

Surveying the Prevalence of Asthma, Allergic Rhinitis and Eczema in Schoolchildren in Khon Kaen, Northeastern Thailand Using the ISAAC Questionnaire: Phase III

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The prevalence of asthma and other allergic diseases is increasing worldwide.¹⁻¹¹ Since 1991, the International Study of Asthma and Allergies in Childhood (ISAAC) steering committee has surveyed (Phase I) the prevalence of these diseases internationally using its questionnaire (and translations thereof).¹²⁻¹⁴ Disease prevalence varies within and between countries.¹² In Thailand, for example, surveillance indicated the 12-month prevalence of wheezing at 12.7, 8.8 and 10.7 percent in Bangkok and the Central region (1995),¹⁵ Chiang Mai in the North (1995)¹⁶ and Khon Kaen in the Northeast (1998),¹⁷ respectively. For an 'across time' comparison, these rates were three times higher than the first survey done in Bangkok in 1990.¹⁸

For a further comparison with the first survey (*i.e.* 5 years earlier), we conducted a second sur-

SUMMARY This is the second survey of schoolchildren in Khon Kaen, Northeastern Thailand, using the Thai version of the ISAAC questionnaire to examine the trend in the prevalence of asthma, allergic rhinitis and eczema, and to compare the results with the ISAAC Phase I data. We analyzed 5,075 questionnaires comprising 2,119 six- to seven- and 2,956 thirteen- to fourteen-year-old children (48 and 42 percent male, respectively). The cumulative vs. 12-month prevalence according to the written questionnaires were: 14.3 vs. 9.8% for wheezing, 42.6 vs. 33.3% for rhinitis and 13.5 vs. 11.2% for eczema, respectively. The cumulative vs. 12-month prevalence for the wheezing module, based on the video questionnaire, was 9.2 vs. 6.3%, respectively. Most Phase III prevalence was significantly lower than the first survey except for the steady, 12-month prevalence of wheeze. Our study confirms the high prevalence of allergic diseases among schoolchildren in Northeastern Thailand; albeit, prevalence has not increased in recent years. The Thai version of the English-language ISAAC questionnaire needs to be validated before further use in epidemiological research.

vey using the same methodology (*i.e.* ISAAC Phase III) to determine the prevalence trends of asthma, allergic rhinitis and eczema in schoolchildren.

SUBJECTS AND METHODS

Participants

The target groups were schoolchildren between 6- and 7-

(*i.e.* in Grades 1 and 2) and 13- and 14-year-old (*i.e.* in Grades 7 and 8). Schools were randomly selected provided they: 1) were in the central district of Khon Kaen; 2) were easily accessible; 3) had > 100 pupils of both sexes; and, 4) school

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administrators agreed to participate. Accordingly, 6 primary schools and 4 secondary schools participated in the study. All of the primary schools were included in the Phase I survey but only one of the secondary schools had participated. The sample sizes were the same as in the Phase I survey.

ISAAC Questionnaires

The Thai-language version of the written questionnaire and the video questionnaire were the same that were used in Phase I.¹⁵⁻¹⁷ A sample of the video questionnaire can be found at <http://www.wnmeds.ac.nz/Academic/Med/warg/AVQ02.mov>.

The parents of the 6- and 7-year-old children were asked to complete the written questionnaire while the 13- and 14-year-old children completed both the written and the video questionnaires themselves.

Data collection and analysis

Data were collected between January and February 2003. The data were then entered into spreadsheets of the Epi-Info Statistical Package Version 5.¹⁹ The prevalence of all symptoms was calculated in terms of the percentage of positive responses to each question divided by the number of completed questionnaires. STATA was used to compare the prevalences of Phases I and III.

RESULTS

The number of returned questionnaires from the 6- to 7- vs. 13- to 14-year-old groups was 2,130 of 2,778 (76.7%) vs. 2,960 of 3,261 (90.8%), respectively. The completed questionnaires analyzed totaled 2,119 (76.3%) vs. 2,956 (90.6%), respectively, of which 48 vs. 42 percent were males. The cumulative and current prevalence, as *per* the written questionnaire, for asthma,

allergic rhinitis and eczema and their symptoms are presented in Tables 1, 3 and 4, respectively.

