Prevalence of asthma, level of control and factors associated with asthma control in Thai elementary school students in Bangkok

Nasamon Wanlapakorn, Suchada Sritippayawan and Jitladda Deerojanawong

Summary

Background: **Little is known about the level of asthma control in Thai elementary school students living in the inner city of Bangkok. Our study aimed to evaluate the prevalence of asthma, level of asthma control and factors associated with asthma control in Thai students.**

Methods: **We conducted a cross-sectional descriptive study in students aged between 6-12 years at 3 public schools and 3 private schools in Bangkok. The parent-completed questionnaire used to assess the prevalence of asthma and asthma symptoms was translated from the Phase I ISAAC (The International Study of Asthma and Allergies in Childhood) questionnaire. Univariate analysis was used to identify possible risk factors related to partly and uncontrolled asthma.**

Results: **A population of 1,428 students was recruited by screening questionnaires (66.1% of response rate). The mean age was 9.5 years. Prevalence of physician-diagnosed asthma was 9% and the most common asthma symptom was night cough (23.8%). The level of asthma control was assessed in students with current asthma and classified as controlled (46.7%), partly controlled (43.3%) and uncontrolled (10%). Around 27% of students with current asthma in this study use controller medications. Factors associated with asthma control were analyzed but none approached significance.**

Conclusions: **The prevalence of asthma in elementary school students living in Bangkok has decreased since the previous survey and the use of controller medications has increased. Asthma management strategies should focus on encouraging awareness among physicians and parents about the importance of using controller medications to achieve better control of asthma.** ***(Asian Pac J Allergy Immunol 2014;32:287-92)***

Keywords: *asthma control, Bangkok, level, prevalence, Thai students*

Abbreviations

GINA	The Global Initiative for Asthma
ICS	Inhaled corticosteroid
ISAAC	The International Study of Asthma and Allergies in Childhood

Introduction

Asthma is one of the most common chronic respiratory diseases of children. Several studies have shown that the prevalence varies considerably from one country to another[1,2] and this disease imposes a huge burden on the patient, their family and society.[3,4] Recent asthma surveys aimed at estimating its prevalence in children from many regions of Thailand showed that the prevalence varies from 6.8-11.9%.[5,6] The reasons for large variations in the prevalence of asthma between countries and within one country are not clearly understood. Some studies suggest that environmental factors underlie these variations.[7,8]

The goal of asthma treatment is to achieve and maintain control and is defined according to The Global Initiative for Asthma (GINA) guidelines 2010 as patients having less than twice weekly daytime attacks, no night attacks, no limitations in their activities and normal pulmonary function test results.[9] Previous studies have shown that the level of asthma control falls markedly short of goals.[10,11] A

From Department of Pediatrics, Faculty of Medicine, Chulalongkorn University, Bangkok, 10330, Thailand
Corresponding author: Jitladda Deerojanawong
E-mail: jitladda.d@chula.ac.th
Submitted date: 8/11/2013
Accepted date: 17/3/2014

survey of asthma control in 8 Asia-Pacific countries in 2000 reported that 51.4% of respondents experienced daytime asthma symptoms and 44.3% had sleep disturbance caused by asthma in the preceding 4 weeks.[10] Similar results were also found in European countries.[11] An asthma control survey conducted in 7 European countries reported that 46% reported daytime symptoms and 30% reported asthma-related sleep disturbances at least once a week. The reasons why asthma control fell far short of goals, are probably a low rate of inhaled corticosteroid use and wrong self-perceptions of asthma severity.[10,11]

In Thailand, there was a population-based asthma survey in adults in 2000.[12] Only 6.7% of 466 asthma sufferers used controller medications, 14.8% had been admitted to hospital and 23.6% had lost workdays due to asthma during the previous year. It was also found that some asthma sufferers greatly underestimated the severity of their condition. This study concluded that, in the past, the burden of asthma in Thailand was high and treatment guidelines were not being properly followed. There was also a study of asthma control conducted in 110 Thai asthmatic children in a tertiary care hospital in 2009 which reported a rate of controller medication use as high as 83%.[14] To the best of our knowledge, there is limited population-based data for the level of asthma control in Thai children. Current asthma status and level of asthma control data are useful for estimating the of the burden of this disease and help guide a strategic plan to treat asthma in Thai children.

We conducted a survey aimed to determine the prevalence of asthma, the level of asthma control and the use of controller medications in Thai elementary school students living in inner city of Bangkok. The secondary objective was to determine factors associated with partly and uncontrolled asthma in Thai asthmatic students.

