Maternal and Child Health Clinic, Kota Bharu, Kelantan, Malaysia  
Correspondence: Ban Seng Quah

12-14 years old.<sup>9</sup> A study using a similar questionnaire is necessary in the future to determine whether the prevalences of wheeze and asthma are increasing in this community.

While many studies of the prevalence of wheeze have been done in schoolchildren, prevalence studies in pre-school children are few.<sup>10</sup> While some pre-school children with respiratory symptoms become symptom free as they get older,<sup>11</sup> others develop symptoms for the first time later in childhood.<sup>12</sup> Although wheezing in children usually begins in early childhood,<sup>13</sup> most epidemiological surveys have not included this age group. About one-third of pre-school wheezers continue to wheeze in the early school years and there is objective evidence that those children with pre-school wheeze who continue to wheeze at school age have poorer ventilatory function, and higher rates of bronchial hyperreactivity, atopy and peak flow variability than asymptomatic schoolchildren.<sup>14</sup> Prevalence studies of pre-school respiratory symptoms conducted in schoolchildren are potentially inaccurate because of incomplete recall by parents. It is thus appropriate to enquire more fully in young children where the incidence of wheezing is high<sup>11</sup> and parental recall bias is less likely.

To the best of our knowledge, a prevalence study on wheezing in pre-school children has not been carried out in Malaysia. The aim of this study was to investigate symptoms, prevalence rates and relevant environmental, family and social risk factors. The latter will be reported separately. We report here cumulative and 12-month prevalence rates for wheeze, night

cough and doctor-diagnosed asthma in pre-school children.

## MATERIALS AND METHODS

### Study subjects and design

A cross-sectional study of pre-school wheezing was conducted in the district of Kota Bharu from April to October 1998. Five primary health clinics under the Ministry of Health, Malaysia, in the district of Kota Bharu were selected for the study: Kota Bharu, Pengkalan Chepa, Kubang Kerian, Wakaf Che Yeh, and Ketereh. All primary health clinics have trained nurses who conduct home deliveries and make regular postnatal home visits to examine newborns. The activities at these health clinics include routine antenatal health care and vaccination procedures. Home visits are also conducted by nurses to trace children who default their immunization schedules. Nurses were recruited from each health clinic to distribute questionnaires related to wheezing and cough in the community. The subjects were pre-school children aged 1-5 years living in the areas served by each health clinic. The children were divided into five age groups: 1 to < 2 years; 2 to < 3 years; 3 to < 4 years; 4 to < 5 years; 5 to < 6 years. Households were selected at random in the area where a home visit was necessary. One child aged 1-5 years was selected from each household without knowledge of his/her symptoms. The nurses in each health clinic were asked to select equal numbers of children in each age group and to some extent this influenced choices within families. The questionnaires were then given to the parent(s) or carer(s) to be completed following explanation of

their nature and purpose. Each questionnaire also contained an introductory paragraph explaining the nature of the study, and instructions on how to complete the questionnaire. The carer(s) were informed that their participation in the study was voluntary and that the information provided would be confidential. Completed questionnaires were collected by the same nurse two days later. Non-respondents were reminded by the nurse to submit their completed questionnaires. The sample size was calculated using standard sample size calculations. Assuming a prevalence of recurrent wheeze in the population of about 5%, a sample size of 2,000 would be required to be 95% certain of estimating an overall prevalence in the sample within a mean of 1% of its true value.

### Questionnaire

The questionnaire was adapted in part from an English questionnaire developed by Luyt *et al.*<sup>10</sup> for pre-school children and translated into Bahasa Malaysia, the national language. Questions relating to wheezing and night cough had previously been translated into Bahasa Malaysia from the ISAAC questionnaire.<sup>9</sup> The questionnaire concentrated on past and current wheezing episodes, night cough and doctor-diagnosed asthma (DDA). Children with "ever wheezed" were defined as those who had experienced an episode of wheezing in the past, while "current wheeze" referred to children who had wheezing in the past 12 months. The first section of the questionnaire dealt with the respiratory history, including symptoms such as wheeze, night cough and

DDA. The second section examined environmental risk factors, family's social status and family history of atopy and wheeze.

