

Asthma control in the Asia-Pacific region: The Asthma Insights and Reality in Asia-Pacific Study

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Background: Few data on asthma management are available for the Asia-Pacific region.

Objective: This study examined asthma symptoms, health care use, and management in the Asia-Pacific region.

Methods: We performed a cross-sectional survey, followed by administration of a questionnaire in a face-to-face setting in the respondents' homes in their language of choice. Urban centers in 8 areas were surveyed: China, Hong Kong, Korea, Malaysia, The Philippines, Singapore, Taiwan, and Vietnam. **Results:** A population sample of 3207 respondents with physician-diagnosed asthma was identified by screening 108,360 households. Daytime asthma symptoms were reported by 51.4% of respondents, and 44.3% reported sleep disturbance caused by asthma in the preceding 4 weeks. At least 2 in every 5 respondents (43.6%) had been hospitalized, attended a hospital emergency department, or made unscheduled emergency visits to other health care facilities for treatment of asthma during the previous 12 months. Overall, 15.3% of respondents reported that they had required admission to the hospital for asthma treatment. Asthma severity correlated with the frequencies of hospitalizations and emergency visits for asthma in the past year. Even in those patients with severe persistent asthma, 34.3% regarded their disease as being well or completely controlled. Current use of an inhaled corticosteroid was reported by only 13.6% of respondents, and 56.3% used quick-relief bronchodilators. Absence from school and work in the past

year was reported by 36.5% of children and 26.5% of adults.

Conclusion: As reported for other regions, current levels of asthma control in the Asia-Pacific region fall markedly short of goals specified in international guidelines for asthma management. (*J Allergy Clin Immunol* 2003;111:263-8.)

Key words: Asia, asthma epidemiology, asthma control, asthma management, inhaled corticosteroids

Asthma is an important chronic disease worldwide, and its prevalence is increasing in all regions.¹⁻⁴ In the Asia-Pacific region asthma prevalence is generally lower than that reported in Western countries, as revealed by the recent findings of the International Study of Asthma and Allergies in Childhood.⁵ The 12-month prevalence of wheezing in teenagers in the Asia-Pacific region is less than half of that reported in Western Europe (8.0% and 16.7%, respectively).^{5,6} Asthma also caused considerable morbidity in the Asia-Pacific region, with 15% of teenagers troubled by exercise-induced symptoms during the past 12 months.³ Furthermore, asthma mortality rates in more affluent areas, such as Hong Kong and Japan, are similar to those reported in Western countries.³

The Global Initiative for Asthma (GINA), developed by the World Health Organization in collaboration with the US National Heart, Lung, and Blood Institute, established diagnostic and management strategies that are now generally accepted worldwide.¹ According to the GINA guidelines, the goal of asthma management is to achieve symptom control, which is defined as the absence or minimization of chronic symptoms; reduction of exacerbations; avoidance of asthma-related visits to emergency health care facilities; minimal or no requirement for as-needed (quick-relief), short-acting β_2 -agonist medication; no asthma-related limitation of normal physical activity; near-normal lung function; and minimal or no adverse effects of asthma medications.¹ Similar guidelines have been published in many areas of the Asia-Pacific region in the last decade.⁷

Despite worldwide consensus on the goals of asthma management, published epidemiologic data from

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TABLE I. Sampling strategy and demographic characteristics by area

	AIRIAP total	China mainland	Hong Kong	Korea	Malaysia	Philippines	Singapore	Taiwan	Vietnam
Total households screened, n	108,360	26,999	21,156	13,988	1989	1226	3877	21,305	17,820
Total households qualified, n	5288	405	685	1024	465	531	586	1153	439
Total survey population, n	3207	400	402	401	404	400	400	400	400
Mean age, years (SD)	31.4 (21.7)	43.9* (22.5)	31.8 (20.1)	29.9 (22.5)	28.7 (16.8)	22.8* (20.2)	25.2* (19.7)	32.0 (24.5)	36.7* (19.1)
Female sex, %	51.6	51.5	36.8	59.1	53.0	53.8	54.8	46.8	57.5
Recruitment methodology, n	D: 2130, S: 951, T: 126	D: 400	D: 132, S: 262, T: 8	D: 401	D: 61, S: 259, T: 84	D: 400	D: 350, S: 20, T: 30	D: 35, S: 365	D: 351, S: 45, T: 4
Interview languages used	—	Mandarin, Shanghainese, Cantonese	Cantonese	Korean	Malay, English, Cantonese	English, Taglish	English, Cantonese, Mandarin, Malay	Mandarin	Vietnamese

