



Universiti Sains Malaysia

Pusat Pengajian Sains Perubatan

School of Medical Sciences

9hb Februari 2003

Puan Latifah Abdul Latif,
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Pejabat Pengurusan & Kreativiti {enyelidikan
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Ruj Fail: FPP 2001/079

Melalui

Dekan
Jawatankuasa Penyelidikan
Pusat Pengajian Sains Perubatan

Puan,


Laporan Akhir Projek Penyelidikan USM Jangka Pendek
Asma, Rinitis Alergi dan Ekzema Di Kalangan Kanak-Kanak Sekolah, Kota Bharu: Perubahan Prevalens Dan Faktor-Faktor Risiko

Surat puan yang bertarikh 15 Januari 2003 dirujuk.

Bersama surat ini dilampirkan salinan laporan akhir projek "**Asma, Rinitis Alergi dan Ekzema Di Kalangan Kanak-Kanak Sekolah, Kota Bharu: Perubahan Prevalens Dan Faktor-Faktor Risiko**" untuk makluman dan tindakan puan.

Sekian terima kasih.

Yang benar,


Prof Madya (Dr) Quah Ban Seng
Jabatan Pediatrik
Pusat Pengajian Sains Perubatan

BAHAGIAN PENYELIDIKAN PUSAT PENGAJIAN SAINS PERUBATAN	
SALINAN :	
<input type="checkbox"/>	Big Penyelidikan, PESP
<input checked="" type="checkbox"/>	Perubatan, USMCK
<input type="checkbox"/>	RCMO
Tarikh : 26/2/03	

BAHAGIAN PENYELIDIKAN & PEMBANGUNAN

CANSELORI

UNIVERSITI SAINS MALAYSIA

Laporan Akhir Projek Penyelidikan Jangka Pendik

1) **Nama Penyelidik:** Prof Madya (Dr). Quah Ban Seng

**Nama Penyelidik-Penyelidik
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Dr. Wan Pauzi Wan Ibrahim
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2) **Pusat Pengajian/Pusat/Unit** : **Jabatan Pediatrik
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3) **Tajuk Projek:** **ASMA, RINITIS ALERGI DAN EKZEMA DI KALANAGAN
KANAK-KANAK SEKOLAH, KOTA BHARU: PERUBAHAN PREVALENS DAN FAKTO-
FAKTOR RISIKO**

4) (a) Penemuan Projek/Abstrak

(Perlu disediakan makluman di antara 100 - 200 perkataan di dalam Bahasa Malaysia dan Bahasa Inggeris. Ini kemudiannya akan dimuatkan ke dalam Laporan Tahunan Bahagian Penyelidikan & Pembangunan sebagai satu cara untuk menyampaikan dapatan projek tuan/puan kepada pihak Universiti).

Prevalens dan keterukan penyakit asma telah meningkat di negara-negara maju. Berikutan penyelidikan FASA I ISAAC dalam tahun 1995, penyelidikan FASA III ISAAC telah direka untuk menilaikan perubahan yang berlaku pada prevalens asthma dan penyakit alahan pada 5 tahun berikutnya.

TUJUAN: i) Untuk menilai prevalens asma, eczema rhinitis alergi di kalangan kanak-kanak sekolah di Kota Bharu dan untuk mengetahui corak perubahan prevalens ini, ii) untuk menilai factor risiko alam sekitar yang menyebabkan whiz dalam 12 belas bulan yang lepas.

METODOLOGI: Kertas soal selidik ISAAC telah disebar kepada 6,161 kanak-kanak sekolah dari Mac hingga Ogos pada tahun 2001. Kertas soal selidik ini diisi oleh ibubapa kanak-kanak sekolah rendah yang berumur 6 hingga 8 tahun ($n=3,157$) manakala kertas soal selidik ini diisi sendiri oleh kanak-kanak sekolah menengah yang berumur 12 hingga 15 tahun ($n=3,004$). Pita video ISAAC hanya di tunjukkan kepada murid2 sekolah menengah selepas mereka mengisi kertas soal selidik ini. Prevalens ini kemudiannya dibandingkan dengan prevalens pada tahun 1995.

KEPUTUSAN: Prevalens untuk "pernah whiz" diantara tahun 1995 dan 2001 didapati tidak berbeza di kalangan kanak-kanak sekolah rendah (8.3% 1995; 6.9 % 2001) dan di kalangan kanak-kanak sekolah menengah (10.7 % 1995; 12% 2001). Whiz dalam 12 bulan yang lepas juga didapati tidak berbeza di kalangan kanak-kanak sekolah rendah (5.4 % 1995; 4.3 % 2001) dan juga di kalangan kanak-kanak sekolah menengah (6.8 % 1995; 5.7 % 2001). Prevalens untuk batuk pada waktu malam dalam masa 12 bulan yang lepas didapati lebih rendah di kalangan kanak-kanak sekolah rendah dalam tahun 2001 (17.5%) jika dibandingkan dengan prevalens pada tahun 1995 (20.4%). Sebaliknya , di kalangan kanak-kanak sekolah menengah prevalens batuk pada waktu malam didapati lebih tinggi dalam tahun 2001 (8.3 %) jika dibandingkan dengan tahun 1995 (5.1 %). Prevalens rinokonjunctivitis dalam masa 12 bulan yang lepas didapati tidak berbeza di antara tahun 1995 dan 2001 di kalangan kanak-kanak sekolah rendah (4.1 % 1995; 5 % 2001) dan kanak-kanak sekolah menengah (11% 1995; 14.8% 2001). Prevalens ruam gatal di bahagian lipatan siku pula didapati lebih tinggi di kalangan kanak-kanak sekolah rendah dalam tahun 2001 (17.6 %) jika dibandingkan dengan tahun 1995 (14%), tetapi keadaan ini tidak berbeza dikalangan kanak-kanak sekolah menengah (12.1 % 1995; 13.4 % 2001)

