Asthma is a chronic inflammatory disease of the airways affecting more than 300 million people worldwide. It can cause considerable burden on the physical, social, emotional, and professional lives of affected individuals and family.

The International Study of Asthma and Allergies in Childhood (ISAAC) and the European Community Respiratory Health Survey (ECRHS) have shown that there is an increase in the global prevalence of asthma, particularly in children. Although the prevalence of asthma is more in the developed countries, evidence in recent years, has shown a sharp increase in the developing countries, possibly due to the effects of urbanization.

There are no reliable data on the prevalence of asthma in the United Arab Emirates (UAE) to date. But some small studies on the prevalence of asthma among school children in the UAE have shown that the prevalence of disease among school children is 13.6%.

Asthma when inadequately controlled can affect the quality of life considerably, hence control of disease is mandatory. The Global Initiative for Asthma was initiated in 1989, in collaboration with The National Heart, Lung, and Blood Institute in 1993 to set up guidelines for the management and treatment of asthma. The last updated GINA in 2008 has focused on staging of asthma according to disease control, rather than staging based on its severity.

The Asthma Insights and Reality (AIR) surveys are part of comprehensive multinational surveys conducted in adults and children worldwide to assess the current level of asthma control among asthmatics. Similar surveys have been conducted and reported in Europe (AIRE), Asia pacific, America, Japan, and Latin America. All of them highlighted that asthma is still globally undertreated and adherence to asthma guidelines is far from optimal.

The AIR survey in the UAE is part of The AIR survey in the Gulf and Near East (AIRGNE), which has also included Jordan, Lebanon, Kuwait, and Oman. AIRGNE is the first and largest comprehensive study done in the region to date, which assessed the level of control of asthma and adherence to treatment guidelines.
Methods

Selection of subjects
This survey was conducted between January 2007 and March 2008. The total population in the UAE is about 2,563,000 of which only 23% are UAE nationals. The most populated urban areas in the UAE, namely, Abu Dhabi, Dubai, and the Northern Emirates were included in the study.

Sampling was structured according to the gender and age within the city or region to provide a representative sample. The sampling quotas were made of nationals (50%), and nonnational groups. The nonnational group comprised other Arabs (25%), South Asians (65%), and East Asians (10%). Accordingly, structured quota samples were applied within cities by gender, age, and nationality, so each interviewer was allotted an area plus a set quota for that area.

Sampling methods
Asthma patients in the country were identified by systematic surveying of households for persons who had been diagnosed as suffering from asthma. The sampling plan was designed to provide a nationally representative sample of households that could be screened to identify a community sample of current asthmatics in the country. Sampling and interviewing limitations required the sampling frame be restricted to urbanized areas within the country. As mentioned above, geographically stratified samples of households proportional to the population in quotas by age and gender were drawn within the four areas of the country. The survey design required a sample of 200 asthmatics from UAE. In each household, an adult was asked whether a physician had ever diagnosed any member of the household as suffering from asthma. If the answer was yes, the interviewer asked whether any of those individuals were currently taking medications for their asthma or had suffered an asthma attack or experienced asthma symptoms in the past one year. Information regarding the number of persons in the household and those who had been diagnosed with asthma and met the survey criteria for current asthma were collected to provide comparative prevalence. If more than one household member was qualified as having current asthma, the interviewer randomly selected one as the designated respondent. Only one respondent was interviewed per household because multiple interviews in the same household can cause a bias. If the selected respondent was 16 years or older, the interview was conducted with the patient; if he or she was 15 years or younger, the interview was conducted with the parent or guardian who was more knowledgeable about the child’s condition and treatment.

Questionnaire
The core questionnaire used in previous AIR studies in Europe and elsewhere, which was actually based on the original ATS questionnaire, was used. The questionnaire was translated to Arabic and then translated back to English and any discrepancies and inconsistencies were solved by consensus. Finally, the self-completed Asthma Control Test (ACT) and additional questions to reflect the local conditions and characteristics of asthma in the UAE and some questions to reflect the latest version of GINA guidelines were additionally included. The questionnaires were printed in English–Arabic side-by-side layout. As per quality control, all the materials were piloted and there was a personal briefing of the interviewers and each interviewer conducted two pilot interviews and reviewed two completed questionnaires with a supervisor before starting the field work. Completed questionnaires were checked locally by the Ministry of Saudi Arabia and again centrally by IMS (Central UK office) and there was a random back checking of interviews conducted by telephone. Finally all the data were included in a database after independent double typing.