The presence of wheeze was elicited by the question "Has your child ever had wheezing or whistling in the chest at any time in the past?" and "Has your child had wheezing or whistling in the chest in the last 12 months?" Night cough was elicited by "In the last 12 months, has your child had a dry cough at night, apart from a cough associated with a cold or chest infection?" DDA was elicited by "Has a doctor ever told you that your child has asthma?"

### Analysis

All data were analysed using the EPI6 software (Version 6.02) for personal computers. Differences between groups were compared using the Chi square test. *P* values of less than 0.05 were considered to indicate statistical significance.

## RESULTS

All of the 2,882 parents included in the study responded. Four questionnaires were excluded from analysis because the children were less than one or more than six years of age. A total of 2,878 questionnaires were analysed.

The number of responses in each health clinic were as follows: Kota Bharu Clinic 637 (22.1%); Kubang Kerian Clinic 590 (20.5%); Pengkalan Chepa Clinic 568 (19.7%); Wakaf Che Yeh Clinic 581 (20.2%); Ketereh Clinic 502 (17.4%). Table 1 shows the number of children studied in each age group. There were 1,478 (51.4%) males and 1,400 (48.6%) females. The distribution by race was as follows: Malays 2,853 (99.1%); Chinese 22 (0.8%); Indians 2 (0.07%); others 1 (0.03%).

Table 2 shows the prevalence of respiratory symptoms and doctor-diagnosed asthma in these pre-school children. The point

Table 1 Distribution by age group and gender

| Age group (years) | Overall (n = 2,878) |      | Males (n = 1,478) |      | Females (n = 1,400) |      |
|-------------------|---------------------|------|-------------------|------|---------------------|------|
|                   | n                   | %    | n                 | %    | n                   | %    |
| 1 - <2            | 536                 | 18.6 | 280               | 18.9 | 256                 | 18.3 |
| 2 - <3            | 613                 | 21.3 | 313               | 21.2 | 300                 | 21.4 |
| 3 - <4            | 595                 | 20.7 | 308               | 20.8 | 287                 | 20.5 |
| 4 - <5            | 610                 | 21.2 | 299               | 20.2 | 311                 | 22.2 |
| 5 - <6            | 524                 | 18.2 | 278               | 18.8 | 246                 | 17.6 |
| Total             | 2,878               | 100  | 1,478             | 100  | 1,400               | 100  |

Table 2 Prevalence rates for respiratory symptoms in pre-school children by gender

|                         | Overall (n = 2,878) |      | Males (n = 1,478) |      | Females (n = 1,400) |      | P value |
|-------------------------|---------------------|------|-------------------|------|---------------------|------|---------|
|                         | n                   | %    | n                 | %    | n                   | %    |         |
| Ever wheezed            | 268                 | 9.3  | 150               | 10.1 | 118                 | 8.4  | 0.127   |
| Current wheeze          | 174                 | 6.0  | 99                | 6.7  | 75                  | 5.4  | 0.154   |
| Night cough             | 294                 | 10.2 | 147               | 9.9  | 147                 | 10.5 | 0.581   |
| Doctor-diagnosed asthma | 203                 | 7.1  | 105               | 7.1  | 98                  | 7.0  | 0.913   |

prevalence and 95% confidence intervals (CI) for respiratory symptoms were, for ever wheezed 9.4% (95% CI 8.3 - 10.4%), current wheeze 6.2% (95% CI 5.2 - 7.0%), night cough 10.2% (95% CI 9.1 - 11.4%) and DDA 7.1% (95% CI 6.2 - 8.0%). The male:female ratios were, for ever wheezed 1.2:1, current wheeze 1.2:1, night cough 0.9:1 and DDA 1.0:1. There were no significant differences between males and females in the prevalence of ever wheezed, current wheeze, night cough and doctor-diagnosed asthma.