Faktor risiko alam sekitar yang signifikan untuk whiz pada 12 bulan yang lepas ialah pengambilan ubat paracetamol dalam masa 12 bulan yang lalu OR 1.6 (95 % CI 1.2 -2.2 , $p < 0.001$) , pengambilan daging ≥ 3 kali dalam seminggu OR 1.5 (95 % CI 1.2- 1.9 , $P < 0.001$); terak lori yang sering melalui jalan-jalan berhampiran dengan rumah OR 1.4 (95 % CI 1.1 - 1.8 , $p = 0.003$), pengambilan susu ≥ 3 kali dalam seminggu OR 1.3 (95 % CI 1.0- 1.8 , $P = 0.04$), dan pengambilan buah ≥ 3 kali seminggu or 0.8 (95 % CI 0.6-0.9 , $p = 0.02$)

KESIMPULAN: Prevalens whiz lelah adalah didapati tidak berbeza pada tahun 2001 jika dibandingkan dengan tahun 1995 kecuali pada keadaan prevalens untuk batuk pada waktu malam. Untuk penyakit alahan didapati prevalens ruam gatal di lipatan siku lebih tinggi di kalangan kanak-kanak sekolah rendah pada tahun 2001.

4) (a) Penemuan Projek/Abstrak

(Perlu disediakan maklumat di antara 100 - 200 perkataan di dalam Bahasa Malaysia dan Bahasa Inggeris. Ini kemudiannya akan dimuatkan ke dalam Laporan Tahunan Bahagian Penyelidikan & Pembangunan sebagai satu cara untuk menyampaikan dapatan projek tuan/puan kepada pihak Universiti).

The prevalence and severity of asthma is increasing in many developed countries. Following the ISAAC phase I prevalence study in 1995, the phase III study was to evaluate the change in prevalence of asthma and allergic diseases during the past 5 years.

AIM: i) To determine the prevalence of asthma, eczema, and allergic rhinitis in Kota Bharu school children, and to examine time trends in the prevalence of asthma, eczema, and allergic rhinoconjunctivitis in Kota Bharu school children, ii) to examine the environmental risk factors in children with recent wheeze.

METHODS: The international study of asthma and allergies in childhood (ISAAC) written questionnaire was administered to 6,161 school children from March to August 2001. The respondents were parents of 6-8 year primary school children (n = 3,157), and secondary school children 12-15 years (n = 3,004). The ISAAC video questionnaire was shown to secondary school children the written questionnaire. The prevalence figures obtained were compared with those obtained in 1995.

RESULTS: The prevalence of ever wheeze between 1995 and 2001 were not significantly different among primary school children (8.3% 1995; 6.9% 2001) and secondary school children (10.7% 1995; 12% 2001). There was also no significant difference in the prevalence of recent wheeze among primary (5.4% 1995, 4.3% 2001) or secondary school children (6.8% 1995, 5.7% 2001). The prevalence of night cough in the last 12 months among primary school children was significantly lower in 2001 (17.5%) compared to 1995 (20.4%). However, among secondary school children the prevalence of night cough, was significantly higher in 2001 (8.3%) compared to 1995 (5.1%). The prevalence of rhinoconjunctivitis in the last 12 months was not significantly different between 1995 and 2001 among primary school children (4.6% 1995; 5% 2001) and secondary school children (11% 1995; 14.8% 2001). The prevalence of itchy flexural rash was significantly higher in 2001 (17.6%) compared to 1995 (14%) among primary school children, but similar among secondary school children (12.1% 1995; 13.4% 2001).

The significant risk factors for recent wheeze were frequent consumption of paracetamol in the last 12 months OR 1.6 (95% CI 1.2 – 2.2 p = .001), consumption of meat ≥ 3 times per week OR 1.5 (95% CI 1.2 – 1.9 p <.001), frequent passing of trucks through the street of the house OR 1.4 (95% CI 1.1 – 1.8 p =.003), consumption of milk ≥ 3 times per week OR 1.3 (95% CI 1.0 – 1.8 p =.04), and consumption of fruit ≥ 3 times per week OR 0.8 (95% CI 0.6 – 0.9 p =.02).

CONCLUSION: Except for changes in the prevalence of night cough, the prevalence of wheeze was similar between 1995 and 2001. In atopic diseases there was a significant increase in flexural itchy rash among primary school children.

(b) Senaraikan Kata Kunci yang digunakan di dalam abstrak:

Bahasa Malaysia

Bahasa Inggeris

asma
rinitis
ekzema
prevalens

asthma,
rhinitis
eczema
prevalence

5) Output Dan Faedah Projek

- (a) Penerbitan (*termasuk laporan/kertas seminar*)
(*Sila nyatakan jenis, tajuk, pengarang, tahun terbitan dan di mana telah diterbitkan/dibentangkan*)

Belum diterbitkan

Telah di bentangkan dalam . 7th National Conference On Medical Sciences

Ban-Seng Quah, Arrifin Nasir, Wan Pauzi Ibrahim, Mazidah Abd Rasid. Prevalence of eczema among school children in Kelantan. 7th National Conference On Medical Sciences. 17-18th May 2002, Universiti Sains Malaysia

Ban-Seng Quah, Arrifin Nasir, Wan Pauzi Ibrahim, Mazidah Abd Rasid. Trends of asthma prevalence among 6-7 year old school children in Kelantan. 7th National Conference On Medical Sciences. 17-18th May 2002, Universiti Sains Malaysia

