UNDERRECOGNITION AND UNDERTREATMENT OF ASTHMA IN CAPE TOWN PRIMARY SCHOOL CHILDREN

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Background. In view of the high local prevalence of asthma, the extent of recognition and appropriate management of childhood asthma was studied in a large suburban area of Cape Town.

Design. Cross-sectional study based on random community sample of schools.

Method. 1 955 parents of sub B pupils from 16 schools completed a questionnaire, followed by: (*i*) an interview of the parents of 348 symptomatic children; and (*ii*) bronchial responsiveness testing on 254 children. The final case group consisted of 242 children with reported asthma or multiple asthma symptoms on both questionnaires. Children in whom asthma was acknowledged were compared with those in whom it was not.

Results. Overall, any past or current ('ever') asthma was acknowledged by respondents in only 53% of the children, and current asthma in only 37.1%. While most children had received treatment in the previous 12 months, 66.1% of the recognised group were on current treatment (23.2% on daily treatment), compared with 37% of the unrecognised group (3% daily). Salbutamol and theophylline syrups were the most common types of medication, while inhalers and anti-inflammatory medications were underused. Only a minority of parents reported the child ever having used a peak flow meter, or volunteered knowledge of preventive measures. Current treatment, and to a lesser degree recognition of asthma by parents, were more common among children on medical aid and of higher socio-economic status.

Conclusions. These findings suggest that ways need to be found: (*i*) to increase the use of current asthma treatment guidelines by practitioners; (*ii*) to provide access to comprehensive care by children not on medical aid; and (*iii*) to improve education of parents in home management measures such as severity assessment and avoidance of smoking, allergen and dietary triggers.

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There is accumulating evidence that childhood asthma is on the increase in the developed world, reflected in a rise in both population prevalence and hospitalisation rates in a number of countries.[1-5] In South Africa asthma appears to be associated with urbanisation,[6] and it is likely that with its rapid urbanisation South Africa is also experiencing a rising asthma prevalence.[7]

Although asthma is not curable, the quality of life of asthmatic children can be greatly improved by appropriate management. Elements of such management include appropriate anti-inflammatory and bronchodilator medication, education of caregivers about the disease, home monitoring and a self-management plan, allergen control, and attention to psychosocial obstacles to treatment.[8,9] Guidelines for the treatment of childhood asthma have been published in South Africa in recent years.[10-13] However, doubt has been expressed about the extent of their application in practice.[14]

Appropriate management of childhood asthma requires acceptance of the diagnosis by parents or caregivers, which in turn requires recognition by medical practitioners. Underrecognition and/or undertreatment of childhood and adolescent asthma have been studied and identified as problems in the UK,[15,16] Australia,[17] the Netherlands[18] and the USA.[19] Differences between socio-economic and ethnic groups in the recognition and treatment of childhood asthma have also been noted.[16-20] The common finding is that poorer, inner city or minority status children, depending on the society, tend to suffer more from their asthma and receive worse care than better off children.

Cape Town is known to have a relatively high prevalence of childhood asthma by published international standards,[21] which is in turn an important cause of paediatric admission to hospital.[22] The aim of the current study was to determine, on the basis of parental reporting, the degree to which asthma in young schoolchildren is recognised and appropriately managed in a large suburban area of Cape Town. The influence of socio-economic and other factors on the recognition and treatment of asthma was also examined. The investigation was population-based to avoid the selection bias in studies of clinic attenders. This study was part of a larger project examining the prevalence of asthma symptoms as well as household risk factors for asthma and wheezing in a young schoolgoing population.[21,23]

METHOD

Self-administered questionnaire

The study site chosen was a well-defined lower socio-economic area of Cape Town of approximately 200 000 people, of whom 30 000 were aged 5 - 9 years.[24] A random sample of 16 primary schools was selected from the 35 in the area. Questionnaires, in English or Afrikaans, were distributed in July 1993 (winter) via the children to the parents of all 2 172 sub B pupils (typically