Among 268 children who had ever wheezed, 139 (51.9%) were diagnosed by doctors to have asthma. In 174 children who had recent wheeze, 79 (45.4%) also had night cough. In 294 children who had night cough, 79 (26.9%) had recent wheeze and 80 (27.2%) DDA. The prevalence of night cough without a history of wheeze in the last 12 months was 6.9%. Of 203 children with DDA, 139 (68.5%) had ever wheeze, 104 (51.2%) had recent wheeze, 80 (39.4%) had night cough and 42 (20.7%) had no history of either

wheeze or night cough. Among children with night cough and DDA 22 (10.8%) had no history of wheeze.

There were no significant differences in the prevalence of ever wheezed ( $p = 0.21$ ), night cough ( $p = 0.22$ ) and DDA ( $p = 0.42$ ) among the age groups (Table 3). The prevalence of current wheeze in the age group 5 - < 6 years was significantly less ( $p = 0.006$ ) than in other age groups.

**Table 3** Prevalence rates for respiratory symptoms in each age group

|  | Overall (n = 2,878) |      | Males (n = 1,478) |      | Females (n = 1,400) |      |
|--|---------------------|------|-------------------|------|---------------------|------|
|  | n                   | %    | n                 | %    | n                   | %    |
| <b>Ever wheezed</b>                          |                     |      |                   |      |                     |      |
| 1 - < 2 years                                | 55                  | 10.3 | 35                | 12.5 | 20                  | 7.8  |
| 2 - < 3 years                                | 56                  | 9.1  | 30                | 9.6  | 26                  | 8.7  |
| 3 - < 4 years                                | 53                  | 8.9  | 28                | 9.1  | 25                  | 8.7  |
| 4 - < 5 years                                | 67                  | 11.0 | 34                | 11.4 | 33                  | 10.6 |
| 5 - < 6 years                                | 37                  | 7.1  | 23                | 8.2  | 14                  | 5.7  |
| <b>Current wheeze</b>                        |                     |      |                   |      |                     |      |
| 1 - < 2 years                                | 46                  | 8.6  | 30                | 10.7 | 16                  | 6.3  |
| 2 - < 3 years                                | 42                  | 6.9  | 25                | 8.0  | 17                  | 5.7  |
| 3 - < 4 years                                | 32                  | 5.4  | 19                | 6.2  | 13                  | 4.5  |
| 4 - < 5 years                                | 37                  | 6.1  | 16                | 5.4  | 21                  | 6.8  |
| 5 - < 6 years                                | 17                  | 3.2  | 9                 | 3.2  | 8                   | 3.3  |
| <b>Night cough during the past 12 months</b> |                     |      |                   |      |                     |      |
| 1 - < 2 years                                | 58                  | 10.8 | 28                | 10.0 | 30                  | 11.7 |
| 2 - < 3 years                                | 69                  | 11.3 | 33                | 10.5 | 36                  | 12.0 |
| 3 - < 4 years                                | 61                  | 10.3 | 32                | 10.4 | 29                  | 10.1 |
| 4 - < 5 years                                | 67                  | 11.0 | 33                | 11.0 | 34                  | 10.9 |
| 5 - < 6 years                                | 39                  | 7.4  | 21                | 7.6  | 18                  | 7.3  |
| <b>Doctor-diagnosed asthma</b>               |                     |      |                   |      |                     |      |
| 1 - < 2 years                                | 41                  | 7.6  | 23                | 8.2  | 18                  | 7.0  |
| 2 - < 3 years                                | 39                  | 6.4  | 21                | 6.7  | 18                  | 6.0  |
| 3 - < 4 years                                | 40                  | 6.7  | 20                | 6.5  | 20                  | 7.0  |
| 4 - < 5 years                                | 52                  | 8.5  | 23                | 7.7  | 29                  | 9.3  |
| 5 - < 6 years                                | 31                  | 5.9  | 18                | 6.5  | 13                  | 5.3  |