For the wheezing module (Table 1), the cumulative prevalence of "ever-wheezed" and the prevalence of "current wheeze" in the 6- to 7- vs. 13- to 14-year-old groups were 17.4 and 10.5 vs. 15.4 and 9.3 percent, respectively. The diagnosed-asthma prevalence was 11.9 vs. 10.4 percent in the younger vs. older groups. Sleep disturbance, severe symptoms, exercise wheeze and night cough during the past year in the younger vs. the older groups were 5.7 vs. 4.1, 2.2 vs. 2.7, 4.3 vs. 18.2, and 20.4 vs. 28.8 percent, respectively.

The self-reported video questionnaires completed by the 13- to 14-year-old group revealed a cumulative vs. current prevalence of: wheezing at rest (9.2 vs. 6.3 percent), exercise wheeze (10.8 vs. 6.6 percent), night wheeze (2.2 vs.

Table 1 Percent positive responses from written questionnaires in the wheezing module

Symptoms	6-7 years N = 2,119 % (95%CI)	13-14 years N = 2,956 % (95%CI)	Total N = 5,075 % (95%CI)	M:F
Wheeze ever	17.4 (15.8-19.0)	15.4 (14.1-16.7)	14.3 (13.3-15.3)	1.1 : 1
Asthma ever	11.9 (10.5-13.3)	10.4 (9.3-11.5)	11.0 (10.1-11.9)	1.2 : 1
Symptoms within 12 months				
- Wheeze	10.5 (9.2-11.8)	9.3 (8.3-10.3)	9.8 (9-10.6)	
- > 4 attacks	3.0 (2.3-3.7)	2.2 (1.7-2.7)	2.5 (2.1-2.9)	
- Night wake	5.7 (4.7-6.7)	4.1 (3.4-4.8)	4.8 (4.2-5.4)	
- Severe wheeze	2.2 (1.6-2.8)	2.7 (2.1-3.3)	2.5 (2.1-2.9)	
- Exercise	4.3 (3.4-5.2)	18.2 (16.8-19.6)	12.4 (11.5-13.3)	
- Night cough	20.4 (18.7-22.1)	28.8 (27.2-30.4)	27 (25.8-28.2)	

Table 2 Percent positive responses to video questionnaires for wheezing

Description of video sequences	Cumulative % (95%CI)	12 month prevalence % (95%CI)	M:F
Wheezing at rest	9.2 (8.2-10.2)	6.3 (5.4-7.2)	1.1:1
Exercise wheeze	10.8 (9.7-12)	6.6 (5.7-7.5)	1.1:1
Night wheeze	2.2 (1.7-2.7)	1.5 (1.1-1.9)	1.2:1
Night cough	19.5 (18.1-20.9)	13 (11.8-14.2)	0.7:1
Severe wheeze	3.9 (3.2-4.6)	2.1 (1.6-2.6)	0.6:1

Table 3 Percent positive responses to written questionnaires in the rhinitis module

Symptoms	6-7 years N = 2,119 % (95%CI)	13-14 years N = 2,956 % (95%CI)	Total N = 5,075 % (95%CI)	M:F
Nose ever	33.6 (31.6-35.6)	49.1 (47.3-50.9)	42.6 (41.2-44)	0.8:1
Hay fever ever	30.2 (28.2-32.2)	25.7 (24.1-27.3)	27.6 (26.4-28.8)	0.9:1
Symptoms within 12 months				
- Nose	29.3 (27.4-31.2)	36.1 (34.4-37.8)	33.3 (32-34.6)	
- Itchy	8.4 (7.2-9.6)	11.9 (10.7-13.1)	10.5 (9.7-11.3)	
- Activity	26.4 (24.5-28.3)	30.7 (29.0-32.4)	28.9 (27.7-30.1)	

Table 4 Percent positive responses to the written questionnaires in the eczema module

Symptoms	6-7 years N = 2,119 % (95%CI)	13-14 years N = 2,956 % (95%CI)	Total N = 5,075 % (95%CI)	M:F
Rash ever	17.2 (15.6-18.8)	10.9 (9.8-12.0)	13.5 (12.6-14.4)	0.9:1
Eczema ever	29.2 (27.3-31.1)	26.8 (25.2-28.4)	27.8 (26.6-29.0)	1:1
Symptoms within 12 months				
- Rash	14.7 (13.2-16.2)	8.7 (7.7-9.7)	11.2 (10.3-12.1)	
- Rash clear	11.3 (10.0-12.6)	6.8 (5.9-7.7)	8.7 (7.9-9.5)	
- Night waking	8.4 (7.2-9.6)	3.9 (3.2-4.6)	5.7 (5.1-6.3)	

1.5 percent), night cough (19.5 vs. 13 percent), severe wheeze (3.9 vs. 2.1 percent) (Table 2).