D, Door-to-door recruitment; S, street interception recruitment; T, telephone recruitment.

*Statistically significant ($P < .00625$) difference between area and total sample for the parameter indicated (t test followed by Bonferroni correction).

Abbreviations used

AIRIAP: Asthma Insights and Reality in Asia-Pacific
GINA: Global Initiative for Asthma
ICS: Inhaled corticosteroid

Europe, the United States, and Australia demonstrate high prevalences of symptoms among current patients with asthma, reflecting suboptimal management and generally low adherence to guidelines.⁸⁻¹³ Both underprescribing by doctors^{10,12,14} and poor compliance with prescribed medications by patients¹⁵ have been implicated in suboptimal asthma management.

Data on the extent of the asthma-related burden of illness in the Asia-Pacific region are limited. The Asthma Insights and Reality in Asia-Pacific (AIRIAP) study was conducted to document the experience of a wide cross-section of patients with asthma in the community and to assess whether asthma management in the region met the goals proposed by the GINA guidelines. The AIRIAP study continues a worldwide research program that has included the Asthma Insights and Reality in Europe and the Asthma in America studies.^{9,13} AIRIAP is the first transnational large asthma survey of this type in children and adults in the Asia-Pacific region.

METHODS

Selection of participants

The AIRIAP survey was conducted from September to December 2000. A random sample of patients with asthma was recruited in urban centers of 8 areas: China (Beijing, Shanghai, Guangzhou), Hong Kong, Korea (Seoul), Malaysia (Klang Valley, Penang, Johor Baru, Ipoh), The Philippines (Metro Manila), Singapore, Taiwan (Taipei), and Vietnam (Hanoi, Ho Chi Minh City).

Sampling was performed by means of face-to-face recruitment conducted on the basis of random street interception, random door-to-door recruitment, or telephone recruitment. All of the above

methods of recruitment were used to ensure that the required number of asthmatic patients was achieved in each area over the same time period. Not all methods were performed in all areas; Table I records the sampling methods used in each region.

The screening population was drawn from 108,360 households. Recruitment by using each of the 3 methods was conducted at various times of the day and on different days of the week to ensure that a cross-section of the population was approached. An adult representative of each household was asked whether asthma had ever been diagnosed in a household member by a medical doctor. All negative responses were confirmed by interviewers before the household was considered ineligible for the survey. Respondents who answered positively were then asked the following: "Does this person take medication for their asthma?" and "Has this person had an asthma attack or asthma symptom in the past 12 months?" Those who answered in the affirmative to either question were identified as patients with current asthma and were considered eligible for subsequent face-to-face interview. The study was designed to have 400 respondents in each of the 8 areas; once this number was reached in a particular area, recruitment in this location was terminated.

Where more than one eligible interviewee was identified in a household, the interviewer selected one designated respondent according to the standard Kish selection grid methodology for selecting a sample of one from a predefined subpopulation.¹⁶ For eligible respondents less than 16 years of age, interviews were conducted with the parent or care giver most knowledgeable about the child's asthma condition and treatment.

Interview

Survey interviews took approximately 45 to 60 minutes to complete and were conducted in the respondents' homes in a choice of either English or a local language. The questionnaire was based on the American Thoracic Society questionnaire,¹⁷ with supplementary questions on health care use and limitation of activity. The English version of the questionnaire was translated into other languages by translators experienced in the use of health surveys, and the translation quality was approved by a bilingual representative in each area.