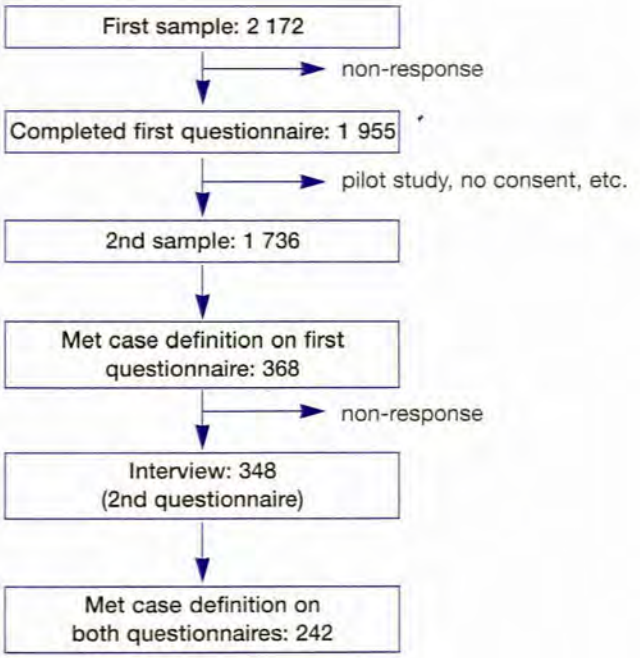

Fig. 1. Sampling pathway to case group.

aged 7 - 8 years) on the class lists of the sample schools. The questionnaire was based on that currently in use in a multicountry study of allergic disease in childhood[25] with the addition of a question on chest tightness, a term in common use in this population. The questions are reproduced in Appendix 1.

The overall prevalence findings have been reported elsewhere.[21] Fig. 1 illustrates how the groups for analysis in this part of the study were obtained. Questionnaires were returned by 1 955 parents (a response rate of 90%). A sampling frame of 1 736 children was obtained, after excluding 83 children from one school who participated in a pilot study of bronchial responsiveness testing, 114 who declined consent to be interviewed, and 22 on whom there was insufficient questionnaire information. From this second-stage sampling frame, a preliminary case group of 368 children was defined: those children with: (*i*) parent-reported asthma, plus at least one symptom in the past 12 months (162); or (*ii*) affirmative responses to four or more symptom questions referring to the past 12 months (206). For this purpose frequent wheezing (four or more occasions) was given the weight of two symptoms.

Interview-administered questionnaire

The parents of the children in the preliminary case group were visited by bilingual interviewers between 6 weeks and 3 months after the self-completed questionnaires were returned. These visits took place between September and November 1993 (spring to early summer months). In the longer questionnaire used in the home interview, the asthma symptom questions used in the first-stage questionnaire were repeated, and further information was sought on sociodemographic features; the child's respiratory medical history; history of treatment for chest symptoms; knowledge of asthma management; and terms used by the parent and medical practitioner to describe the child's condition (see Appendix 1). If the child was on current treatment, the respondent indicated the medication used by the child with the aid of a chart with photographs of the most common oral and inhaled medication in local use. The name and mode of delivery of the medication were recorded by the interviewer if the information could be obtained.

Bronchial responsiveness (BR) testing

From the preliminary case group of 368 symptomatic children, a 70% simple random sample was chosen to undergo bronchial responsiveness testing at school. The sampling was done because of resource constraints. Absent children were replaced by the next child on the sampling frame. Histamine challenge tests were carried out by pulmonary technologists and a medical practitioner using the long challenge protocol of Yan.[26] A Vitalograph S-Model dry bellows spirometer was used, calibrated daily with a 3-litre syringe. Any child judged clinically by the medical practitioner present to have a significant respiratory infection on the day was not tested. Parents were asked, in a letter sent the week before the test, to withhold routine asthma medication on the morning of the test unless the child was unwell, but it was not possible to evaluate compliance with this request.

Each child carried out a standing forced expiratory manoeuvre without a noseclip until two reproducible tracings, i.e. within 50 ml of each other, were obtained. The baseline measurement was repeated after an inhalation of normal saline. Any child found to have a post-saline forced expiratory volume in one second (FEV_1) of less than 75% of predicted for sex, age and height was not challenged with histamine. Instead, the child inhaled two puffs of salbutamol aerosol from a metered dose inhaler and repeated the expiratory manoeuvre after 10 minutes. A positive bronchodilator test was defined as one in which the FEV_1 increased by 15% or more after inhaling bronchodilator.