The cumulative and current prevalence of "nose" symptoms in the 6- to 7- vs. the 13- to 14-year-old groups were 33.6 and 29.3 vs.

49.1 and 36.1 percent, respectively. Hay fever was reported in 30.2 vs. 25.7 percent of the younger vs. older groups. The current "nose" symptoms associated with 'itchy eyes' and 'interfered with daily activities' occurred in 8.4 and 26.4 vs. 11.9 and 30.7 percent of the younger

vs. older groups, respectively (Table 3). The peak of current "nose" symptoms was between November and January (Fig. 1).

The cumulative and current prevalence of chronic pruritic rash were 17.2 and 14.7 vs. 10.9 and 8.7

Fig. 1 Monthly percentages of children reporting symptoms of rhinitis

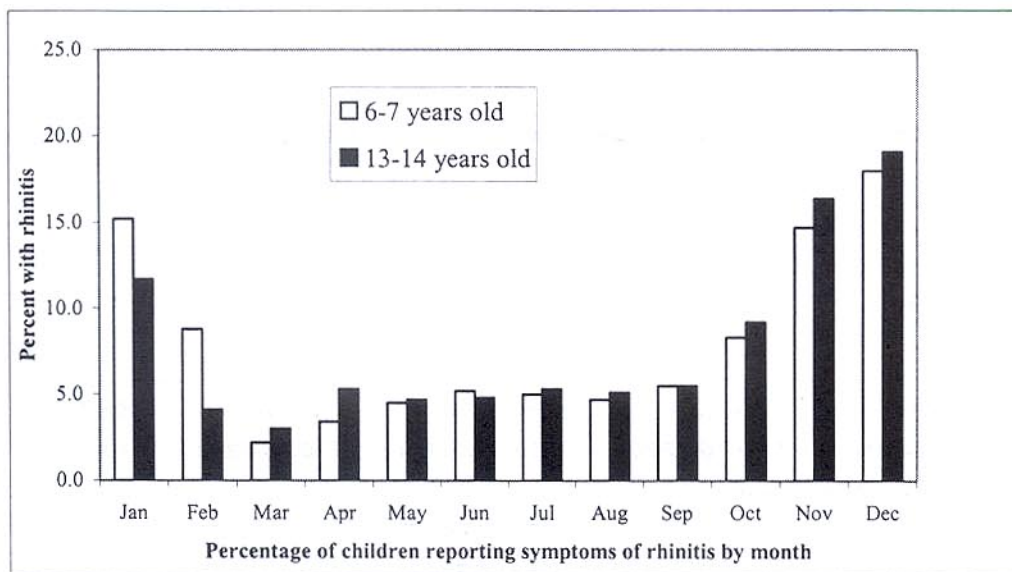


Table 5 Comparison of the wheezing module for Phases I and III as per the written questionnaires

Symptoms	6-7 years ^{1*} N = 2,658 %	6-7 years ^{2**} N = 2,119 %	13-14 years ¹ N = 3,410 %	13-14 years ² N = 2,956 %	Total ¹ N = 6,068 % (95% CI)	Total ² N = 5,075 % (95% CI)	p
Wheeze ever	18.6	17.4	20.5	15.4	19.7 (18.7-20.7)	14.3 (13.3-15.3)	<.001
Asthma ever	11.6	11.9	15.1	10.4	13.6 (12.7-14.5)	11.0 (10.1-11.9)	<.001
Symptoms within 12 months							
Wheeze	10.2	10.5	11.0	9.3	10.7 (9.9-11.5)	9.8 (9-10.6)	0.133
≥ 4 attack	2.8	3.0	3.7	2.2	3.3 (2.9-3.7)	2.5 (2.1-2.9)	0.016
Night wake	5.0	5.7	4.0	4.1	4.4 (3.9-4.9)	4.8 (4.2-5.4)	0.439
Severe	2.4	2.2	4.2	2.7	3.4 (2.9-3.9)	2.5 (2.1-2.9)	0.007
Exercise	5.2	4.3	26.6	18.2	17.2 (16.3-18.1)	12.4 (11.5-13.3)	<.001
Night cough	30.6	20.4	29.5	28.8	30.0 (28.8-31.2)	27.0 (25.8-28.2)	<.001

1* = phase I; 2** = phase III

percent in the younger vs. the older groups, respectively, and chronic eczema in 29.2 vs. 26.8 percent, which cleared within 12 months in 11.3 vs. 6.8 percent, respectively. Only 8.4 vs. 3.9 percent of the younger vs. older groups experienced sleep disturbance because of the rash (Table 4).