- (b) Faedah-Faedah Lain Seperti Perkembangan Produk, Prospek Komersialisasi Dan Pendaftaran Paten.**
(Jika ada dan jika perlu, sila gunakan kertas berasingan)

Tiada

- (c) Latihan Gunatenaga Manusia**

i) Pelajar Siswazah: Tiada

ii) Pelajar Prasiswazah: Tiada

iii) Lain-lain:

6. Peralatan Yang Telah Dibeli:

Epson Perfection 1650

UNTUK KEGUNAAN JAWATANKUASA PENYELIDIKAN UNIVERSITI

Title:

Prevalence of asthma, eczema and allergic rhinitis: Changes in prevalence and risk factors

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Kubang Kerian, Kelantan

Malaysia

Abstract

The prevalence and severity of asthma is increasing in many developed countries. Following the ISAAC phase I prevalence study in 1995, the phase III study was to evaluate the change in prevalence of asthma and allergic diseases during the past 5 years.

AIM: I) To determine the prevalence of asthma, eczema, and allergic rhinitis in Kota Bharu school children, and to examine time trends in the prevalence of asthma, eczema, and allergic rhininoconjunctivitis in Kota Bharu school children, ii) to examine the environmental risk factors in children with recent wheeze.

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RESULTS: The prevalence of ever wheeze between 1995 and 2001 were not significantly different among primary school children (8.3% 1995; 6.9% 2001) and secondary school children (10.7% 1995; 12% 2001). There was also no significant difference in the prevalence of recent wheeze among primary (5.4% 1995, 4.3% 2001) or secondary school children (6.8% 1995, 5.7% 2001). The prevalence of night cough in the

last 12 months among primary school children was significantly lower in 2001 (17.5%) compared to 1995 (20.4%). However, among secondary school children the prevalence of night cough, was significantly higher in 2001 (8.3%) compared to 1995 (5.1%). The prevalence of rhinoconjunctivitis in the last 12 months was not significantly different between 1995 and 2001 among primary school children (4.6% 1995; 5% 2001) and secondary school children (11% 1995; 14.8% 2001). The prevalence of itchy flexural rash was significantly higher in 2001 (17.6%) compared to 1995 (14%) among primary school children, but similar among secondary school children (12.1% 1995; 13.4% 2001).

The significant risk factors for recent wheeze were frequent consumption of paracetamol in the last 12 months OR 1.6 (95% CI 1.2 – 2.2 p = .001), consumption of meat ≥ 3 times per week OR 1.5 (95% CI 1.2 – 1.9 p < .001), frequent passing of trucks through the street of the house OR 1.4 (95% CI 1.1 – 1.8 p = .003), consumption of milk ≥ 3 times per week OR 1.3 (95% CI 1.0 – 1.8 p = .04), consumption of fruit ≥ 3 times per week OR 0.8 (95% CI 0.6 – 0.9 p = .02).

CONCLUSION: Except for changes in the prevalence of night cough, the prevalence of wheeze was similar between 1995 and 2001. In atopic diseases there was a significant increase in flexural itchy rash among primary school children.

Key Words: asthma, rhinoconjunctivitis, eczema, prevalence

Introduction

Asthma is a problem worldwide, and the disease's burden and costs to public and private health care systems are substantial. The Phase I International Study of Asthma and Allergies in Childhood (ISAAC) surveys, conducted among school children of two age groups (13-14 and 6-7 years), showed wide variations in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and atopic eczema between different centres throughout the world (ISAAC Steering Committee 1998a, ISAAC Steering Committee 1998b, Williams et al 1999, Strachan et al 1997). The ISAAC surveys which used standardised questionnaires showed a marked variation in the prevalence of asthma symptoms with up to 15-fold differences between countries (ISAAC Steering Committee 1998b). From the written questionnaire, the prevalence of wheeze in the last 12 months ranged from 2.1-32.2% in the 13-14-year-olds, and 4.1-32.1% in the 6-7-year-old. The video questionnaire completed only in the older age group showed a similar pattern. The prevalence of rhinitis with itchy-watery ("rhinoconjunctivitis") eyes in the past year also varied across centres from 0.8-14.9% in 6-7-year-olds and from 1.4-39.7% in the 13-14-year-olds (Strachan et al 1997). Using itchy relapsing skin rash in the last 12 months that had affected skin creases as a definition of atopic eczema, the prevalence ranged from 2-16% in 6-7-year-olds and from 1-17% in 13-14-year-olds (Williams et al 1999). In Kota Bharu the prevalence of wheeze in the last 12 months from the written questionnaire was 5.4% in 6-7-year-olds and 6.8% in the 13-14-year-olds (Quah et al 1997). The video questionnaire (13-14-year-olds) showed a higher prevalence of wheeze in the last 12 months (9.4%). The prevalence of rhinoconjunctivitis was much higher in the 13-14-year-olds (11%) compared with the 6-7-year-olds (5%). Similarly the prevalence of

atopic eczema (itchy relapsing skin rash in the last 12 months that had affected skin creases) was higher among 13-14-year-olds (17.6%) compared with 6-7-year-olds (14%).

The prevalence for allergic rhinitis and eczema (Fleming & Crombie 1987, Peat et al 1992, von Mutius et al 1998, Weitzman et al 1992,) has also risen together with asthma.

There is good evidence that asthma prevalence has increased significantly in many countries (Robertson et al 1991, Burr et al 1989, Shaw et al 1998, Dubois et al 1998, Peat et al 1994, Omran & Russell 1996, von Mutius et al 1998, Al Frayh et al 2001, Rona et al 1995, Anthracopoulos et al 2001, Goren & Hellmann 1997, Whincup et al 1993).

Populations studied with the same methods on two occasions at least 9 years apart have shown an increase in prevalence of asthma. In Australia the prevalence among 8-11-year-olds increased from 6.5% in 1982 to 9.9% in 1992 (Britton et al 1986, Peat 1993).