In the other children, the test consisted of inhaling doubling doses of histamine solution delivered with a series of De Vilbiss No. 40 hand-held nebulisers which dispense an average of 0.003 ml with each squeeze. The exact amount per squeeze delivered by each of the nebulisers used in the study was measured at the beginning of the study and again in the middle to calculate the delivered dose. The test was ended when a fall in FEV_1 of 20% or more from the post-saline value was recorded (a positive test), or when a cumulative dose of approximately 7.8 µmol histamine had been reached without such a fall (a negative test). Any child who experienced a fall of 10% or more in the course of the challenge was given two puffs of salbutamol at the end of the testing and observed until the FEV_1 had returned to its baseline value.

Definition of asthma and appropriateness of treatment

For purposes of evaluating recognition and treatment, those children who met the criteria for case status (see above) on both the self-administered and interview questionnaires were regarded as having asthma. They were further subdivided into those children for whom the respondent answered yes to the question 'has your child ever had asthma' on the second (interview) questionnaire, and those for whom the respondent answered no. Current treatment was defined as affirmative response to the question 'is your child currently on treatment from a doctor for any of the following symptoms: wheezing/whistling in the chest, tight chest, night cough or asthma?' Appropriateness of treatment was inferred by comparing reported treatment against the recommended South African guideline published in 1992.[10]

The study was approved by the Ethics and Research Committee of the University of Cape Town Medical Faculty, and informed consent for study participation and histamine testing was obtained from the parents of all participating children.

Statistical analysis

Symptom proportions in the two groups as well as the proportions of the two groups reporting various aspects of management and knowledge of asthma were compared using the likelihood ratio chi-squared statistic. The associations of sociodemographic, medical and family history factors and symptom severity with asthma recognition, current treatment and use of an inhaler were tested in bivariate analyses. In this cross-sectional design, the measure of effect presented in Table V is the prevalence ratio. The Cox proportional hazards model was used to obtain the point estimates and the corresponding 95% confidence intervals.

RESULTS

Of the 368 interviews planned, 20 were not concluded either because the child did not live in the study area or because access was not obtained. A total of 348 home interviews were successfully concluded, a response rate of 94.5%. A total of 243 children qualified as asthmatic by meeting the criteria for case status on both the initial and repeat questionnaires, and full information was available for 242 (Fig. 1).

A total of 254 children successfully underwent bronchial responsiveness testing, 244 of these completing the histamine challenge test and 10 the bronchodilator test. Of another 42 children invited to the testing, 14 were absent on the day, 14 were judged to have a significant respiratory tract infection, 7 were unable to perform an adequate test, and 5 were no longer at the school; in 2 cases the test was curtailed because of time. Of the group that underwent bronchial responsiveness testing, however, only 178 children also met the criteria for case status on both questionnaires, so that for 65 of the asthmatic children bronchial responsiveness status was unknown.

Table I. Reported symptoms and bronchial responsiveness by asthma recognition (%) (N = 242)

Symptoms (past 12 months)	Asthma recognised (N = 129)	Asthma not recognised (N = 113)
Wheeze	95.3	100[a]
Wheeze > 4 episodes	45.7	44.3
Sleep disturbance by wheeze	76.6	87.6[b]
Speech disturbance by wheeze	43.4	52.2
Night cough	71.1	85.8[a]
Exercise wheeze	68.2	71.7
Tight chest	83.7	79.7
Bronchial responsiveness test (N = 178)		
Positive	62.0	48.1[c]
Negative	38.0	51.9

[a] $P = 0.005$.
[b] $P = 0.02$.
[c] $P = 0.07$.

Of the 242 children identified as asthmatic, only 129 (53%) had recognised asthma (Table I). Even in this group, only 88 (37% of total) were acknowledged as 'still' having asthma (Appendix 1, question 13.1). Even on the stricter criterion for case status of persistent symptoms plus bronchial responsiveness (100 children), recognition of asthma occurred in only 62%, of whom 45% were acknowledged as current.

The unrecognised group had significantly higher prevalences of wheeze, sleep disturbance and night cough than the recognised group (Table I). By contrast a higher proportion of the recognised asthma group had a positive bronchial responsiveness test (62% v. 41%; $P = 0.07$).

The mother was identified as the respondent in 85% of both the recognised and unrecognised asthma group. The majority of children were aged 6 - 8 years. Boys made up just over half of both groups.