Tables 5, 6, 7 and 8 show a comparison of all the prevalences between Phases I and III. Most of the prevalences in the wheezing and allergic rhinitis modules, according to the written questionnaire, second survey, were significantly lower than during the first surveillance, except

for 'current wheeze' and 'awakened at night from wheezing'. In the atopic eczema module, all the dermatological symptoms showed no significant difference in prevalence.

DISCUSSION

Our study confirms the high prevalence of allergic diseases in schoolchildren in Northeastern Thailand, although the data from the written questionnaire indicates a significantly lower prevalence in all aspects compared to Phase I. The prevalence of 'ever wheezed' from Phases I and III was between 19.7 and 14.3 percent, 'asthma

ever' 13.6 and 11.0 percent, while the 'current wheeze' prevalence was almost unchanged (*i.e.* 10.7 vs. 9.8 percent), respectively. The results of the video questionnaire were comparable between the surveys, and the prevalence of 'currently wheezing at rest' was between 5 and 6 percent.

Since there is no specific Thai vocabulary for 'wheeze' and 'allergic rhinitis', and the written questionnaire was not validated before the survey, the results of the written vs. video questionnaires were different. Phankingthongkum *et al.*²⁰ showed that the word for

Table 6 Comparison of the wheezing module for Phases I and III as per the video questionnaires

Description of video sequences	Cumulative (1)* % (95% CI)	Cumulative (2)** % (95% CI)	12 month prevalence (1) N = 3,410 % (95% CI)	12 month prevalence (2) N = 2,956 % (95% CI)	p
Wheezing at rest	8.7 (7.8-9.6)	9.2 (8.2-10.2)	5.2 (4.5-5.9)	6.3 (5.4-7.2)	0.058
Exercise wheeze	13.8 (12.6-14.9)	10.8 (9.7-12)	8.7 (7.8-9.6)	6.6 (5.7-7.5)	0.002
Night wheeze	4.2 (3.5-4.9)	2.2 (1.7-2.7)	2.2 (1.7-2.7)	1.5 (1.1-1.9)	0.032
Night cough	22.0 (20.6-23.4)	19.5 (18.1-20.9)	13.1 (12.0-14.2)	13.0 (11.8-14.2)	0.941
Severe wheeze	6.0 (5.2-6.8)	3.9 (3.2-4.6)	3.3 (2.7-3.9)	2.1 (1.6-2.6)	0.003

1* = phase I; 2** = phase III

Table 7 Comparison of the rhinitis module for Phases I and III as per the written questionnaires

Symptoms	6-7 years ^{1*} N = 2,658 %	6-7 years ^{2**} N = 2,119 %	13-14 years ¹ N = 3,410 %	13-14 years ² N = 2,956 %	Total ¹ N = 6,068 % (95% CI)	Total ² N = 5,075 % (95% CI)	p
Nose ever	38.4	33.6	59.4	49.1	50.2 (48.9-51.5)	42.6 (41.2-44.0)	<.001
Hay ever	34.8	30.2	35.8	25.7	35.3 (34.1-36.5)	27.6 (26.4-28.8)	<.001
Symptoms within 12 months							
- Nose	33.5	29.3	42.5	36.1	38.6 (37.4-39.8)	33.3 (32.0-34.6)	<.001
- Itchy	9.4	8.4	15.0	11.9	12.5 (11.7-13.3)	10.5 (9.7-11.3)	<.001
- Activity	31.2	26.4	34.4	30.7	33.0 (31.8-34.2)	28.9 (27.7-30.1)	<.001

1* = phase I; 2** = phase III

Table 8 Comparison of the eczema module for Phases I and III as *per* the written questionnaires