A survey of asthma symptoms among adolescent schoolchildren in a rural, largely Maori population was done in 1975 and 1989 by Shaw et al (1990) using an identical questionnaire. The prevalence of reported asthma or wheeze significantly increased from 26.2% in 1975 to 34.0% 1989. In Finland (Rimpela et al 1995) the prevalence of self-reported physician diagnosed asthma (1.0% in 1977-1979 and 2.8% in 1991) and allergic rhinitis (5.0% in 1977-1979 and 14.9% in 1991) increased three fold in 14 years. In England the prevalence of current wheeze showed a steady increase: 3.9% in 1966, 3.5% in 1982, 6.1% in 1990, and 9.4% in 1992 (Whincup et al 1993, Rona et al 1995).

However in some countries the trend to an increase has slowed or ceased (von Mutius et al 1998, Ronchetti et al 2001). In Rome, Italy after an almost three-fold rise in childhood asthma between 1974 and 1992 has remained stable between 1992 and 1998.

Objectives:

1. To determine the prevalence of asthma, eczema, and allergic rhinitis in Kota Bharu school children.
2. To examine time trends in the prevalence of asthma, eczema, and allergic rhinococonjunctivitis in Kota Bharu school children.
3. To examine the environmental risk factors in children with recent wheeze.

Methods

Questionnaires

Prevalence Written questionnaire

The first part of the questionnaire was the Bahasa Malaysia prevalence questionnaire previously translated during the ISAAC phase I study (Quah et al 1997). The asthma symptoms questionnaire concentrates on past and current wheezing episodes, frequency of wheezing attacks in the previous 12 months, sleep disturbance, speech limitation during attacks, exercise induced wheezing and nocturnal cough. The rhinitis symptoms questionnaire contains questions on past and current episodes of sneezing or running or blocked nose when the child does not have a cold or flu, the association of these nose symptoms with itchy watery eyes, and their interference with daily activities. The eczema symptoms questionnaire focuses on any past and current presence of itchy rash, whether its distribution is typical of eczema and the occurrence of sleep disturbances caused by itch.

Environmental Written Questionnaire

For the second part of the written questionnaire the environmental questionnaire developed by ISAAC (appendix) was translated into Bahasa Malaysia and tested in the community for clarity. The Bahasa Malaysia version was then back translated to English an independent person to check for accuracy. The environmental questionnaire inquired a) the frequency of certain food or drink consumption during the last 12 months, b) the frequency of vigorous physical activity during a week, c) the numbers of hours watching television in a day, d) the type of fuel used for cooking in the house, e) the consumption of paracetamol in the last 12 months, f) the number of older and younger siblings, g)

highest level of maternal education, h) the frequency of trucks passing through the street where the child lives, i) keeping cats in the house during the past 12 months, j) maternal and paternal smoking, k) the total number of people smoking in the house. Primary school children were asked additional questions on a) consumption of paracetamol in the first 12 months of life, b) administration of antibiotics in the first 12 months of life, c) breast feeding, d) keeping cats in the house in the first year of the child's life, e) regular contact with farm animals in the first year of the child's life or during the mother's pregnancy, and f) maternal smoking during in the first year of the child's life

Risk factors for recent wheeze

The following risk factors were examined for association with recent wheeze (wheeze in the last 12 months) from the written questionnaire.

1. Frequent consumption (≥ 3 per week) of the following food or drink in the last 12 months
 - a. Meat (e.g. beef, lamb, chicken, pork)
 - b. Seafood (including fish)
 - c. Fruit
 - d. Vegetables (green and root)
 - e. Rice
 - f. Butter
 - g. Margarine
 - h. Potatoes
 - i. Cow's milk
 - j. Eggs
 - k. Fast food/Burgers
2. Inactivity: children who had no or occasional vigorous physical activity in a week
3. Watching television: Children who watch television ≥ 3 hours a day
4. Type of fuel used for cooking

- a. electricity
 - b. gas
 - c. charcoal
 - d. wood
5. Consumption of paracetamol: children who had consumed paracetamol at least once a year.
 6. Large family: children from households with ≥ 5 number of children in the family
 7. High maternal education: children whose mother had acquired secondary or tertiary education
 8. Exposure to dust: children who lived in houses where trucks passed through the street of the house frequently throughout the day or almost the whole day.
 9. Exposure to cats: children from families who keep cats in the house during the past 12 months.
 10. Maternal smoking: mothers who responded that they have ever smoked.
 11. Paternal smoking: fathers who responded that they have ever smoked.
 12. Other smokers: presence of household members other than parents who have ever smoked.

Video questionnaire

The international composite video questionnaire developed by ISAAC AVQ 3.0 was administered to all children in the secondary school after completion of the written prevalence and environmental questionnaires. The questionnaire involves five sequences of asthma symptoms in young persons. The five sequences were (i) mild wheezing while at rest, (ii) wheezing after exercise, (iii) waking at night with wheezing, (iv) waking at night with coughing, and (v) a severe attack of asthma, involving difficulty in breathing at rest. After each sequence, participants were asked to specify whether their breathing had ever been like that of the person in the video. If the response was positive, further inquiry was made about symptoms occurring in the last year, and their frequency in each month.

Data Collection

The study was conducted in the district of Kota Bharu, state of Kelantan, Malaysia between March and August 2001. Two age groups of school children 6-8 years and 12-15 years were studied. Using a school as a sampling unit, 29 of 94 primary schools and 12 of 35 secondary schools were randomly selected for the study. In the schools selected all standard one pupils in primary schools and all form two pupils in secondary schools were studied. The number of standard one pupils (3,469) constituted 30% of all standard one pupils (11,537) in the district, and the number of form two pupils (3,236) constituted 37.1% of all form two pupils (8,720) in the district. In primary schools 3,157 children participated giving a response rate of 91% and in secondary schools 3,004 children participated giving a response rate of 92.8%. The overall response rate was 91.9%.