**Table 4** Prevalence rates for respiratory symptoms and doctor-diagnosed asthma in pre-school (1999), primary and secondary schoolchildren (1995)

|                         | 1-5 years (n = 2,878) |      | 5-7 years (n = 3,939) |      | 12-14 years (n = 3,116) |      |
|-------------------------|-----------------------|------|-----------------------|------|-------------------------|------|
|                         | n                     | %    | n                     | %    | n                       | %    |
| Ever wheezed            | 268                   | 9.3  | 328                   | 8.3  | 332                     | 10.7 |
| Current wheeze          | 174                   | 6.0  | 213                   | 5.4  | 213                     | 6.8  |
| Night cough             | 294                   | 10.2 | 803                   | 20.4 | 672                     | 21.6 |
| Doctor-diagnosed asthma | 203                   | 7.1  | 396                   | 10.1 | 269                     | 8.6  |

## DISCUSSION

In this study of a representative sample of pre-school children, the cumulative and current prevalence rates for wheeze were 9.3% and 6% respectively. More children experienced night cough (10.2%) than wheezing during the preceding 12 months, and 6.9% of children had only night cough without a history of wheeze at any time. The proportion (7.1%) of children with DDA was lower than the prevalence of ever wheezed (9.3%). There were no major differences in any of these prevalence rates in relation to gender or age groups.

There are no previous Malaysian data for this age group. Recent prevalence data for these symptoms are, however, available for school-aged children in Kota Bharu, and summarised together with the present findings in Table 4. The prevalence rates for ever and current wheeze in pre-school children are similar to those reported for 5-7 and 12-14 years old age groups, and the prevalence of night cough and DDA lower.<sup>9</sup> Epidemiological data such as these are limited by imperfect recall of symp-

toms. The respondents to written questionnaires in the present study and in that of 5-7 years old schoolchildren in the previous Malaysian study were parents or carers, whereas in 12-14 year olds symptoms were self reported.<sup>15</sup> Point prevalence estimates of wheeze after 5 years of age may significantly underestimate the cumulative prevalence<sup>11,16</sup> because previous episodes of wheeze may have been forgotten. To a lesser degree, under-reporting is also a problem in pre-school studies.<sup>10</sup> It has also been demonstrated that many children with early onset wheeze are asymptomatic in later life.<sup>11</sup> The fact that the parents of very young children report a similar cumulative prevalence of wheeze to the parents of older children strongly suggests that some episodes of wheeze that are perceived as significant by the parents of the younger children are forgotten as the child gets older.

The prevalence of night cough (10.2%) in this study was similar in all age groups and was significantly lower than for 5-7 years old (20.4%,  $p < 0.001$ ) and 12-14 years old (21.6%,  $p < 0.001$ ) Kota Bharu schoolchildren. About

two-thirds of pre-school children with night cough had never experienced wheezing. Even though a history of cough is commonly used in questionnaires in epidemiological studies, the reporting of cough has poor repeatability.<sup>10</sup> Cough as a symptom has been categorised as 'asthmatic'<sup>17</sup> and a trial of inhaled or oral steroids has also been advocated for children with cough alone.<sup>18</sup> However, it has been shown that the clinical features of children with persistent nocturnal cough resemble more closely these of the asymptomatic population than those of the asthmatic population, and that cough alone is not indicative of hidden or atypical asthma in most children.<sup>19</sup> Further, a randomised controlled trial of inhaled salbutamol and beclomethasone in children with cough alone showed that these medications were no different from placebo in reducing objectively-measured cough frequency.<sup>20</sup> It seems likely that most children with cough alone do not have asthma or increased bronchial hyper-reactivity but do have increased cough receptor sensitivity.<sup>21</sup>