Methods

This is a population-based cross sectional study in which 2,160 grade 1-6 students from 3 public and 3 private schools in Bangkok were randomly selected between January and March 2012. The sample size for the asthma prevalence survey was chosen on the assumption of a 5% prevalence of asthma, around 1% acceptable error (d) and a 5% level of statistical significance. Parent-completed ISAAC phase I screening questionnaires in Thai were distributed to the students. This questionnaire was used in the previous survey of asthma prevalence in Thailand in 1995.[6] Students who had physician-diagnosed asthma were recruited for the second survey. The questionnaire in the second survey was newly-developed to assess the level of asthma control based on GINA guidelines 2010.[9] It was tested for validity and reliability with a group of parents of children attending the respiratory clinic at King Chulalongkorn Memorial Hospital. Participants were questioned about their age, sex, type of school, history of wheezing attacks and other asthma symptoms, current medications for asthma, places for health care visits, parental income and education. This study was approved by the Institutional Review Board of Chulalongkorn University (IRB number 470/54).

Statistical analysis

All calculations were performed with the SPSS package (version 17, SPSS Inc., Chicago, IL, USA). The demographic data and the prevalence of asthma and asthma symptoms were expressed using descriptive statistics (frequency, mean, standard deviation and range). Categorical variables were compared between groups using the chi-squared test. The possible risk factors related to partly and uncontrolled asthma were analyzed by univariate analysis with a binary logistic regression model. *p*-values <0.05 were considered to be statistically significant.

Results

Of the 2,160 students randomly selected, 1,428 (66%) consented and submitted a complete questionnaire, defined as one in which 80% or more of the questions were answered. The mean age of students was 9.5 ± 1.8 years (range 6-12). Around 47% were boys and 49% were from public schools. The prevalence of asthma, which was assessed by parent's reports of physician-diagnosed asthma, was 9% (95% CI 7.5-10.5). The most common asthma symptom was night cough as its prevalence was 23.8% (95% CI 21.6-26.0). The prevalence of wheeze ever was 15.1 % (95%CI 13.3-17.1), while prevalence of wheeze in the last 12 months was 5.7% (95%CI 4.5-7.0) as shown in table 1.

When the difference in prevalence of physician-diagnosed asthma and asthma symptoms between schools was assessed using a chi-squared test, the difference did not approach statistical significance as shown in table 2.

Students who had physician-diagnosed asthma from the first survey were recruited for the second

Table 1. Percentage of asthma and asthma symptoms from parent's screening questionnaires

Physician-diagnosed asthma and other asthma symptoms	n	Percent (95%CI)
Q1. Wheeze ever (n=1,390)*	210	15.1 (13.3-17.1)
Q2. Wheeze in the last 12 months (n=1,376) *	79	5.7 (4.5-7.0)
Q5 Severe wheeze (n =1,392) *	26	1.9 (1.1-2.6)
Q7 Wheeze after exercise (n =1,398) *	92	6.6 (5.3-7.9)
Q8 Night cough (n=1,396) *	332	23.8 (21.6-26.0)
Q6 Physician–diagnosed asthma (n=1,410) *	127	9.0 (7.5-10.5)

* The difference in number of participants in each question was due to incomplete data in the questionnaires.

survey (n=128). Of the 128 students, 71 (56%) returned complete questionnaires for assessment of asthma control level and asthma medications. The mean age of students was 9.2±1.8 years (range 6-12). Around 49% were boys and the majority (62%) were from private schools. Nearly half of the parents (47.1%) had an income of 10,000-50,000 THB per month and had graduated from a university. Around half of students (51.5%) being surveyed received asthma treatment in a public or university hospital as shown in table 3.

Around 53% of students with physician-diagnosed asthma had not had an asthma attack within the last 12 months, while 40% had had at least one attack and 7% did not answer this item in the questionnaires. In order to assess the level of asthma control according to GINA guidelines 2010[9], we only recruited students with current asthma, which means either that they had had at least one attack within the last 12 months or were currently controlled by inhaled corticosteroids (ICS) or leukotriene antagonists. This led to a total of 30 students for asthma control assessment. Our study found that 46.7% achieved control, 43.3% had partly controlled asthma and 10% had uncontrolled asthma. The overall rate of controller medication use was 26.7%. The majority of students with partly-controlled asthma (84.6%) and uncontrolled asthma (66.7%) were not using any kind of controller medications. When we assessed factors associated with asthma control, students with partly controlled and uncontrolled asthma were included in the same group, due to the small number of uncontrolled asthmatic students. We analyzed 7 factors as follows: 1) age at onset of asthma more than 2 years, 2) parents who had not had a university education, 3) no controller medication used, 4) male sex, 5) family income less than 10,000 THB per month, 6) presence of comorbidities, and 7) treatment in private clinics or hospitals. There were two factors which showed a tendency to be associated with poorer control of asthma. They were age at onset of asthma more than 2 years and low parental education level; Odds ratio (OR) 4.5 (95%CI 0.9-22.2, p-value 0.064) and OR 3.7 (95%CI 0.8-17.7, p-value 0.095), respectively. However the differences were not statistically significant as shown in table 4.