Symptoms	6-7 years ^{1*} N = 2,658 %	6-7 years ^{2**} N = 2,119 %	13-14 years ¹ N = 3,410 %	13-14 years ² N = 2,956 %	Total ¹ N = 6,068 % (95% CI)	Total ² N = 5,075 % (95% CI)	<i>p</i>
Rash ever	18.0	17.2	9.9	10.9	13.5 (12.6-14.4)	13.5 (12.6-14.4)	0.933
Eczema ever	30.5	29.2	24.4	26.8	27.1 (26-28.2)	27.8 (26.6-29.0)	0.394
Symptoms within 12 months							
- Rash	15.2	14.7	7.4	8.7	10.8 (10.0-11.6)	11.2 (10.3-12.1)	0.524
- Rash clear	11.5	11.3	4.1	6.8	7.3 (6.6-8.0)	8.7 (7.9-9.5)	0.089
- Night wake	7.8	8.4	3.3	3.9	5.3 (4.7-5.9)	5.7 (5.1-6.3)	0.315

1* = phase I; 2** = phase III

'wheeze' in the Thai version of the ISAAC questionnaire was not universally understood. Therefore, local Thai equivalents for asthma and other allergic symptoms need to be established and publicized.²¹⁻²²

The prevalence of current wheezing symptoms in schoolchildren in Northeastern Thailand may be 5 vs. 10 percent based on the video vs. written questionnaire, respectively. Our results are comparable to the prevalence of 'current wheeze' found in Bangkok university students during the same year.²³ Our survey indicates no increasing trend in recent years, in contrast to some other reports.²⁴⁻²⁶

Our study confirms the seasonal variation of 'nose' symptoms in Northeastern Thailand: the peak prevalence was between November and January, as in the first survey.¹⁷ The seasonal change may be due to an increase in respiratory syncytial virus infections and the peak incidence of grass pollen.²⁷⁻²⁹ One-third of the children suffered from the nose symptoms which disturbed their daily activities and 11% suffered a pruritic

rash in the past year and half were awakened at night because of it.

Although, the questionnaire used in these two surveys needs to be validated, the initial data demonstrate that these allergic diseases have a significant impact on the health of schoolchildren in this part of the country. The trigger allergens should be identified and preventive strategies established for the improvement of the quality of life for these children.

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REFERENCES

1. Burney PG, Chinn S, Rona RJ. Has the prevalence of asthma increased in children? Evidence from the national study of health and growth 1973-86. *BMJ* 1990; 300: 1306-10.
2. Gergen PJ, Mullally DI, Evans R. 3rd. National survey of prevalence of asthma among children in the United States, 1976 to 1980. *Pediatrics* 1988; 81: 1-7.
3. Weitzman M, Gortmaker SL, Sobol AM, Perrin JM. Recent trends in the prevalence and severity of childhood asthma. *JAMA* 1992; 268: 2673-7.
4. Bauman A. Has the prevalence of asthma symptoms increased in Australian children? *J Paediatr Child Health* 1993; 29: 424-8.
5. Peat JK, van-den-Berg RH, Green WF, Mellis CM, Leeder SR, Woolcock AJ. Changing prevalence of asthma in Australian children. *BMJ* 1994; 308: 1591-6.
6. Goh DYT, Chew FT, Quek SC, Lee BW. Prevalence and severity of asthma, rhinitis and eczema in Singapore schoolchildren. *Arch Dis Child* 1996; 74: 131-5.
7. Goren AI, Hellmann S. Has the prevalence of asthma increased in children? Evidence from a long-term study in Israel. *J Epidemiol Community Health* 1997; 51: 227-32.
8. Nystad W, Magnus P, Gulsvik A, Skarpaas IJ, Carlsen KH. Changing prevalence of asthma in schoolchildren: evidence for diagnostic changes in asthma in two surveys 13 years apart. *Eur Respir J* 1997; 10: 1046-51.
9. Vangveeravong M. Asthma: an increasing problem in children? *Asian Pac J Allergy Immunol* 1998; 16: 141-7.
10. Venn A, Lewis S, Cooper M, Hill J, Britton J. Increasing prevalence of wheeze and asthma in Nottingham primary schoolchildren 1988-1995. *Eur Respir J* 1998; 11: 1324-8.