Data analysis

Quantitative variables were compared by using t tests, and percentages were compared by using χ^2 tests. Bonferroni corrections

were applied when multiple comparisons were made, and a *P* value of less than .00625 was considered significant. Survey questions on the frequency, severity, and pattern of symptoms were used to construct a symptom severity index⁹ on the basis of the GINA asthma severity classification.¹ Accordingly, each respondent's current asthma was classified objectively as severe persistent, moderate persistent, mild persistent, or mild intermittent on the basis of reported quantitative asthma characteristics. The significance of the association between hospital admissions and unscheduled emergency visits with increasing objective severity of asthma was estimated with a χ^2 *P* value for trend. Multivariate ordinal logistic regression analysis was used to compare asthma severity with socioeconomic factors.

RESULTS

Sample population

One or more family members with current asthma were identified in 5288 households of the screening population of 108,360 households from the 8 areas. Approximately 400 respondents were recruited consecutively from the eligible households in each area. A total of 3207 interviews were completed by 2323 adults and by proxy for 884 children; 22 respondents declined to provide an age. The sampling strategy is summarized in Table I.

The age of child and adult respondents was 7.4 ± 3.8 years (mean $\pm$ SD) and 40.5 ± 18.5 years, respectively. The percentage of female patients ranged from 36.8% in Hong Kong to 59.1% in Korea. More than half of all participating adults (50.7%) and children (60.1%) reported current symptoms consistent with mild intermittent asthma on the basis of objective severity assessment. Their respective demographic and asthma-related variables are summarized in Table II.

Asthma control

Compared with the GINA criteria, asthma was poorly controlled in a high proportion of respondents (Table III). Overall, 51.4% of all respondents reported daytime coughing, wheezing, shortness of breath, or chest tightness, and 44.3% had been awakened by asthma symptoms during the past 4 weeks. Sleep disruption, a marker of suboptimal asthma treatment, occurred at least once per week in 28.3% of respondents. Only 31.2% reported no symptoms during the past 4 weeks, whereas symptoms perceived by respondents as mild, moderate, or severe were reported by 50.3%, 14.6%, or 3.7%, respectively. This underestimation of asthma severity is similar in adults and children (Table II). Respondents also perceived their asthma to be better controlled than their clinical symptoms suggested, and approximately one third of respondents (34.3%) with severe persistent asthma thought their disease was either well or completely controlled (Table IV). The level of education of respondents, total household income, sex, and smoking status were not significantly associated with asthma severity. Although there were variations in severity between regions, the predominance of mild asthma and the tendency to underestimate asthma severity were consistent between areas.

Activity limitation caused by asthma was considerable. A mean of 44.7% of respondents reported that nor-

TABLE II. Demographic and asthma-related variables in children and adults

	Children	Adults
Current asthma, n	884	2323
Mean $\pm$ SD age, y	7.4 ± 3.8	40.5 ± 18.5
Female sex, %	42.3	55.2
Mean $\pm$ SD age at diagnosis of asthma, y	3.8 ± 2.6	24.2 ± 19.1
Smoking status, %*		
Current	—	19.1
Former	—	8.9
Never smoked regularly	—	23.8
Not answered	100.0	0.3
Current symptom severity, assessed using symptom severity index, %		
Mild intermittent	60.1	50.7
Mild persistent	19.1	20.0
Moderate persistent	12.8	16.8
Severe persistent	8.0	12.5
Self- or proxy-reported asthma severity, %†		
None	36.4	29.3
Mild	49.0	50.8
Moderate	11.5	15.8
Severe	2.5	4.1

*Only those adults with a smoker in the house were asked to provide their smoking status.

†Total for children does not sum to 100.0% because of rounding.

mal physical activity was compromised, and 37.9% believed that their choice of job or career was limited. A total of 52.7% of respondents said that sports and recreation were affected, and 37.6% believed their lifestyle was restricted (Table III).