Data analysis
The data on asthma morbidity and management practices were stratified by age (children: 15 years or younger; adults: 16 years or older) because existing asthma treatment guidelines are different for children and adults and the responses for children were obtained by proxy. The frequency and severity of daytime and nighttime symptoms, exercise-induced symptoms; severe episodes, and total symptom frequency were used to determine asthma symptom severity. The events, such as hospitalization and utilization of emergency services as well as loss of school/work days due to asthma were documented. The patients’ demography and asthma severity were compared using Chi-square analysis to identify factors that might account for differences in asthma management across the country or analysis of variance for quantitative variables whenever required. Statistical comparisons (SPSS for Windows version 12.0) of reports within the country vs published international AIR reports were done. All statistical tests were two-sided and comparisons with <5% probability of error were considered statistically significant.

Results

Sample population
A total of 200 asthmatic subjects across UAE were surveyed in this study. Thirty-four percent of the total participants were from Abu Dhabi and 33% from Dubai, and the remaining 33% from the Northern Emirates. Eighteen percent were younger than 16 years and 82% were adults. Eighty-five percent of the asthmatics were males and 10% of the participants were current smokers and 6% exsmokers. The average age in years that is mean ± SD of the participants was 28.4 ± 14.5 years. The mean age at the time of diagnosis of asthma was 15.0 ± 11.9 years [Table 1].

Asthma control
Based on the ACT score, the majority of patients (70%) perceived their asthma was well controlled. The mean ± SD ACT score was 20.9 ± 2.2, although there was no good agreement with subjective asthma control (χ² P value < 0.05) [Table 2] or with general health [Figure 1]. Over half of them believed their asthma was getting better (59%), and the majority (71%) reported seasonal asthma.

Morbidity due to asthma
There was substantial morbidity associated with asthma. Two thirds (64%) had suffered sudden severe episodes of asthma during the past year. About 40% had such attacks at least twice a year and 11% of children and 3% of adults had to
be hospitalized for asthma. Twenty-one percent of the well-controlled group and 60% of the poorly controlled asthmatics had to utilize emergency resources during the past year. Sixty-one percent had at least some limitation of sport activities. Sixteen percent of adults and 53% of children had to miss their work or school during the past year. Daytime symptoms and nighttime symptoms in the past four weeks were reported by 57.5% and 35.5%, respectively. Of these, 30% had daytime symptoms and 27% had nighttime symptoms at least twice a week [3].

In comparison with all the AIRGNE participants, children in the UAE had similarly high lost school days during the past year (52%) ($\chi^2 P$ value > 0.05). However, the adults reported a substantially lower burden compared with the AIRGNE participants in terms of work absence, number of lost days, emergency visits, and hospitalization (all $\chi^2 P$ value < 0.05) [3].

Less than half of the participants had ever heard of a peak flow meter and only 8% (n=16) had ever used it. Only 25% of the children and 37% of the adults had ever undergone a lung function test.

Only 31% were familiar with inhaled corticosteroids and only 5.5% were using them. Sixty-seven percent were using short-acting beta-2 agonist (SABA) as their current medication and most (57%) believed that SABA is the most effective drug for controlling asthma symptoms.

Almost 70% were diagnosed as having asthma and were being followed-up by general practitioners. Only 17% had scheduled follow-up visits and only 15% had a written action plan by the doctor, whereas just less than a quarter were aware of asthma guidelines.

Finally the ACT correlated well with increased utilization of health services, either emergency room visits (linear $\chi^2 4.448$,

### Table 1: Demographic characteristics of asthma patients

| Parameter                          | Population |
|------------------------------------|------------|
| Interval age distribution (years)  | n = 200    |
| 5-15                               | 36 (18)    |
| 16-29                              | 60 (30)    |
| 30-49                              | 86 (43)    |
| > 50                               | 18 (9)     |
| Mean age at diagnosis (years)      | 15.0 ± 11.9|
| Mean age of participants (years)   | 28.4 (14.5)|
| Gender                             |           |
| M                                  | 170 (85)   |
| F                                  | 30 (15)    |
| Level of education                 |           |
| Primary                            | 4 (2)      |
| Secondary                          | 52 (26)    |
| University                         | 140 (70)   |
| Income                             |           |
| < 12000 AED                        | 48 (24)    |
| 12000-15000 AED                     | 48 (24)    |
| 15000-25000 AED                     | 52 (26)    |
| > 25000 AED                        | 52 (26)    |
| Region                             |           |
| Abu Dabi                           | 68 (34)    |
| Dubai                              | 66 (33)    |
| Northern Emirates                  | 66 (33)    |
| Smoking habits in adults           |           |
| Current                            | 20 (10)    |
| Former                             | 12 (6)     |
| Never smoked                       | 168 (84)   |

Values correspond to numbers (percentages) of patients in the corresponding category except for age at diagnosis, which are represented as mean ± SD.

