

Asthma control in cities of developing countries: results of a five-city survey

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Introduction

Over 80% of asthma-related deaths occur in low and lower-middle income countries,¹ with asthmatic children in low and middle income countries having more severe symptoms than those in high income settings.²⁻⁴ Asthma-associated symptoms, sleep disturbances, impairment of lung function, increased use of rescue medication, and limitation of daily activity and quality of life impose a significant burden on affected individuals, the updated Global Initiative for Asthma (GINA) guidelines⁵ therefore emphasise that asthma management should be based on achieving and maintaining clinical asthma control.⁶⁻⁹

Surveys assessing the current level of asthma control in asthmatic children and adults in different regions of the world¹⁰⁻²⁰ have indicated that asthma control was suboptimal and that the disease was still under-diagnosed and under-treated globally. Inadequate asthma control results in poor health outcomes; including greater numbers of emergency room visits and hospitalization/urgent healthcare utilization, increased mortality, lower physical and mental health-related quality of life scores, absenteeism from work/school, and higher levels of activity impairment/overall work productivity loss.^{20, 22-26} Most of these observations are based on information from Western Europe and North America. In view of the dearth of asthma control information from developing countries, the objectives of this study were to understand, for urban settings of developing countries from diverse regions of the world, the perception of asthma in the general population through a household survey and the level of asthma control through a complementary survey with asthmatics.

Materials and methods

Study design

This was a pilot survey conducted in two parts: part 1, a household survey to assess the perceptions of asthma and part 2, a survey of patients with asthma to assess the level of asthma control in developing countries. Five

cities from developing economies in Africa and Asia were selected: Dakar (Senegal), Dhaka (Bangladesh), Lusaka (Zambia), Nairobi (Kenya), and Phnom Penh (Cambodia). We used a multi-modular approach for both surveys consisting of structured interviews which were conducted using standardised questionnaires developed based on discussion with experts and healthcare workers in the field. No tests or investigations were performed as part of this research. Prior to finalisation, the master version for each module of research was reviewed and approved for medical content and then translated into the native languages of the different countries by agencies conducting the fieldwork. The translated questionnaires were validated, approved and finalised for use in the study by local clinicians fluent in English and in the native language from each country and by the sponsor.

The study samples/sizes were determined by Ipsos Healthcare, London, UK; an independent healthcare market research organisation specialising in such surveys and contracted to deliver the study. For the household survey, n=1000 was used as it offers a statistical reliability of +3% (at 95%). For the survey of patients with asthma, as it is a smaller population, n=300 was used; it offers a statistical reliability of +5.7% (at 95%). The survey was performed according to the European Pharmaceutical Market Research Association guidelines.²⁷ All study participants provided written informed consent to participate in the study as required by the guidelines. The study followed established practices for market research projects.

Part 1. Household survey

The main household survey was designed to explore attitudes to asthma across each city. At least 1000 households per city were interviewed using a random door-to-door sampling strategy within neighbourhoods, designed to ensure the sample reflected different socioeconomic levels. Standardised questionnaires were used for the interviews. Respondents for this element of the research had to be over the age of 18 years. As it was important for the sample to be representative of the city, there were no other specific inclusion criteria (i.e. the city's population served as the target group). Interviewers were instructed to move to a different household if they were unable to establish contact or permission to participate in the study. The tools used to assess socioeconomic class was selected to reflect to the social and economic environment for each city; it was based on the Living Standards Mea-

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asures for the three African cities and was complemented by questions on education and occupation for Dakar. A combination of education and occupation was used for Dhaka, whereas income was used in Phnom Penh for assessment of socioeconomic class.

Part 2. Asthma survey

Patients with self-reported asthma defined as a physician diagnosis in the last 12 months or breathing problems/symptoms suggestive of asthma were asked to participate in the asthma survey. Asthmatic adults and parents/guardians of children with asthma living within the households from the above described survey were then interviewed with regard to their own asthma or the asthma of children under their care.

The aim was to recruit 300 people with asthma in each of the 5 cities of the study. Insufficient asthmatics were identified from the household survey. Following a pre-defined secondary search strategy, additional asthmatics (using the same definition as above) from the same neighbourhood were identified via referrals from health professionals and referral from those interviewed in the household survey.