Table II describes the terms offered by the respondent to describe the child's respiratory problem, as well as the terms attributed to the child's doctor (see Appendix I). The term asthma was offered by only 31.0% of the recognised group and 2.7% of the unrecognised group (the latter thus contradicting the response to the direct question about asthma). The largest proportion in both groups preferred 'tight chest' (*'toebors'*). Wheeze/wheezing chest was rarely used. In describing what term the doctor used, 'asthma' was reported by the majority (71.9%) of the recognised group. In the unrecognised group, 'bronchitis' (20%) and 'cold' (*'verkoue op die bors'*) were the majority responses.

Almost all of the children in both groups had received some treatment for asthma symptoms in the previous 12 months (Table III). However, while 23.2% of the recognised group were on daily treatment, and a further 42.9% on treatment as needed, only 3% in the unrecognised group were on daily

Table II. Terms to describe child's chest symptoms* used by respondent or attributed to doctor, according to asthma recognition (N = 242)

	Asthma recognised (N = 129)	Asthma not recognised (N = 113)
Name used by respondent		
Tight chest	31.0	28.3
Asthma	31.0	2.7
Cold	7.8	16.8
Bronchitis	7.0	15.0
Sore chest	5.4	12.4
Short breath	2.3	2.7
Wheezing chest	5.4	4.4
Other	5.4	9.7
None	10.1	8.0
Name attributed to doctor (N = 215)		
Asthma	71.9	7.0
Bronchitis	11.4	49.0
Cold	2.6	20.0
Tight chest	3.5	9.0
Other	4.4	7.0
None	6.1	8.0

* See appendix, questions 7 and 8.1.

Table III. Treatment and parental knowledge of home management, according to asthma recognition (%) (N = 242)

	Asthma recognised (N = 129)	Asthma not recognised (N = 113)
Treatment in past 12 months (yes = 215)	90.5	89.3
Source of treatment (N = 215)		
Private doctor	67.5	49.0[a]
Day hospital	28.1	47.0[b]
Red Cross Hospital	43.9	22.0[b]
Other hospital	7.0	5.1
Other	8.8	16.0
Current treatment (N = 215)		
Every day	23.2	3.0
As needed	42.9	34.0
No	33.9	63.0[c]
Type of current treatment (N = 112)		
Pills	54.8	25.0[b]
Syrup	90.5	88.9
Inhaler	44.6	8.3[b]
Nebuliser	44.6	13.9[b]
Inhaler or nebuliser	64.9	21.6[b]
Injection	6.9	2.8
Other	1.4	8.3
Peak flow meter (ever used) (N = 242)	46.8	13.2[b]
Knowledge of bedroom prevention (N = 114)*		
Clean room	22.4	26.1
No smoke	16.4	8.7
Sleep with fresh air	16.4	30.4
No soft furniture/carpets	17.9	10.9
Other	17.9	17.4
Did not specify	9.0	6.5
Knowledge of dietary avoidance (N = 60)		
Drinks	43.8	33.3
Dairy	10.4	22.2
Preservatives/colourants	6.3	5.6
Other	22.9	27.8
Did not specify	16.7	11.1

[a] $0.005 < P < 0.01$ for difference.
[b] $P < 0.005$ for difference.
[c] $P < 0.0001$ for trend.
* See appendix, questions 10 and 11.

treatment, with a large proportion (63%) on no current treatment. Children in the recognised group were more likely to have been treated privately and/or at Red Cross War Memorial Children's Hospital. By contrast, the day hospital was a more common site of treatment of children in the unrecognised group.

With regard to types of medication currently used, syrups were mentioned by a large majority of the respondents to this question (90.5% and 88.9% in the recognised and unrecognised group, respectively), with pills the next most common mode of treatment reported. Inhalers were used by 44.6% of the recognised group and only 8.3% of the unrecognised group. Nebulisers were as commonly used as inhalers (the question did not distinguish between nebuliser use in a clinic or surgery and at home). Only 46.8% of the recognised group and 13.2% of the unrecognised group reported that the child had ever used a peak flow meter.

Response rates to the questions about home preventive measures were low (Table III). Of the 114 who answered the question about preventive bedroom measures, a minority (16.4% in the recognised asthma group, 8.7% in the unrecognised group) mentioned avoidance of smoking in the child's bedroom. Even fewer respondents (60) answered the question about dietary avoidance. Among these, the most common reference was to cooldrinks. There were no significant differences between the two groups in these responses.