Primary school children were handed the written questionnaires by their teachers to be completed by their parents or guardian, while secondary school children completed the questionnaire by themselves in the classroom. After completing the written questionnaire, the video questionnaire was shown to the secondary school children. The survey was conducted in Bahasa Malaysia.

Consent for the study was obtained from the Ministry of Education, Malaysia and the Research and Ethics Committee, Universiti Sains Malaysia. All respondents were informed the purpose of the study in an introductory letter. Parents unwilling to participate in the study were not required the answer the questionnaire.

Data Entry and Analysis

All data were analysed using the STATA statistical software for personal computers. A sample size of 3,000 children in each age group was estimated to detect a 0.4% yearly increase (decrease) in prevalence of symptoms of asthma, and other allergic diseases assuming an initial level of prevalence of 5%. Point estimates for prevalence figures were calculated as a proportion of respondents who answered 'YES' out of the total number of respondents. Differences between age groups and sex were compared using the Chi-squared test. The variance of point estimates of prevalence was calculated using the formula for cluster sampling by Rao and Scott (1992).

$$V_c = \frac{m}{m-1} \frac{\sum_{j=1}^m (x_j - n_j p)^2}{n^2}$$

where: m = number of clusters

n_j = number in the j th cluster

x_j = number with a positive response in the j^{th} cluster

n = sum of n_j

x = sum of x_j

$p = x/n$

Hence the 95% confidence interval is $(p - 1.96 \cdot \text{sqrt}(V_c), p + 1.96 \cdot \text{sqrt}(V_c))$. The difference in prevalence between 2001 and 1995 by subtracting the prevalence for 1995 (P_{1995}) from the prevalence for 2001 (P_{2001}). The variance for the difference in prevalence ($P_{2001-1995}$) was estimated by adding the variance for the prevalence for 1995 (V_{c1995}) and the variance for 2001 (V_{c2001}).

Thus the standard error for $P_{2001-1995}$ ($SE_{2001-1995}$) = $\sqrt{[(V_{c2001}) + (V_{c1995})]}$. The 95% confidence interval for $P_{2001-1995}$ is $(P_{2001-1995}) - 1.96*(SE_{2001-1995})$, $(P_{2001-1995}) + 1.96*(SE_{2001-1995})$.

Risk factors for current wheeze were analysed using wheeze in the last 12 months as the dependent variable and the various environmental factors as independent variables.

Observations were considered to be independent across schools but necessarily within school as school was the sampling unit. This cluster effect was considered in the analysis. The logistic regression was used to identify independent risk factors for recent wheeze using school as a cluster. All potential risk factors were included in the initial model. The risk factor with the lowest Wald χ^2 value was then excluded one at a time until only variables with a p value of ≤ 0.05 remained.

Results

The age distribution of children in primary secondary schools were as follows: 6 years old 1,911 (60.53%); 7 years old 1,245 (39.44%); 8 years old 1 (0.03%); and that for children in secondary schools were as follows: 12 years old 2 (0.07%); 13 years old 1,192 (39.68%); 14 years old 1,792 (59.65); 15 years old 18 (0.60%). There were 98.9% Malays, 0.2% Chinese, 0.1% Indians and 0.8% other races.

The prevalence and severity of asthma symptoms using the written questionnaire are shown in Table 1. The prevalence of ever wheezed ($p = <0.001$) and wheezing in the last 12 months ($p = <0.001$) were both significantly higher in secondary (12% and 5.7% respectively) than in primary (6.9% and 4.3% respectively) school children. Secondary school children also had more frequent attacks of wheezing in the last 12 months ($p <0.001$), and more sleep disturbance ($p <0.001$) than primary school children. There was no significant difference in the prevalence of severe attacks limiting speech ($p = 0.1$). The prevalence of ever diagnosed asthma was significantly higher ($p = 0.007$) in primary school children, but both exercise induced wheeze ($p <0.001$) and night cough ($p <0.001$) were significantly higher in secondary school children.

When males and females for the combined age groups were compared, there were significantly more females with ever wheeze ($p = 0.005$), wheeze in the last 12 months ($p = 0.001$) and night cough in the last 12 months ($p = 0.012$). There were no significant differences between males and females in the prevalences of ever diagnosed asthma ($p = 0.57$) and exercise induced wheeze in the last 12 months ($p = 0.68$).

The prevalences and severity of asthma symptoms using the video questionnaire in secondary school children are shown in table 2. The prevalence of ever wheeze (16.2%) was about 25% higher than that reported in the written questionnaire (12%). However the prevalence of wheeze in the last 12 months (11%) was about twice that reported in the written questionnaire (5.7%).

The prevalences and severity of rhinitis symptoms are shown in table 3. Secondary school children had significantly more rhinitis symptoms ($p = <0.001$), rhinitis symptoms in the last 12 months ($p = <0.001$) and rhinitis symptoms associated with itchy-watery eyes ($p = <0.001$) than that in primary school children. The prevalences of rhinitis symptoms, rhinitis symptoms in the last 12 months, and rhinitis symptoms associated with itchy-watery eyes were similar in males and females.

The prevalence and severity of eczema symptoms are given in table 4. The prevalence of children who ever had itchy rash ($p = <0.001$), itchy rash in the last 12 months ($p = 0.001$), and itchy rash affecting a typical distribution ($p = <0.001$) were significantly more common in primary than secondary school children. There were no significant differences between males and females with these symptoms.