Discussion

To the best of our knowledge, this is the first study to assess level of asthma control in the general Thai pediatric population. Data obtained from this survey showed a lower rate of asthma prevalence compared with the previous study conducted in Bangkok in 1995, which reported a prevalence of 11.9%.[6] However, a study of worldwide trends in asthma using ISAAC phase I and III reported 5 years apart showed that in the Asia-Pacific region, the prevalence of asthma decreased in children aged 6-7 years, but increased in aged 13-14 years.[7] The divergent trends in asthma prevalence form the basis for further studies to investigate factors that potentially lead to these patterns. The most common asthma symptom in our study was night cough, as nearly a quarter of school students experienced this symptom. However, this can be overestimated as night cough was not specific for asthma. It could be a symptom of other diseases such as allergic rhinitis and gastroesophageal reflux diseases. For other asthma symptoms which include wheeze at any time in the past, wheeze in the last 12 months, wheeze after exercise and severe wheeze, all of the

Table 2. Prevalence of asthma and asthma symptoms in private and public schools in Bangkok

Physician-diagnosed asthma and other asthma symptoms	Public school (%)	Private school (%)	*p-value*
Q.6 Physician – diagnosed asthma (n=1,410)*	62 (9.0%)	65 (9.0%)	0.969
Q1. Wheeze ever (n=1,390)*	105 (15.4%)	105 (14.9%)	0.786
Q2. Wheeze in the last 12 months (n= 1,376)*	34 (5.1%)	45 (6.4%)	0.312
Q5. Severe wheeze (n = 1,392)*	13 (1.9%)	13 (1.8%)	0.722
Q7. Wheeze after exercise (n = 1,398)*	46 (6.7%)	46 (6.4%)	0.820
Q8. Night cough (n = 1,396)*	170 (25.0%)	162 (22.6%)	0.298

* The difference in number of participants in each question was due to incomplete data in the questionnaires.

prevalence rates have slightly decreased since the previous survey.[6]

A study in the USA reported that asthma prevalence varies among different types of schools.[13] When 16,640 students were assessed for the prevalence of asthma, the highest quartile schools had a mean asthma prevalence of 21.9% compared to the lowest quartile schools with a mean asthma prevalence of 7.1%. However, future research is needed to determine potential mechanisms for the school's influence on asthma outcomes. In our study, we compared the prevalence of asthma between private schools and public school with a hypothesis that children attending different schools may differ in their allergen exposure. In Thailand, most private schools serve high socioeconomic families and provide air-conditioned classrooms for students, while public schools have more outdoor exposure. However, there were no differences in the prevalence of asthma and asthma symptoms among types of school in our study.

More than half of the students (53%) with physician-diagnosed asthma had not had asthma attacks within the preceding 12 months, without using controller medications. This implies that asthma in children improves after 5 years of age. However, parents and physicians might have misdiagnosed viral-induced wheeze as asthma, as these two diseases share similar clinical presentations. When the level of control was assessed only in students with current asthma, the number of respondents decreased to 30. The results of our survey indicate that 46.7% achieved control, 43.3% had partly controlled asthma and 10% had uncontrolled asthma. This is comparable to a previous study of 110 Thai asthmatic children in a tertiary care hospital using the same GINA criteria in 2009, in which 55.5% of them achieved control.[14] This indicates that the level of asthma control remains unsatisfactory in Thai children. The rate of controller medication use in our study was around 27%, which is higher than that in population-based studies in Asia-Pacific in 2000 (13%) and in Europe in 1998 (23%).[9,10] This could imply that asthma management is gradually improving. However, as the sampling in this study was undertaken only in the capital city, the results might not reflect the asthma burden in rural regions of Thailand. In a study surveying 110 Thai asthmatic children in a tertiary care hospital in 2009, a rate of controller medication use as high as 83% was found.[14] This is probably because the subjects studied received good medical care and had regular follow up visits with asthma specialists.