A sensitivity analysis on asthma control was conducted to ensure the asthmatic population identified in the secondary search was similar to the group of asthmatics identified during the household survey. Asthma control, in asthmatics identified by both methods, was assessed using the Asthma Control Test™ (ACT; Quality Metric Incorporated, Lincoln, Rhode Island, USA)²⁸ and acute exacerbations were defined as self-reported visits to the hospital because of asthma/breathing problems.

Results

The disposition of households surveyed and demographics of the subjects with asthma in the different cities are presented in Table 1.

The number of households contacted varied between the cities due to variations in the numbers of households either failing to respond or refusing to participate in the survey.

The mean age of asthmatic subjects identified in our study was between 27 and 47.5 years in the different cities. In four of the five cities included in the survey, a small majority of asthmatic respondents were female and relatively few participants in the asthma questionnaire reported to be

current smokers. Assessment of the socioeconomic class indicated that the vast majority of asthmatics were either of medium or low socioeconomic status.

Asthma control and acute exacerbations

A large group of asthmatics (between 32 and 56%) indicated that their asthma was well controlled, despite being short of breath or waking in the night due to asthma symptoms (see Table 2).

Assessment, according to the ACT score, showed that asthma control was generally very poor across all cities. The distribution of ACT scores was largely uni-modal; with the majority of subjects having scores between 12 and 19 (see Figure 1) and relatively few subjects (15–27%) achieving at least well controlled asthma (ACT \geq 20) (see Table 3). Asthma control was found to be worst in the lower socioeconomic classes but did not appear to be influenced by the age of the patient (see Table 3). Also, asthmatics identified from the household survey tended to have marginally better control than those from referrals (see Table 4).

Parameter	Dakar	Dhaka	Lusaka	Nairobi	Phnom Penh
Households surveyed					
Total number of contacts made (n)	1618	1913	1194	1355	3668
Number of no response or refusals (n)	472	733	50	112	2386
Number of completed surveys (n)	1146	1180	1144	1243	1282
Asthmatics surveyed	n=302	n=300	n=301	n=300	n=302
Mean age (years) (range)	47.5 (1–89)	35.6 (1–80)	30 (<1–91)	27 (<1–87)	30 (1–87)
% Female	35.5	53	58	58	60
% Male	64.5	47	42	42	40
Mean height (cm)	169	152	159	163	141
Mean weight (kg)	70	53	62	63	49
% Smokers	6	15	6	7	5
% Households in SEC					
A		17	–	–	–
AB		–	13	23	23
B		24	–	–	–
C		18	–	–	22
C1/C2		–	28/41	34/34	–
D		20	–	–	19
DE		–	19	9	–
E		22	–	–	36
High	16				
Medium	32				
Low	32				
Socioeconomic class (SEC) was based on the Living Standards Measures for the three African cities and was complemented by questions on education and occupation for Dakar. A combination of education and occupation was used for Dhaka, whereas income was used in Phnom Penh for assessment of socioeconomic class.					
SEC in only Dakar defined as high, medium, or low.					

Table 1 Disposition of households surveyed and demographics of subjects with asthma from households interviewed in different cities

Asthmatic subjects in our survey were asked to report repeated asthma exacerbations requiring hospitalisations in the previous year. The majority of subjects reported at least 1 exacerbation requiring hospitalisation in the previous year (between 48% and 82% of responders per city) and an average hospitalisation rate of between 4.6 and 10.7 per year (see Table 5). The majority of patients from all cities surveyed stayed for <1 day in hospital and received tablets as treatment for exacerbations. Aligned with this finding, a large number of asthmatics reported not having inhaled or nebuliser therapy (see Table 5).

Frequently used asthma treatments

Based on reports from asthmatics, large numbers of patients did not use or even possess an inhaler, whereas oral bronchodilators were used very commonly and appeared to prevail in most cities (see Table 6).

Asthma and/or treatment-associated social stigma

In the household survey, responders were asked to rate

their understanding of several diseases (asthma, HIV, arthritis, diabetes and cancer). Between 33% and 54% of responders indicated that they had a good (rated 4 out of 5) or very good (rated as 5 out of 5) understanding of asthma (see Table 7). The reported understanding of asthma fell below that of diseases like HIV (mean score varying between 2.6 and 3.5 for asthma and 3.3 and 4.4 for HIV). Negative attitudes and the stigma attached to inhaled medication seemed to be common among the responders. A large number of responders (ranging from 16% to 29%) agreed with the statement that “asthma problems should not be discussed openly” and even more (between 31% and 63%) with the statement that “the use of inhalers means you are very sick” (see Table 7).