There was a strong association between self-reported symptoms of asthma and symptoms of rhinitis and eczema in the written questionnaire Table 6. Children who had ever wheezed were significantly more likely to have rhinitis symptoms (OR 4.1), rhinitis

symptoms in the last 12 months (OR 4.0), and rhinitis symptoms associated with itchy-watery eyes (OR 4.1). The association was weaker between ever wheezed and itchy rash ever (OR 2.1) and itchy rash in the last 12 months (OR 2.5). Similarly children with wheeze in the last 12 months were significantly more likely to have rhinitis symptoms (OR 3.3), rhinitis symptoms in the last 12 months (OR 4.1), and rhinitis symptoms associated with itchy-watery eyes (OR 3.8), itchy rash ever (OR 2.1) and itchy rash in the last 12 months (OR 2.5). However, children who had ever wheezed and wheeze in the last 12 months were less likely to have itchy rash with a typical distribution.

Table 1: Self reported prevalence of asthma symptoms: Findings from the written questionnaire by age group and sex.

	Overall n = 6161		Age Group				Sex			
			6-8 years n = 3157		12-15 years n = 3004		Male n = 3018		Female n = 3143	
	n	%	n	%	n	%	n	%	n	%
Ever Wheezed*	576	9.3	217	6.9	359	12.0	250	8.3	326	10.4
Wheeze in the last 12 months**	307	5.0	135	4.3	172	5.7	122	4.0	185	5.9
Attacks of wheezing in last 12 months										
None	1590	25.8	1016	32.2	574	19.1	831	27.5	759	24.1
1-3	301	4.9	117	3.7	184	6.1	128	4.2	173	5.5
4-12	45	.7	19	.6	26	.9	15	.5	30	1.0
>12	12	.2	1	.0	11	.4	2	.1	10	.3
Blank	4213	68.4	2004	63.5	2209	73.5	2042	67.7	2171	69.1
Sleep disturbed by wheezing in last 12 months										
Never	1495	24.3	934	29.6	561	18.7	748	24.8	747	23.8
<1 per week	173	2.8	76	2.4	97	3.2	77	2.6	96	3.1
1+ per week	24	.4	3	.1	21	.7	7	.2	17	.5
Blank	4469	72.5	2144	67.9	2325	77.4	2186	72.4	2283	72.6
Severe attack limiting speech in last 12 months	68	1.1	28	.9	40	1.3	36	1.2	32	1.0
Ever diagnosed asthma***	617	10.0	348	11.0	269	9.0	309	10.2	308	9.8
Exercise induced wheeze in the last 12 months	465	7.5	116	3.7	349	11.6	232	7.7	233	7.4
Night cough in last 12 months	1280	20.8	552	17.5	728	24.2	587	19.4	693	22.0

*Children who had wheezing at any time in their life

**Children who had wheezing in the last 12 months

***Children who responded YES to the question 'Have you ever had asthma'

Table 2: Self reported prevalences of asthma symptoms: Findings from the Video Questionnaire

	13-15 year					
	Overall n = 3004		Males n = 1545		Females n = 1459	
	n	%	n	%	n	%
Mild wheeze while at rest						
Ever*	134	4.5	55	3.6	79	5.4
In the last 12 months	83	2.8	36	2.3	47	3.2
Once or more/month	63	2.1	25	1.6	38	2.6
Wheeze after exercise						
Ever*	392	13.0	154	10.0	238	16.3
In the last 12 months	264	8.8	98	6.3	166	11.4
Once or more/month	154	5.1	63	4.1	91	6.2
Waking with wheeze						
Ever*	69	2.3	27	1.7	42	2.9
In the last 12 months	52	1.7	21	1.4	31	2.1
Once or more/month	32	1.1	12	.8	20	1.4
Any wheezing (Yes to any of question 1-3)						
Ever*	487	16.2	197	12.8	290	19.9
In the last 12 months	329	11.0	130	8.4	199	13.6
Once or more/month	206	6.9	86	5.6	120	8.2
Waking with cough						
Ever*	366	12.2	115	7.4	251	17.2
In the last 12 months	249	8.3	82	5.3	167	11.4
Once or more/month	141	4.7	44	2.8	97	6.6
Severe attack						
Ever*	120	4.0	44	2.8	76	5.2
In the last 12 months	89	3.0	28	1.8	61	4.2
Once or more/month	56	1.9	17	1.1	39	2.7

*At any time in the child's life.

Table 3 Self reported prevalences of rhinitis symptoms: Findings from the written questionnaire by age group and sex

	Overall n = 6161		Age Group				Sex			
			6-8 years n = 3157		12-15 years n = 3004		Male n = 3018		Female n = 3143	
	n	%	n	%	n	%	n	%	n	%
Ever had rhinitis*	1944	31.6	527	16.7	1417	47.2	947	31.4	997	31.7
Rhinitis in the last 12 months**	1482	24.1	438	13.9	1044	34.8	711	23.6	771	24.5
Rhinitis accompanied by itchy-watery eyes in the last 12 months	602	9.8	159	5.0	443	14.7	274	9.1	328	10.4
Rhinitis interfering with daily activities										
None	748	12.1	500	15.8	248	8.3	375	12.4	373	11.9
A little	1161	18.8	479	15.2	682	22.7	563	18.7	598	19.0
Moderate	604	9.8	157	5.0	447	14.9	282	9.3	322	10.2
A lot	102	1.7	41	1.3	61	2.0	49	1.6	53	1.7
Blank	3546	57.6	1980	62.7	1566	52.1	1749	58.0	1797	57.2
Ever diagnosed allergic rhinitis ***	1427	23.2	553	17.5	874	29.1	623	20.6	804	25.6