As many as 26.5% of adult respondents and 36.5% of children surveyed had missed work or school within the past year as a result of asthma symptoms. The survey also showed that 43.6% of respondents had been hospitalized, attended a hospital emergency department, or made unscheduled emergency visits to other health care facilities during an acute episode of asthma during the past 12 months. This varied by area, from 30.8% in Vietnam to 85.1% in Hong Kong. Admission to the hospital for asthma treatment during the past year was reported by 15.3% of respondents. Both hospital admissions and unscheduled emergency visits were correlated with increasing objective severity of asthma, as shown in Fig 1 (*P* < .05 for trend). Hospitalization and use of emergency health care were reported at a similar rate in adults and children.

Use of any preventative medication (≥ 1 agents from the following groups: inhaled corticosteroids [ICSs], leukotriene modifiers, or sodium cromoglycate, and nedocromil) was reported by only 14.4% of respondents. ICSs were the most commonly used preventative medications, either prescribed or obtained elsewhere, as reported by 13.6% of respondents. This is despite almost half of the sample meeting the criteria for persistent asthma on the basis of self-reported frequency of symptoms. Reported ICS use was highest for Taiwan (26.3%) and lowest for Korea (1.2%). Very few respondents used leukotriene modifiers (0.5%) or sodium cromoglycate and nedocromil (0.5%). A total of 13.5% of respondents

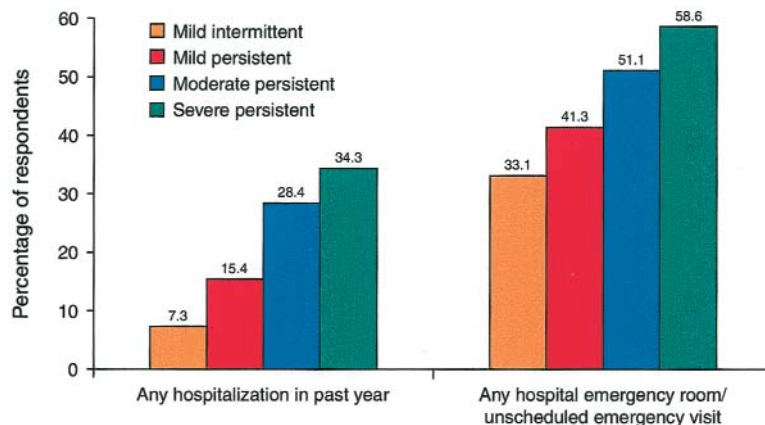


FIG 1. Hospital admissions and emergency visits in the past year according to asthma severity assessed objectively.

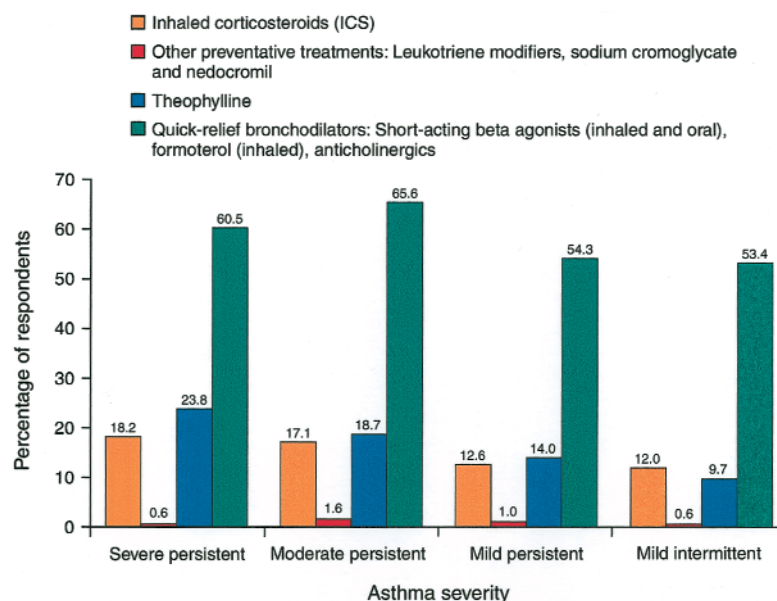


FIG 2. Asthma medication use according to asthma severity.

took theophylline, and 56.3% used at least one quick-relief bronchodilator (short-acting β -agonists, formoterol, or anticholinergic agonists). The percentage use of each medication type was closely comparable in adults and children, with the exception of theophylline, which was used by more than twice as many adults as children.