A total of 101 of the 242 respondents provided more detail about the treatment the child used currently, either daily or as needed (Appendix I, question 9.1). Based on these responses, the number of times a specific medication/mode of delivery was mentioned is listed in Table IV. Salbutamol was most commonly mentioned, with a syrup preparation the most frequent mode of administration. Other beta-2-agonists, including fenoterol, were mentioned much less commonly. The next most popular medication was the theophyllines, again with syrups the most common form. Anti-inflammatory medication was identified relatively few times: inhaled corticosteroids 9 times, oral corticosteroids 11, and sodium cromoglycate 12. The remainder of the medications mentioned included antihistamines, antibiotics and various cold and flu preparations.

Table IV. Number of times medication class mentioned (N = 101)*

Salbutamol	71
Syrup	32
Inhaler	15
Pills	7
Unspecified	17
Fenoterol	14
Syrup	8
Inhaler	1
Pills	0
Unspecified	5
Other beta-2-agonist	2
Theophylline	66
Syrup	21
Pills	10
Unspecified	35
Steroids	20
Inhaled	9
Oral	11
Sodium cromoglycate	12
Ketotifen	3
Antihistamines	12
Syrup	0
Pills	1
Unspecified	11
Other	27

*N refers to number of respondents who gave information. As a single respondent could mention multiple medications, numbers in table do not refer to respondents.

Variables examined in relation to asthma recognition, current treatment and inhaler use were demographic (age, sex); medical history (hayfever, eczema, parental asthma); socio-economic (school, household crowding, number of other children in the household, maternal and paternal education and employment status); health care (medical aid, use of private doctor or day hospital); and severity (frequent wheeze, speech disturbance, positive bronchial responsiveness). Covariates reaching statistical significance in any association, plus those of *a priori* interest, are presented in Table V. Older children, and those with hayfever or a parental history of asthma, were more likely to be in the recognised asthma group. Having medical aid and attending a private doctor were also associated with recognition, while day-hospital attendance was associated with non-recognition.

Similar factors were associated with being on current treatment, with the addition of eczema and some socio-economic variables (higher socio-economic status school, and 3 or fewer other children in the household). A positive bronchial responsiveness test was also significantly associated with current treatment. The only predictors of inhaler use (among the group of 112 children on current treatment) were hayfever and 3 or fewer other children in the household.

Finally, it is of interest to estimate the population prevalence of asthma from this study. Based on the definition of case positive in both questionnaires, the prevalence of asthma (current or past 12 months) is 242/1 736, i.e. approximately 14%. If one adds the requirement of a positive bronchial responsiveness test and adjusts for the subsampling done for bronchial responsiveness testing, the prevalence of current (and presumably more severe) asthma is 7.8%. These point estimates would be closer to 13% and 7% if one assumes that non-respondents to the first questionnaire had children with fewer symptoms. These figures are higher than the 5% sometimes cited as the urban prevalence of asthma in South Africa. A reasonable approximation of the prevalence of clinically significant asthma in Cape Town is therefore between 7% and 13%, depending on definition of severity. If mild or occasional asthma is included, the prevalence based on reports of recent wheezing, tight chest, and exercise wheeze in this population may be as high as 25%.[21]

Discussion

The results of this study show that asthma, a common disease, is underrecognised and undertreated in this population of Cape Town schoolchildren. There are certain limitations in a study of this nature. Diagnosis of asthma and assessment of its severity are clinical processes; epidemiological definitions can make only approximate classifications. Epidemiological studies may, for example, identify infrequently symptomatic children who would not merit diagnosis or treatment because of the mildness of their condition.

For these reasons, a relatively strict epidemiological definition was used in an attempt to make the group as specific to clinical asthma as possible. To qualify, respondents had to acknowledge multiple symptoms typical of asthma and/or a diagnosis of asthma on both of two questionnaires 3 - 4 months apart. A positive bronchial responsiveness test was not used to define asthma, as it is relatively insensitive in detecting asthma in population studies.[27,28] In this study it can be regarded as a marker of severity of asthma and of current activity of the child's asthma.