*Children who had a problem with sneezing, or a runny, or blocked nose when they DID NOT have a cold or flu at any time in their life

** Children who had a problem with sneezing, or a runny, or blocked nose when they DID NOT have a cold or flu in the last 12 months

***Children who answered YES to the question "Have you ever had allergic rhinitis"

Table 4: Self reported prevalence of eczema: Findings from the written questionnaire by age group and sex

	Overall n = 6161		Age Group				Sex			
			6-8 years n = 3157		12-15 years n = 3004		Male n = 3018		Female n = 3143	
	n	%	n	%	n	%	n	%	n	%
Itchy rash ever*	899	14.6	543	17.2	356	11.9	419	13.9	480	15.3
Itchy rash in the last 12 months**	814	13.2	505	16.0	309	10.3	404	13.4	410	13.0
Itchy rash with typical distribution***	957	15.5	556	17.6	401	13.3	476	15.8	481	15.3
Age itchy rash first occur (5-7 year old questionnaire only)										
<2 years	251	4.1	251	8.0			109	3.6	142	4.5
2-4 years	190	3.1	190	6.0			85	2.8	105	3.3
5 or more	368	6.0	368	11.7			180	6.0	188	6.0
Blank	2348	38.1	2348	74.4			1099	36.4	1249	39.7
Rash cleared during past year	879	14.3	567	18.0	312	10.4	441	14.6	438	13.9
Times kept awake by itchy rash in past year										
Never	1240	20.1	740	23.4	500	16.6	612	20.3	628	20.0
<1 per week	375	6.1	215	6.8	160	5.3	194	6.4	181	5.8
1+ per week	98	1.6	54	1.7	44	1.5	44	1.5	54	1.7
Blank	4448	72.2	2148	68.0	2300	76.6	2168	71.8	2280	72.5
Ever diagnosed eczema****	267	4.3	55	1.7	212	7.1	123	4.1	144	4.6

*Children who had an itchy rash that was coming and going for at least 6 months at any time in their life.

**Children who had an itchy rash that was coming and going for at least 6 months during the last 12 months.

*** Children with itchy rash affecting any of the following places during the last 12 months: the folds of the elbows, behind the knees, in front of the ankles, under the buttocks, or around the neck, ears or eyes.

****Children who answered YES to question 'Have you ever had eczema?'

Table 5: Association between symptoms of asthma and symptoms of rhinitis and eczema

	Ever wheeze				Wheeze in the last 12 months			
	n	%	p	OR (95% CI)	n	%	p	OR(95%CI)
Ever had rhinitis	358	62.2	<.001	4.1 (3.5-4.9)	181	59.0	<.001	3.3 (2.7-4.1)
Rhinitis in the last 12 months	298	51.7	<.001	4.0 (3.2-5.0)	167	54.4	<.001	4.1 (3.3-5.2)
Rhinitis accompanied by itchy-watery eyes in the last 12 months	152	26.4	<.001	4.1 (3.3-5.1)	83	27.0	<.001	3.8 (2.8-5.2)
Itchy rash ever	143	24.8	<.001	2.1 (1.7-2.6)	78	25.4	<.001	2.1 (1.6-2.8)
Itchy rash in the last 12 months	145	25.2	<.001	2.5 (1.8-3.4)	80	26.1	<.001	2.5 (1.8-3.3)
Itchy rash with typical distribution	165	28.6	<.001	0.9 (0.87-0.93)	94	30.6	<.001	0.9 (0.87-0.92)

Time Trends in Prevalence of symptoms of asthma, and other allergic diseases

Table 6, 7, and 8 shows the prevalence of symptoms of asthma, rhinitis and eczema in 1995 and 2001 respectively.

Symptoms of Asthma

There were no significant differences in the overall prevalence of ever wheeze (-0.01) and recent wheeze (wheeze in the last 12 months) (-1.06%) between the years 2001 and 1995. There was also no significant difference in the prevalence of doctor diagnosed asthma (0.59%), exercise induced wheeze in the last 12 months (1.03%) and night cough in the last 12 months (-0.13%).

Among primary school children, there were no significant differences in the prevalence of ever wheeze (-1.45%), recent wheeze (-1.13%) doctor diagnosed asthma (0.59%), exercise induced wheeze in the last 12 months (1.03%), and night cough in the last 12 months (-0.13%) between 2001 and 1995.

Among secondary school children, the differences in the prevalence of ever wheeze (1.30%), recent wheeze (-1.11%), doctor diagnosed asthma (0.32%), exercise induced wheeze in the last 12 months (1.77%) and night cough in the last 12 months (2.67%) were not significant using the written questionnaire. Using the video questionnaire there was also no significant increase in the prevalence of ever wheeze (2.03%) and recent wheeze (1.58%) (table 8). However the prevalence of night cough ever increased significantly from 8.4% to 12.2% (difference 3.74%) and the prevalence of night cough in the last 12 months significantly increased from 5.1% to 8.3% (difference 3.19%). The prevalence of a severe attack (difference 0.56%) was similar in both years.