The pattern of use of quick-relief bronchodilators and preventative medications was similar between severity classifications. Only 18.2% of those with severe persistent asthma reported current use of an ICS compared with 12.0% of those with mild intermittent asthma. Similarly, 60.5% of respondents with severe persistent asthma reported current quick-acting bronchodilator use compared with 53.4% of those with mild intermittent asthma (Fig 2).

That patients in the Asia-Pacific region have a poor understanding of ICSs is reflected by the finding that only 12.9% of respondents in the total sample claimed to be very or somewhat familiar with ICSs, and a further 7.2%

were not too familiar. However, of these 20.1% of respondents who had some degree of familiarity with ICSs, 29.9% believed that the risks of taking an ICS probably outweighed the benefits. Furthermore, only 23.2% of the total AIRIAP population realized that inflammation was the underlying cause of asthma, and even fewer (17.5%) thought the underlying condition could be treated.

Fear of side effects was considered to be a major factor in failure to follow the physician's instructions on medication use by over half of the respondents (56.7%) and a minor factor by 32.1%. Other reasons included concern over long-term use (50.4% considered it a major factor, and 36.5% considered it a minor factor), lack of immediate effect (46.8% and 38.2%, respectively), loss of effectiveness over time (42.8% and 41.9%, respectively), lack of symptoms (37.2% and 43.2%, respectively), and cost (30.3% and 37.0%, respectively).

Only 33.3% of respondents reported having undergone a lung-function test during the past year, whereas 60.3%

TABLE III. GINA criteria for asthma control compared with AIRIAP findings

GINA definition for control of asthma	AIRIAP findings	Respondents
Minimal chronic symptoms, including nocturnal symptoms	Asthma symptoms: During day (past 4 wk) Night wakening (past 4 wk) Exercise-induced asthma (past 12 mo)	51.4% 44.3% 33.1%
Minimal exacerbations	Sleep disruption at least once per week	28.3%
No emergency visits for asthma	Use of emergency care in past 12 mo: hospitalization, emergency department visit, or other unscheduled emergency visit	43.6%
Minimal need for short-acting β_2 -agonists	Current use of quick-relief bronchodilators*	56.3%
No limitation of physical activity	Asthma restricts: Sport and recreation Normal physical activity Choice of job or career (adults) Social activities-playing Lifestyle Household chores Have lost work-school days in past 12 mo because of asthma: Adults Children	52.7% 44.7% 37.9% 38.1% 37.6% 32.6% 26.5% 36.5%
Normal or near-normal lung function	Never had a lung-function test	60.3%

*Includes short-acting β -agonists (inhaled and oral), formoterol (inhaled), and anticholinergics.

TABLE IV. Self-classification of asthma control relative to current symptom severity in the AIRIAP study

Patient self-classification	Current symptom severity index*			
	Severe persistent (n = 362)	Moderate persistent (n = 503)	Mild persistent (n = 634)	Mild intermittent (n = 1708)
Completely controlled (%)	6.9	8.4	12.0	30.8
Well controlled (%)	27.4	34.2	44.8	50.6
Somewhat controlled (%)	43.1	43.5	37.2	16.9
Poorly controlled (%)	19.9	10.5	5.5	1.2
Not controlled at all (%)	2.8	3.0	0.5	0.4

*Column totals do not sum to 100.0% because of rounding.

of respondents had never undergone lung-function testing. Overall, 29.2% of respondents had heard of a peak flowmeter, although only 7.1% reported owning one.