The first finding was that only about half of the respondents for these symptomatic children acknowledged any asthma history, while only a third acknowledged current asthma. Recognition should (approximately) be a function of severity. Surprisingly, while the recognised asthma group had a higher proportion of children with positive bronchial responsiveness tests, symptom prevalences were equivalent or higher in the unrecognised group. This may reflect a treatment effect, with the asthma in the recognised group being better controlled.

Labelling of ill-health is a complex phenomenon, reflecting medical practice, parental education, parental willingness to accept the diagnosis or the management of the problem, and explanatory constructs held by parents of cause and natural history.[29] Practitioners may use less specific diagnoses or be reluctant to use the term asthma for fear of alarming parents.

Table V. Predictors of asthma recognition, current treatment and inhaler use in asthmatic primary school children

	Asthma recognition (N = 242)			Current treatment (N = 242)			Inhaler use (N = 112)		
	%	Prevalence ratio (95% CI)		%	Prevalence ratio (95% CI)		%	% Prevalence ratio (95% CI)	
Age (yrs)									
6 - 7	62.3	1.3	(1.03 - 1.66)	50.9	1.13	(0.86 - 1.48)	33.9	1.08	(0.63 - 1.87)
8 - 11	47.8			45.1			31.4		
Hayfever									
Yes	62.1	1.29	(1.02 - 1.62)	67.4	1.93	(1.48 - 2.51)	40.3	1.83	(1.00 - 3.35)
No	48.3			34.9			22.0		
Eczema									
Yes	60.3	1.19	(0.94 - 1.52)	59.4	1.41	(1.09 - 1.84)	36.6	1.24	(0.72 - 2.12)
No	50.6			42.1			29.6		
Parental asthma									
Yes	47.7	1.45	(1.16 - 1.81)	49.7	1.15	(0.84 - 1.57)	31.3	0.91	(0.50 - 1.65)
No	69.1			43.3			34.5		
Medical aid									
Yes	65.5	1.4	(1.11 - 1.76)	56.1	1.35	(1.03 - 1.76)	30.4	0.89	(0.51 - 1.54)
No	46.8			41.7			34.9		
Treated by private doctor									
Yes	60.2	1.45	(1.09 - 1.92)	58.6	1.39	(1.05 - 1.85)	29.3	0.75	(0.44 - 1.29)
No	41.6			42.1			38.9		
Treated at day hospital									
Yes	40.0	0.67	(0.49 - 0.90)	38.8	0.65	(0.48 - 0.89)	30.0	0.90	(0.48 - 1.69)
No	59.9			59.6			33.3		
Socio-economic status of school									
High	57.9	1.23	(0.96 - 1.58)	53.3	1.37	(1.03 - 1.83)	32.4	0.98	(0.56 - 1.72)
Low	47.1			38.8			32.5		
Other children in household									
≤ 3	56.8	1.23	(0.94 - 1.61)	52.2	1.42	(1.03 - 1.97)	37.4	2.17	(0.93 - 5.04)
> 3	46.3			36.7			17.2		
Bronchial responsiveness test									
+	62.6	1.29	(0.98 - 1.69)	58.2	1.97	(1.35 - 2.89)	33.3	1.53	(0.65 - 3.62)
–	48.7			29.5			21.7		

CI = confidence interval.

Bronchitis, and to a lesser extent *'verkoue op die bors'*, were the terms other than asthma most commonly attributed to medical practitioners by parents in both groups, reflecting belief in an infective cause of the symptoms. Alternatively, even if asthma is diagnosed by the practitioner, he or she may not convey the implications of the diagnosis to the parents effectively, or parents may be reluctant to accept the diagnosis or the chronicity of the condition. Fear of the prognosis or guilt over perceived neglect of the child may underlie this reluctance. When asked what terms they used to describe the child's chest symptoms, the majority of parents who had acknowledged asthma in a direct question offered 'tight chest' and a variety of other terms rather than asthma.

The importance of diagnosis rests on the hypothesis that specific asthma management is more likely to follow if the correct diagnosis is made. This study lends support to this hypothesis in that children with recognised asthma were considerably more likely to be on current treatment, and especially on daily treatment, than if asthma was not acknowledged.