Table 6: Prevalence of asthma symptoms for Primary and Secondary school children, 1995 and 2001

	Overall			Primary School			Secondary School		
	1995 %	2001 %	Difference (95% CI)	1995 %	2001 %	Difference (95% CI)	1995 %	2001 %	Difference (95% CI)
Ever Wheezed*	9.36	9.35	-0.01 (-1.85 to 1.84)	8.33	6.87	-1.45 (-2.96 to 0.05)	10.65	11.95	1.30 (-1.53 to 4.12)
Wheeze in the last 12 months**	6.04	4.98	-1.06 (-2.11 to 0.00)	5.41	4.28	-1.13 (-2.36 to 0.10)	6.84	5.73	-1.11 (-2.81 to 0.59)
Attacks of wheezing in last 12 months									
1-3	5.27	4.89	-0.39 (-1.52 to 0.74)	4.54	3.71	-0.84 (-1.85 to 0.17)	6.19	6.13	-0.07 (-1.90 to 1.77)
4-12	0.96	0.73	-0.23 (-0.59 to 0.12)	0.84	0.60	-0.24 (-0.68 to 0.21)	1.12	0.87	-0.26 (-0.83 to 0.32)
>12	0.40	0.19	-0.20 (-0.43 to 0.02)	0.23	0.03	-0.2 (-0.36 to -0.03)	0.61	0.37	-0.24 (-0.65 to 0.16)
Sleep disturbed by wheezing in last 12 months									
<1 per week	4.29	2.81	-1.49 (-2.34 to -0.63)	3.68	2.41	-1.27 (-2.31 to -0.24)	5.07	3.23	-1.84 (-3.11 to -0.58)
1+ per week	0.40	0.39	-0.01 (-0.25 to 0.24)	0.41	0.10	-0.31 (-0.55 to -0.07)	0.39	0.70	0.31 (-0.06 to 0.69)
Severe attack limiting speech in last 12 months	1.12	1.10	-0.02 (-0.45 to 0.42)	0.96	0.89	-0.08 (-0.54 to 0.39)	1.32	1.33	0.01 (-0.73 to 0.76)
Ever diagnosed asthma***	9.43	10.01	0.59 (-1.13 to 2.31)	10.05	11.02	0.97 (-0.37 to 2.31)	8.63	8.95	0.32 (-3.02 to 3.67)
Exercise induced wheeze in the last 12 months	6.52	7.55	1.03 (-1.38 to 3.44)	3.88	3.67	-0.21 (-1.09 to 0.67)	9.85	11.62	1.77 (-1.41 to 4.94)
Night cough in last 12 months	20.91	20.78	-0.13 (-3.37 to 3.11)	20.39	17.48	-2.90 (-4.92 to -0.89)	21.57	24.23	2.67 (-3.39 to 8.73)

Prevalence of symptoms of Rhinoconjunctivitis

Table 7 shows the prevalence of rhinitis symptoms in 1995 and 2001. There was no difference in the overall prevalence of rhinitis ever (4.52%), rhinitis in the last 12 months (2.95%), and rhinitis accompanied by itchy-watery eyes in the last 12 months (2.32%) between the years 2001 and 2001. Similarly, among primary school children, there was also no significant difference in the prevalence of rhinitis ever (-1.53%), rhinitis in the last 12 months (-0.77%), and rhinitis accompanied by itchy-watery eyes in the last 12 months (0.42%). However, among secondary school children, the prevalence of rhinitis ever in 2001 (47.17%) was significantly higher than 1995 (38.16%) (difference 9.01%). Rhinitis in the last 12 months (5.49%), and rhinitis accompanied by itchy-watery eyes in the last 12 months (3.71%) were not significantly different between year 2001 and year 1995.

Prevalence of symptoms of Eczema

The overall difference in the prevalence of eczema symptoms was significantly different for itchy rash ever (2.60%) but not significant for itchy rash in the last 12 months (1.55%) and itchy with typical distribution (2.35%). Among primary school children the prevalence of itchy rash ever (3.52%), itchy rash in the last 12 months (2.79%), and itchy rash with a typical distribution (3.57%) were all significant higher in 2001 than 1995. Among secondary school children there were no significant differences in of itchy rash ever (2.0%), itchy rash in the last 12 months (0.56%), and itchy rash with a typical distribution (1.25%)

Table 7: Prevalence of rhinitis symptoms for Primary and Secondary school children, 1995 and 2001

	Overall			Primary School			Secondary School		
	1995 % (95% CI)	2001 % (95% CI)	Difference (95% CI)	1995 % (95% CI)	2001 % (95% CI)	Difference (95% CI)	1995 % (95% CI)	2001 % (95% CI)	Difference (95% CI)
Ever had rhinitis*	27.03	31.55	4.52 (-3.33 to 12.38)	18.23	16.69	-1.53 (-3.91 to 0.84)	38.16	47.17	9.01 (0.45 to 17.57)
Rhinitis in the last 12 months**	21.11	24.05	2.95 (-2.79 to 8.69)	14.65	13.87	-0.77 (-2.85 to 1.30)	29.27	34.75	5.49 (-1.34 to 12.31)
Rhinitis accompanied by itchy-watery eyes in the last 12 months	7.46	9.77	2.32 (-0.72 to 5.35)	4.62	5.04	0.42 (-0.60 to 1.43)	11.04	14.75	3.71 (-0.78 to 8.19)
Rhinitis interfering with daily activities									
None	20.74	12.14	-8.60 (-12.07 to -5.12)	26.38	15.84	-10.54 (- 12.58 to - 8.50)	13.61	8.26	-5.35 (-9.76 to -0.95)
A little	14.44	18.84	4.40 (1.19 to 7.62)	12.47	15.17	2.71 (0.84 to 4.57)	16.94	22.70	5.76 (0.20 to 11.32)
Moderate	9.37	9.80	0.43 (-3.02 to 3.89)	5.38	4.97	-0.41 (-1.77 to 0.95)	14.41	14.88	0.47 (-4.45 to 5.39)
A lot	2.08	1.66	-0.43 (-0.95 to 0.09)	1.93	1.30	-0.63 (-1.26 to 0.00)	2.28	2.03	-0.25 (-1.05 to 0.56)
Blank									
Ever diagnosed allergic rhinitis ***	17.46	23.16	5.70 (1.72 to 9.68)	15.44	17.52	2.08 (-0.21 to 4.38)	20.03	29.09	9.07 (2.62 to 15.52)