DISCUSSION

AIRIAP is the first study of this scale and type in children and adults with asthma in the Asia-Pacific region. Data collection was undertaken by local professional researchers not engaged in asthma care and unconnected to the investigators to minimize bias and ensure effective communication in local languages. Although the use of face-to-face interviewing is expected to have diminished the potential for inaccuracy, cultural and methodological biases must be considered. For instance, there are likely to be regional differences in willingness to be interviewed, variation in levels of education might not have allowed a consistent degree of understanding between respondents, and adults answering on behalf of children are unlikely to have been fully aware of certain aspects of their condition. The variability in the mean age of respondents in different areas is likely to be related to cultural differences in willingness to participate.

Because the sampling was undertaken only in cities, the results might not reflect asthma burden or man-

agement in rural regions. Although asthma prevalence appears to be highest among urban areas worldwide, underdiagnosis and undertreatment of asthma might be more prevalent in rural areas, which tend to be allocated fewer health care resources. Thus this study's findings have probably underestimated the effect of asthma on many patients and societies in the Asia-Pacific region.

The AIRIAP findings demonstrate that, as in other regions of the world, asthma is suboptimally controlled in the Asia-Pacific region. The considerable asthma morbidity and reported management practices fall markedly short of standards recommended by GINA. Over half of the respondents reported symptom rates far in excess of accepted criteria for symptom control (Table III), and hospitalization, urgent, or emergency care was required by 43.6% of patients in the previous year. The rate of hospitalization in the past year was higher in the AIRIAP survey (15.3%) than in Europe (7% of Asthma Insights and Reality in Europe study respondents)⁹ or the United States (9% of Asthma in America study respondents).¹³ This is probably a reflection on the structure of the health care systems and an inadequate outpatient service in the Asia-Pacific region because our data show that there are less patients with severe persistent disease in this region.

Although preventative anti-inflammatory therapy is well recognized worldwide as the appropriate basis of treatment for patients with persistent asthma, only 13.6% of the sample reported current use of an ICS, and use of other preventative therapies was low (Fig 2). Despite a generally consistent pattern of medication use according to asthma severity among the 3 regions, Asia-Pacific respondents reported lower use of ICSs than respondents in Europe (23%) but similar use to those in the United States (15%).^{9,13} In other regions underuse of ICSs has been attributed to concerns about corticosteroid-related adverse effects by prescribers and patients, underestimation of severity status, economic factors, and failure to adhere to guidelines.^{7,10-15,18} Our findings show that, in addition to fear of steroid-related side effects and the cost of medication, other factors, including concern over long-term use of medicines, lack of immediate effect, loss of effectiveness over time, and lack of symptoms might be important in contributing to the underuse of ICSs. A poor understanding of ICSs and the inflammatory basis of asthma was also noted. Another possible reason for underuse might be an apparent lack of efficacy of ICSs, resulting from the incorrect technique commonly seen in patients using metered-dose inhalers.¹⁹ This possibility was not investigated in this study.

The AIRIAP findings are consistent with the results of previous surveys conducted by using a similar methodology in the United States and Western Europe.⁹⁻¹⁵ As in other regions, our patients and their parents or care givers tend to underestimate the severity of asthma and overestimate the level of asthma control. Thus one third of our respondents with symptoms consistent with severe persistent asthma claimed that their disease was completely or well controlled. This underestimation of disease severity is not only seen in asthmatic patients but also in physicians, including asthma specialists in the United States.¹⁸

The AIRIAP survey also documents a need for increased patient education about asthma and its management. Expectations should be raised among patients that improved control is achievable. A comprehensive, low-cost asthma education program has been shown to be effective in increasing the use of ICSs; in turn, better asthma control and reduction in health care use could be observed, even in patients with low socioeconomic status, such as those frequently encountered in the Asia-Pacific region.²⁰

Similar to studies in America and Europe, the AIRIAP study highlights the discrepancy between accepted goals for asthma management and the actual degree of asthma control in the Asia-Pacific region. Failure to achieve treatment targets is likely to be due to the underuse of preventative medications, especially ICSs.

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APPENDIX

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