### Table 2: Comparison between objective and subjective evaluation of asthma control

|                        | Subjective asthma control | Objective asthma control |
|------------------------|----------------------------|--------------------------|
| Poorly and not well controlled | 8 (4)                     | 60 (30)                  |
| Well/completely controlled | 192 (96)                 | 140 (70)                 |

*Objective evaluation of asthma control according to the Asthma Control Test (ACT). An ACT of 5 to 19 corresponds to a poorly or not well controlled asthma, and an ACT of 20 to 25 corresponds to a well controlled asthma. Figures in parentheses are in percentage.
Discussion

The AIR UAE study, which was conducted as part of the AIR GNE (first study in the region), was the first survey in the UAE that assessed the current level of asthma control and management. As in other studies of the kind conducted worldwide, these surveys provide direct evidence that despite the availability of guidelines and effective medication the burden of asthma in the UAE is unacceptably high. The majority of patients had acute attacks and 40% had unscheduled emergency visits. The disparity between the patient’s perceived level of asthma control and GINA goals of asthma control is striking. Although 89% of asthmatics felt their general health was at least good, most of them had chronic symptoms and many had limitation of activities and loss of school/work days. High reliance on controller medication and significant underuse of preventive medication is another disturbing finding. These findings show that majority of asthmatics in the UAE are undertreated and the GINA goals of treatment of asthma are not yet met.

Data on asthma prevalence and morbidity in the UAE are scarce. A cross-sectional study on 850 school children conducted by Bener et al.,[4] in 1994, showed that the prevalence of asthma among the school children was 13.6%. In 2000, another study was conducted among school children in the UAE by Almaskari and colleagues. The ISAAC study was conducted in Kuwait,[15] Morocco, Oman, and Lebanon but not in the UAE.

Limitations of the study

Random digit dialing (RDD)[16] was used in many previous AIR surveys. In countries where telephone coverage is close to 100%, RDD can approximate a representative random sample of the population. However, RDD was not considered in this survey because of social norms, low penetration of telephone coverage, and lack of availability of telephone number databases. The urban sampling frame used in this study would have created a selection bias toward higher socioeconomic groups rather than the country as a whole. In the absence of comprehensive demographic information, it is hard to assess the magnitude of the bias. However, this does not influence the overall conclusions reached from this survey, as it points to lack of sufficient awareness as well as undertreatment of asthma. One would presume that in the rural population, the results would have been worse[17,18] or more or less the same because of economic constraints and reduced availability of health care facilities.

One of the regional factors that are worth considering is the problem associated with the term “asthma” in Arabic, which means acute severe problem, and hence many doctors use the term allergy making it more acceptable to patients. There is also no good translation of “inflammation” in Arabic. This might have caused the patients to underestimate their disease severity and to rely on rescue medication for the treatment of their condition.

As with other AIR surveys,[6] our study also highlights the discrepancies between patients’ perceived asthma control and symptom severity. Patients adapt themselves to their condition and overestimate their control, thus settling for a quality of life much less than that is achievable if management guidelines are followed. This is evident from the fact that, although 30% of the participants had poorly controlled or uncontrolled asthma when measured objectively using ACT, only 8% were aware of it. Only 17% believed that their condition could be treated. Increasing public awareness of the disease and improving both patient’s and physician’s expectations can go a long way in improving overall asthma control.

Our survey is in conformity with the earlier surveys of the kind, concerning the underutilization of inhaled corticosteroids (ICS). It may be noted that only 5.5% of the participants were using ICS, which was much less when compared with the overall AIRGNE results of 14.5%. Only one third of them were familiar with ICS and the majority believed that the risks possibly outweighed the benefits. This calls for better communication between patients and physicians[19] and patient education regarding the benefits and the imperative need for the use of preventive medication for long-term management of asthma.

The GINA goal of monitoring and long-term management of asthma are also unmet as can be seen from the results of the survey. Only 30% of the participants had a lung function test. Only 8% had ever used a peak flow meter. The majority did not have a written action plan for asthma control and only 17% had scheduled follow-up visits.

In conclusion The AIR in UAE survey indicates that asthma in the UAE is undertreated and adherence to asthma guidelines is poor. It is imperative that general physicians who are responsible for the diagnosis and management of most asthmatics need to be updated to improve the asthma control methods and to lessen the gap between long-term goals of asthma management and the existing condition in the UAE.

Acknowledgment

The AIRGNE survey was sponsored by GlaxoSmithKline. Authors had access to the database and discussed and drafted this report independently from the sponsor.