11. von Mutius E, Weiland SK, Fritzsche C, Duhme H, Keil U. Increasing prevalence of hay fever and atopy among children in Leipzig, East Germany. *Lancet* 1998; 351: 862-6.
12. The International Study of Asthma and Allergies in Childhood (ISAAC) Steering Committee. Worldwide variation in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis and atopic eczema: ISAAC. *Lancet* 1998; 351: 1225-32.
13. The International Study of Asthma and Allergies in Childhood (ISAAC) Steering Committee. Worldwide variation in the prevalence of asthma symptoms: The International Study of Asthma and Allergies in Childhood (ISAAC). *Eur Respir J* 1998; 12: 315-35.
14. Asher MI, Keil U, Anderson HR, *et al.* International study of asthma and allergies in childhood (ISAAC): rationale and method. *Eur Respir J* 1995; 8: 483-91.
15. Vichyanond P, Jirapongsananuruk O, Visitsunthorn N, Tuchinda M. Prevalence of asthma, rhinitis and eczema in children from Bangkok area using ISAAC (International Study of Asthma and Allergies in Childhood) questionnaires. *J Med Assoc Thai* 1998; 81: 175-84.
16. Trakultivakorn M. Prevalence of asthma, rhinitis and eczema in northern Thai children from Chiang Mai (International Study of Asthma and Allergies in Childhood, ISAAC). *Asian Pac J Allergy Immunol* 1999; 17: 243-8.
17. Teeratakulpisarn J, Pairojkul S, Heng S. Survey of the prevalence of asthma, allergic rhinitis and eczema in schoolchildren from Khon Kaen, Northeast Thailand: an ISAAC study. *Asian Pac J Allergy Immunol* 2000; 18: 187-94.
18. Boonyarittipong P, Tuchinda M, Balangkura K, Visitsunthorn N, Vanaprapar N. Prevalence of allergic disease in Thai children. *J Pediatr Soc Thailand* 1990; 29: 24-32.
19. Public Health Service CDC. Epi-Info computer program for epidemiology. Atlanta, Georgia; US Department of Public Health and Human Services, 1990.
20. Phankingthongkum S, Daengsuwan T, Visitsunthorn N, Thamlikitkul V, Udompunthuruk S, Vichyanond P. How do Thai children and adolescents describe asthma symptoms? *Pediatr Allergy Immunol* 2002; 13: 119-24.
21. Hong SJ, Kim SW, Oh JW, *et al.* The validity of the ISAAC written questionnaire and the ISAAC video questionnaire (AVQ 3.0) for predicting asthma associated with bronchial hyperreactivity in a group of 13-14 year old Korean schoolchildren. *J Korean Med Sci* 2003; 18: 48-52.
22. Chan HH, Pei A, Van Krevel C, Wong GW, Lai CK. Validation of the Chinese translated version of ISAAC core questions for atopic eczema. *Clin Exp Allergy* 2001; 31: 903-7.
23. Vichyanond P, Sunthornchart S, Singhirannusorn V, Ruangrat S, Kaew-somboon S, Visitsunthorn N. Prevalence of asthma, allergic rhinitis and eczema among university students in Bangkok. *Respir Med* 2002; 96: 34-8.
24. Ng Man Kwong G, Proctor A, Billings C, *et al.* Increasing prevalence of asthma diagnosis and symptoms in children is confined to mild symptoms. *Thorax* 2001; 56: 312-4.
25. Woods RK, Walters EH, Wharton C, Watson N, Abramson M. The rising prevalence of asthma in young Melbourne adults is associated with improvement in treatment. *Ann Allergy Asthma Immunol* 2001; 87: 89-90.
26. Maziak W, Behrens T, Brasky TM, *et al.* Are asthma and allergies in children and adolescents increasing? Results from ISAAC Phase 1 and Phase 3 surveys in Munster, Germany. *Allergy* 2003; 58: 572-9.
27. Sunakorn P, Chunchit L, Niltawat S, Wangweerawong M, Jacobs RF. Epidemiology of acute respiratory infections in young children from Thailand. *Pediatr Infect Dis J* 1990; 9: 873-7.
28. Suwanjutha S, Chantarojanasiri T, Wattana-kasetr S, *et al.* A study of non-bacterial agents of acute lower respiratory tract infection in Thai children. *Rev Infect Dis* 1990; 12: S923-8.
29. Tuchinda M, Theptaranon Y, Limsarthyourat N. A 10-year surveillance of atmospheric pollens and moulds in the Bangkok area. *Asian Pac J Allergy Immunol* 1983; 1: 7-9.