Discussion

The main objectives of our study were to understand the perception of asthma in the general population through a household survey and the level of asthma control through a complementary survey with asthmatics across cities

of the developing countries in Africa and Asia. As far as we can ascertain, this is the first study which investigates asthma control in patients in major cities of several developing countries.

Our study demonstrated that asthma control across the cities surveyed, based on the ACT scores, was very poor compared to European and North American surveys using the ACT to assess degree of asthma control.¹⁰⁻²⁰ This was supported by the high level of reported symptoms as well as the prevalence of repeated exacerbations requiring hospitalisation. To the best of our knowledge, the rate of repeated exacerbations requiring hospitalisation was higher in our survey than in any other asthma control survey. It is possible that patients in developing countries use emergency departments for relatively minor worsening of symptoms and as part of their ongoing management of the disease but the poor asthma control identified using the ACT score would suggest otherwise.

Management of asthma seemed to be based on oral

Parameter	Dakar (n=302)	Dhaka (n=300)	Lusaka (n=301)	Nairobi (n=300)	Phnom Penh (n=300)
% Patients rating their asthma as well controlled	56	37	37	53	32
% Patients short of breath once or twice a week	39	27	40	42	44
% Patients waking once or twice a week due to asthma symptoms	27	19	32	22	23
% Patients without an inhaler	68	24	42	38	14

Table 2. Perception of asthma control, weekly symptoms, and inhaler use by patients from different cities