The lower prevalence of

DDA in young children may reflect a reluctance by doctors to diagnose asthma in this age group. Many clinicians distinguish between infants who wheeze only in association with upper respiratory tract infection and those in whom wheeze is provoked by triggers, such as allergens, in the absence of infection.<sup>22</sup> Various diagnostic labels have been used for infants who wheeze only with upper respiratory tract infection, including wheezy bronchitis, spastic bronchitis, asthmatic bronchitis, asthmatoïd bronchitis, obstructive bronchitis and pseudoasthma.<sup>23</sup> These terms have arisen because of a reluctance to diagnose asthma either because of uncertainty about the diagnosis or fear that it will cause unnecessary parental anxiety.<sup>24,25</sup> In a general practice audit of asthma in childhood in the United Kingdom, a diagnosis of asthma in young children was made after an average of 20 consultations.<sup>24</sup> The present study shows that most wheezy children were labelled asthmatic, and that in a minority DDA was based on night cough alone. However 44 children without previous wheeze or night cough as defined were categorised DDA. There is no obvious explanation for this; the misdiagnosis of previous respiratory infections is a possible explanation that was not explored. Similarities between wheezy bronchitis and asthma in relation to allergic associations and pathophysiology<sup>15</sup> were stressed during the 1980s, leading to the suggestion that the same therapy was justified for both conditions.<sup>23</sup> However, the validity of the diagnosis 'asthma' made during the pre-school years will have to await longer term follow-up and assessment during the school years. Caution in diagnosing

asthma in wheezy pre-school children is further warranted to avoid confusion with the subgroups of pre-school wheezers who may or may not have asthma. For example, only a minority of children with acute respiratory syncytial virus bronchiolitis in infancy have asthma in later childhood, despite frequent episodes of cough/wheeze in early childhood.<sup>26</sup> Pre-existing airway narrowing may also predispose to wheeze in the first three years of life, and influence the presentation of acute bronchiolitis.<sup>27,28</sup> Preterm birth,<sup>29</sup> neonatal respiratory distress, bronchopulmonary dysplasia<sup>30</sup> and gastro-oesophageal reflux are also associated with early recurrent wheeze, not necessarily related to asthma.

Comparison with other reports is limited because so few have focussed on the pre-school age group. The prevalence rates of wheeze, cough and DDA in a population based study in Leicestershire, England,<sup>10</sup> differed considerably from the present study. The prevalence of cumulative wheeze in pre-school children in Leicestershire (15.6%) was significantly higher ( $p = < 0.001$ ) than in Kota Bharu (9.3%). The male:female ratio for wheeze was slightly higher (1.3:1) than in Kota Bharu (1.2:1). The absence of gender effect on DDA in this study differs from that in Leicestershire where a male preponderance was noted (1.4:1). Prevalence studies of wheeze in schoolchildren also support a male predominance,<sup>4,5</sup> which seems to increase until 16 years of age, after which a marked reversal in male:female ratio is observed.<sup>26</sup> However, no gender difference was observed in the prevalence of wheeze among schoolchildren in

Kota Bharu.<sup>9</sup>

The sample selected in any epidemiological study should be representative of the population of interest. Such samples are best obtained by random selection from the population using methods such as random sampling from birth records, telephone numbers or house addresses. None of these methods were possible in this study and the sample of pre-school children was selected as described from an area served by a health clinic during home visits by nurses. The study was conducted in five of eight main primary health centres of comparable size in the district of Kota Bharu. These centres were situated in geographically representative areas within the district, and utilised by most pre-school children. Whilst recognising the limitations of this approach, we had no reason to suspect that the group of pre-school children selected differed from that of the general population of pre-school children in this area.

In conclusion, the prevalence rates of 'asthma' symptoms in pre-school children in Kota Bharu were similar to those reported for school-aged children in an earlier report. Prevalence rates for the latter were lower than in large urban centres in Malaysia, notably Kuala Lumpur, but there are no available Malaysian data with which to compare our findings for pre-school children. However, the prevalence rates for pre-school children are much lower than those reported in a population based-European study. These data provide a baseline for future studies of symptom prevalence trends in this part of Malaysia.

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