References

1. Bateman ED, Hurd SS, Barnes PJ, Bousquet J, Drazen JM, Fitzgerald M, et al. Global strategy for asthma management and prevention: GINA executive summary. Eur Respir J 2008;31:143-78.
2. Pearce N, Sunyer J, Cheng S, Chinn S, Bjorksten B, Burr M, et al. Comparison of asthma prevalence in the ISAAC and the ECRHS. Eur Respir J 2000;16:420-6.
3. Braman SS. The global burden of asthma. Chest 2006;130:48-12S.
4. Bener A, Abdurazzaq YM, Deube P, Al-Mutawaa J. Prevalence of asthma among Emirates school children. Eur J Epidemiol 1994;10:271-8.
5. Chen H, Gould MK, Blanc PD, Miller DP, Kamath TV, Lee JH, et al. Asthma control, severity, and quality of life: Quantifying the effect of uncontrolled disease. J Allergy Clin Immunol 2007;120:396–402.
6. Global Initiative for Asthma (GINA). Global strategy for asthma management and prevention. NHLBI/WHO work shop report. Bethesda MD. National Institutes of Health, National Heart, Lung and Blood Institute, NIH publication No. 02-3659; April 2002.
7. Rabe KF, Vermeire PA, Soriano JB, Maier WC. Clinical...
management of asthma in 1999: The asthma insights and reality in Europe (AIRE) study. Eur Respir J 2000;16:802-7.
8. Lai CK, De Guia TS, Kim YY, Kuo SH, Mukhopadhyay A, Soriano JB, et al. Asthma control in the Asia-Pacific region: The asthma insights and reality in Asia-Pacific study. J Allergy Clin Immunol 2003;111:263-8.
9. Adams RJ, Fuhlbrigge A, Guilbert T, Lozano P, Martinez F. Inadequate use of asthma medication in the United States: Results of the asthma in America national population survey. J Allergy Clin Immunol 2002;110:58-64.
10. Adachi M, Ohta K, Morikawa A, Nishima S. Asthma insights and reality in Japan 2005. Arerugi 2006;55:1340-3.
11. Neffen H, Fritscher C, Schacht FC, Levy G, Chiarella P, Soriano JB, et al. Asthma control in Latin America: The asthma insights and reality in Latin America (AIRLA) survey. Rev Panam Salud Publica 2005;17:191-7.
12. Rabe KF, Adachi M, Lai CK, Soriano JB, Vermeire PA, Weiss KB, et al. Worldwide severity and control of asthma in children and adults: The global asthma insights and reality surveys. J Allergy Clin Immunol 2004;114:40-7.
13. Ferris BG. Epidemiology standardization project. Am Rev Respir Dis 1978;118:1-120.
14. Schatz M, Sorkness CA, Li JT, Marcus P, Murray JJ, Nathan RA, et al. Asthma control test: Reliability, validity, and responsiveness in patients not previously followed by asthma specialists. J Allergy Clin Immunol 2006;117:549-56.
15. Owayed A, Behbehani N, Al-Momen J. Changing prevalence of asthma and allergic diseases among Kuwaiti children. Med Pract 2008;17:284-9.
16. Waksberg J. Methods for random digit dialing. J Am Stat Assoc 1978;73:40-6.
17. Wissow LS, Gittelsohn AM, Szklo M, Starfield B, Mussman M. Poverty, race and hospitalization for childhood asthma. Am J Public Health 1988;78:777-82.
18. Halfon N, Newacheck PW. Childhood asthma and poverty: Differential impacts and utilization of health services. Pediatrics 1993;91:56-61.
19. Cochrane MG, Bala MV, Downs KE, Mauskopf J, Ben-Joseph RH. Inhaled cortico steroids for asthma therapy: Patient compliance, devices, and inhalation technique. Chest 2000;117:542-50.
20. Ulrik CS. Outcome of asthma: Longitudinal changes in lung function. Eur Respir J 1999;13:904-18.

Source of Support: GlaxoSmithKline, Conflict of Interest: None declared.

Author Help: Online submission of the manuscripts

Articles can be submitted online from http://www.journalonweb.com. For online submission, the articles should be prepared in two files (first page file and article file). Images should be submitted separately.

1) First Page File:
Prepare the title page, covering letter, acknowledgement etc. using a word processor program. All information related to your identity should be included here. Use text/rtf/doc/pdf files. Do not zip the files.

2) Article File:
The main text of the article, beginning with the Abstract to References (including tables) should be in this file. Do not include any information (such as acknowledgement, your names in page headers etc.) in this file. Use text/rtf/doc/pdf files. Do not zip the files. Limit the file size to 1 MB. Do not incorporate images in the file. If file size is large, graphs can be submitted separately as images, without their being incorporated in the article file. This will reduce the size of the file.

3) Images:
Submit good quality color images. Each image should be less than 2048 kb (2 MB) in size. The size of the image can be reduced by decreasing the actual height and width of the images (keep up to about 6 inches and up to about 1800 x 1200 pixels). JPEG is the most suitable file format. The image quality should be good enough to judge the scientific value of the image. For the purpose of printing, always retain a good quality, high resolution image. This high resolution image should be sent to the editorial office at the time of sending a revised article.

4) Legends:
Legends for the figures/images should be included at the end of the article file.