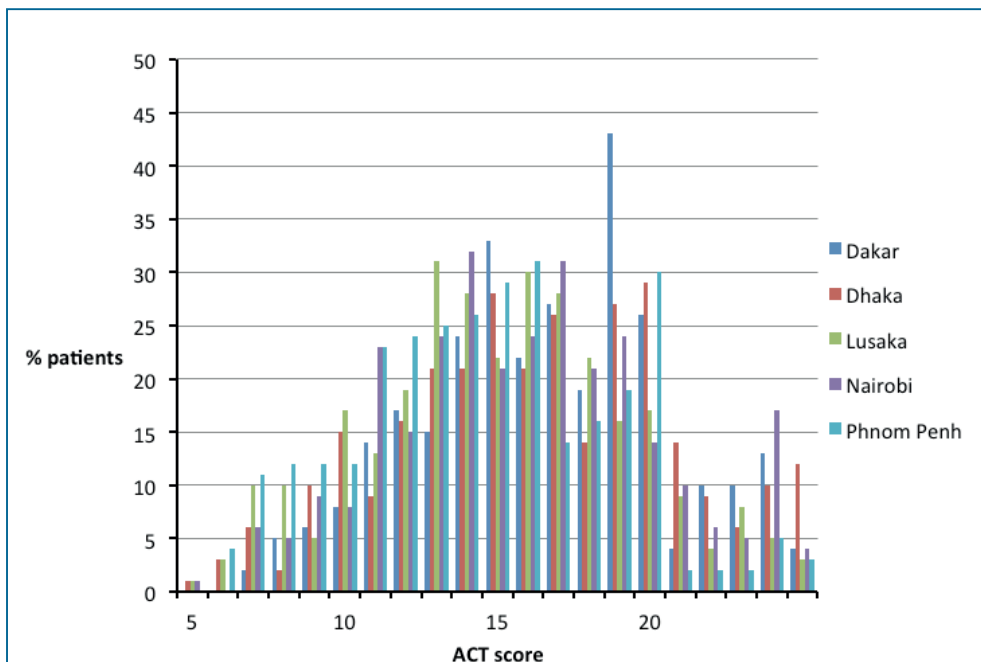


Figure 1 Distribution of Asthma Control Test (ACT) scores by city

Parameter	Dakar (n=302)	Dhaka (n=300)	Lusaka (n=301)	Nairobi (n=300)	Phnom Penh (n=302)
% asthmatics with ACT scores:					
20–25 (well controlled)	22	27	15	19	15
5–19 (not well controlled) (15–19; 5–14)	78 (48; 30)	73 (38; 35)	85 (39; 46)	81 (40; 41)	85 (36; 49)
% asthmatics with controlled (uncontrolled) asthma in age group:					
<25 years	20 (80)	3 (6)	18 (82)	17 (83)	19 (81)
25–35 years	14 (86)	22 (78)	5 (95)	23 (77)	16 (84)
36–45 years	14 (86)	29 (71)	4 (96)	16 (84)	9 (91)
46–55 years	29 (71)	15 (85)	16 (84)	19 (81)	11 (89)
>55 years	25 (75)	24 (76)	23 (77)	0 (100)	5 (95)
% asthmatics with controlled (uncontrolled) asthma in SEC:					
A		38 (62)	–	–	–
AB		–	23 (77)	23 (77)	30 (70)
B		28 (72)	–	–	–
C		29 (71)	–	–	18 (82)
C1		–	22 (78)	25 (75)	–
C2		–	10 (90)	12 (88)	–
D		21 (79)	–	–	5 (95)
DE		–	7 (93)	8 (92)	–
E		23 (77)	–	–	5 (95)
High	32 (68)				
Medium	23 (78)				
Low	17 (83)				

Socioeconomic class (SEC) was based on the Living Standards Measures for the three African cities and was complemented by questions on education and occupation for Dakar. A combination of education and occupation was used for Dhaka, whereas income was used in Phnom Penh for assessment of socioeconomic class. SEC in Dakar only defined as high, medium, or low.

Table 3 Asthma control and influence of age and socio-economic class (SEC) in patients from different cities.

Parameter	Dakar	Dhaka	Lusaka	Nairobi	Phnom Penh
% subjects controlled from those identified from household survey (n controlled/n identified)	28 (44/157)	28 (34/120)	18 (29/157)	26 (15/57)	15 (3/20)
% subjects controlled from those identified via referrals (n controlled/n identified)	16 (23/145)	38 (46/120)	12 (17/144)	17 (41/243)	15 (41/282)
% subjects controlled from total (n controlled/n identified)	22 (67/302)	27 (80/300)	15 (46/301)	19 (56/300)	15 (44/302)

Table 4 Percentage of asthmatic subjects with well-controlled asthma

therapy. The relatively limited use of inhaled medication may be linked to the stigma we identified with the use of inhaled medication and with asthma in general. It could also result from the limited availability of inhaled medication. These observations suggest that care may be improved by implementing simple educational programmes aimed at increasing the understanding of asthma for both the general population and asthma patients. In addition, healthcare workers should be kept informed of international and local guidelines and of the role of inhaled controller medications.

Our study has limitations. The interviewers were asked to move on to another household if they were

unable to establish contact or permission to participate in the study. The responders to the household survey may therefore be different to the general population. The sample sizes were relatively small and based in urban environments, and therefore may be unlikely to be representative of the general asthmatic population across each country. The consistency of the findings across the different

cities surveyed, however, suggests that our observations are valid at least for urban settings. We also used standardised questionnaires developed and translated for this study during face to face interviews rather than telephone interviews, which increases the validity of our observations. Identifying asthmatic subjects in a survey can be problematic. Patients identified by physicians are usually from a more severe consulting population. Reversibility testing is impractical during a cross-sectional study because of the transient nature of the disease and bronchial hyper-reactivity is logistically difficult to measure and ethically complicated. Asthmatics in our survey

Parameter	Dakar	Dhaka	Lusaka	Nairobi	Phnom Penh
% patients with acute exacerbations resulting in hospitalisation in the last year	(n=302) 77	(n=299) 48	(n=301) 80	(n=300) 82	(n=297) 61
Frequency of hospitalisation in last 12 months (mean (SD))	(n=232) 10.7 (25.16)	(n=144) 5.1 (11.8)	(n=240) 4.24 (4.3)	(n=245) 4.6 (4.9)	(n=180) 6.2 (8.0)
% patients in hospital for:					
<1 day	90	62	78	68	64
1–2 days	2	15	12	14	15
3–7 days	8	11	6	10	14
>7 days	0	11	4	8	6
% patients receiving:					
Tablets	42	63	88	74	81
Inhaler	21	46	15	39	46
Nebuliser	15	27	10	12	32
Oxygen	16	31	5	17	11
Other	32	4	3	23	9
GPs' estimate of asthma treatment	5.8	6.3	8.5	5.9	7.7
Nurses' estimate of asthma treatment	6.5	6.9	7.8	7.8	7.3