We also analyzed some factors that might be associated with partly or uncontrolled asthma. Although our sample size was small, some trends were observed. Onset of asthma at more than 2 years of age tended to be associated with poorer control of asthma. This was probably due to the transient early wheezer asthma phenotypes in most Thai children which gradually improve by 5 years of age, while asthma diagnosed at older age tended to be chronic asthma. Early diagnosis also leads to better knowledge in following asthma treatment plan. The relationship between age at onset of asthma and level of asthma control was not clearly explained. However, the results of a study by Jacques de Blic demonstrated that unacceptable asthma control was significantly associated with a more recent diagnosis of asthma (p =0.008).[15]

Table 3. Characteristics of students who had physician-diagnosed asthma and responded to the second survey

Characteristics	Number	Percent
Sex (n = 71)*		
Male	35	49.3
Female	36	50.7
Mean age (years) (n = 71)*	9.2 ± 1.8	
Types of school (n = 71)*		
Public schools	27	38
Private schools	44	62
Family monthly income (n=70)*		
Less than 10,000 THB	28	40
More than 10,000 THB	42	60
Level of education (n=70)*		
Lower than a university level	37	52.9
University level	33	47.1
Type of heath care visit (n=68)*		
University or public hospitals	35	51.5
Private clinic or hospitals	28	41.2
Others (e.g. primary health care center, drug store)	5	7.3

* The difference in number of participants in each question was due to incomplete data in the questionnaires.

Many reports have identified low educational status as a risk factor for poorly-controlled asthma.[16,17] Our study also showed that education of parents finishing below university tended to be associated with poorer control of asthma in their children. This was probably due to less understanding of the disease and poor compliance with asthma treatment for their asthmatic children. An association between the presence of comorbidities and unacceptable asthma control has been reported in France and Brazil, while the relationship between low socioeconomic status and poorly-controlled asthma has also been described in France and Canada.[15,18,19] However, our study did not demonstrate statistically significant association with these possible risk factors related to partly and uncontrolled asthma.

This is the first study surveying asthma control in a general Thai pediatric population to assess asthma burden and risk factors of poorly controlled asthma. The response rates of the first and second questionnaire were 66% and 56%, respectively. Although the use of parent-completed questionnaires is expected to have diminished the accuracy and completeness of the data, and variation in the level of education of the parents might affect the understanding of the questionnaires, asthma

Table 4. Factors associated with asthma control (n=30) analyzed by univariate analysis with a binary logistic regression model.

Possible risk factors	Controlled	Partly controlled and uncontrolled	OR (95%CI)	*p*-value
Age at onset more than 2 years (n=28)*	4 (30.8%)	9 (69.2%)	4.5 (0.9-22.2)	0.064
Parents graduated from lower than university level (n=29)*	4 (30.8%)	9 (69.2%)	3.7 (0.8-17.7)	0.095
No controller use (n=30)*	9 (40.9%)	13 (59.1%)	2.4 (0.5-12.7)	0.301
Male sex (n=30)*	6 (46.2%)	7 (53.8%)	1.0 (0.2-4.4)	0.961
Income < 10,000 THB per month (n=29)*	4 (33.3%)	8 (66.7%)	2.9 (0.6-13.3)	0.182
Presence of comorbidities (n=29)*	8 (42.1%)	11 (57.9%)	2.0 (0.4-9.8)	0.363
Treated in private clinics or hospitals (n=29)*	7 (46.7%)	8 (53.3%)	1.1 (0.3-4.9)	0.858

* The difference in number of participants in each question was due to incomplete data in the questionnaires

burden in elementary school students needs more attentive care. Further studies of asthma burden could use interviews or telephone questionnaires in order to reduce bias, incorrect diagnosis or incompleteness of data.

Conclusions

Data obtained from this survey showed a lower rate in asthma prevalence as compared to that in the previous study conducted in Bangkok in 1995.[6] Onset of asthma after two years of age and parents with lower education level tended to be associated with poorer control of asthma. However, these differences were not statistically significant due to a small number of participants in this study. For asthma management, there is room for improvement as 53% of cases did not achieve control and the percentage of controller medication use was still unsatisfactory. Asthma management strategies should focus on encouraging awareness among physicians and parents about the importance of using controller medications to achieve better control of asthma.

Acknowledgments

This research received a grant from the Ratchadapisek-Sompoch Research Fund, Faculty of Medicine, Chulalongkorn University (Grant no. RA 55/72).

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