Table 5 Acute exacerbation-associated hospitalisation and treatments in patients from different cities

	Dakar	Dhaka	Lusaka	Nairobi	Phnom Penh
Generally used treatments	Corticosteroids	Nebuliser	Salbutamol tablet/ inhaler/syrup	Ventolin syrup	Ventolin
	Ventolin syrup	Oxygen	Ventolin tablet/ inhaler/syrup	Ventolin tablet	Salbutamol tablet
	Ventolin and salbutamol tablets	Ventolin inhaler	Aminophylline injection	Adrenaline	Any other asthma drug preparation
Doctor prescribed	Ventolin inhaler (6/10)	Asmasol HFA 7/10	Ventosal syrup 5/10	Ventolin tablets 8/10	Ventolin (unspecified) 7/10
	Ventolin tablets (4/10)	Ventolin inhaler 6/10	Aminophylline tablet 4/10	Ventosal syrup 8/10	
	Celestine injectable 3/10	Ventolin tablets 4/10		Ventolin Evohaler inhaler 7/10	Salbutamol tablet 7/10
	Brodil tablets 3/10		Seretide inhaler 4/10		Seretide 4/10
	Salmolin inhaler 3/10				

Table 6 Top three treatments used generally or prescribed by doctors for moderate asthmatics as standard of care in different cities.

were self-reported as having a physician diagnosis of asthma in the last 12 months or symptoms suggestive of asthma in the same period. Although not perfect, this approach is consistent with major international surveys including the International Study of Asthma and Allergies in Childhood (ISAAC) and the European Community Respiratory Health Survey (ECRHS). It is possible that asthmatics identified during the household survey were more representative of the general population and that those from the secondary search strategy would be more severe cases. A sensitivity analysis comparing the ACT scores in these two groups did not support this hypothesis. The mean age in our surveys was higher than that of the general population and may reflect a selection bias based on the search methodology.

In conclusion, this study has shown that asthma control, as assessed by ACT scores, frequency of symptoms, and the very high rate of exacerbations requiring hospitalisa-

tion, was generally very poor in all five cities. Despite poor asthma control and acute exacerbations being very frequent, patients appeared to overestimate their level of control. Treatment patterns varied greatly from one city to the other, both in average number of dispensed treatments and in type of treatment, and there often appeared to be an over-reliance on oral bronchodilators as the mainstay of therapy. Moreover, treatments were generally not aligned to international guidelines and appeared to focus on systemic and inhaled bronchodilators and on treatment of exacerbations. Use of controller medication and inhalers was low in all cities; probably due to the combination of cost and stigma/negative attitudes associated with inhaler use. Educational programmes and public awareness campaigns could help improve asthma care and lessen the burden associated with this disease in developing countries.

Parameter	Dakar (n=1152)	Dhaka (n=1167)	Lusaka (n=1145)	Nairobi (n=1247)	Phnom Penh (n=1266)
^aHouseholds' ratings for understanding of asthma (%)					
1	10	20	21	17	26
2	14	14	17	16	26
3	22	18	20	19	16
4	25	13	20	17	23
5	29	35	21	31	10
Mean rating	3.5	3.3	3.0	3.3	2.6
^bNegative perceptions among households surveyed (%)					
Asthma/breathing problems are contagious	^c 22	30	43	35	35
Asthma/breathing problems should not be discussed openly	^c 18	29	26	16	29
Use of inhaler means being very ill	^c 63	44	62	31	53
It is difficult to use an inhaler	^c 35	25	40	10	42
Tablets are preferred to prevent awareness of asthma to others	^c 44	21	41	45	43
Living in a dusty house leads to asthma	^c 81	79	58	54	62
Use of paraffin oil/wood for cooking/heating leads to asthma	^c 74	47	54	48	36
^a Rating scale 1 to 5: with 1 = very little understanding and 5 = very good understanding.					
^b Expressed as percentage of responders who agree, rather than those that were aware of this perception.					
^c Expressed as percentage of total asthmatics surveyed in Dakar (n= 302).					

Table 7 Asthma understanding and treatment-associated attitudes and social stigma in different cities

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