The existence of a published guideline based on a graduated approach to treatment allows for evaluation of the management items reported by respondents. Although the latest guideline[13] postdates the study, earlier guidelines have been published.[10] While approximately 90% of all symptomatic children had received some form of treatment in the last 12 months, this did not appear to conform to the recommended protocol. Although the protocol recommended beta-2-agonists as first-line therapy rather than theophyllines, a sizable proportion of children on whom specific information was provided were on a theophylline preparation. In addition, inhaler therapy was used by less than half of the children in the recognised group, and less than 10% in the unrecognised group. The overwhelming majority of children were on some

form of oral medication, particularly syrups. This preference for oral treatment may be because of a fear of inhaler therapy (e.g. a perception that it is addictive or weakens the heart[30]) or a preference for compound linctuses or syrups offering 'broad-spectrum' symptomatic treatment, or because oral medication appears cheaper. Later guidelines have emphasised that inhaled therapy is preferable to oral therapy. Use of syrups, in particular, may make it difficult to achieve the correct dose.

In the 1991 guideline,[10] bronchodilator therapy was recommended only whenever necessary (prn medication), with the addition of maintenance inhaled cromoglycate for moderate asthma and steroids for severe asthma. In the recognised asthma group, 23% were on daily medication. While this would include a proportion appropriately on anti-inflammatory treatment such as cromoglycate or steroids, given the medications cited in Table IV and the underuse of inhalers, it is likely that a sizable proportion of this daily therapy was bronchodilator medication. Similarly, it can be inferred that anti-inflammatory treatment was uncommon in the unrecognised group. Underuse of anti-inflammatory medication has been associated elsewhere with increased morbidity[31] and may be one of the factors contributing to high asthma morbidity[21] in this population.

A majority of children overall (59.1%) received some of their treatment from a private general practitioner, despite the facts that only 34.9% came from families on some form of medical aid, and that a high proportion were of lower socio-economic status as reflected in education and household variables. A substantial fraction (43%) in the recognised group and 22% in the unrecognised group had been treated at some time at Red Cross Hospital. This accords with other findings that even in low-income areas patients may use some combination of private practitioners and State hospitals in preference to day hospitals.[32] Treatment at the hospital may reflect greater severity of asthma and appropriate referral, but may also include inappropriate use of the hospital for primary care.[19]

Although the management of asthma should include the use of a peak flow meter in diagnosis, assessment and monitoring of airways obstruction, only about half the recognised group of respondents and 13.2% of the unrecognised group could recall the child ever using a peak flow meter, even with a photographic prompt. With regard to home use, however, these meters are relatively expensive (price range as of mid-1998 approximately R90 - > R200) and are not reimbursable by all medical aid schemes.

The home and bedroom environment merits attention in managing asthma because of the importance of house dust mite[33] and environmental tobacco smoke[23] in causing and maintaining asthma symptoms in this population. Diet is another important area of management in some cases because of the role of sulphited drinks and foodstuffs in triggering asthma in susceptible children.[34] The lack of any significant difference between the two groups in their responses on the open-ended questions about preventive measures may partly be due to the low response rate to these questions, but may also reflect a low priority given by medical practitioners to these measures, even in diagnosed children.

In examining potential barriers to recognition and treatment, we found that the absence of medical aid was a strong predictor of non-recognition and non-treatment. Medical aid is a marker of both socio-economic status and, independently, of access to medical care. Apart from medical aid, current treatment and inhaler use were less likely in children with some but not all indicators of lower socio-economic class. Overall, this seems to confirm the association of poor asthma control with lower income status. American studies have suggested that children from lower income homes are more likely to use multiple carers and make heavier reliance on hospital emergency facilities, resulting in fragmented care and absence of asthma management plans.[19,20] Children from poorer areas may also be less likely to be on anti-inflammatory medication, contributing to greater morbidity and hospitalisation.[31] Similar factors are likely to operate in this population.

Amid many pressing problems in child health in South Africa, asthma was not recognised as a priority in a recent policy document on child health.[35] It is arguable whether enough is known at this stage to develop policies on primary prevention of asthma.[36,37] However, sufficient is known about secondary prevention to develop a primary care asthma strategy. Such a strategy might include 24-hour medical care in proximity to where people live to encourage adequate utilisation of primary care services. It would also include promotion of the use of consensus guidelines by health professionals. In this respect, acceptability of guidelines to primary care practitioners may be influenced by the extent to which they have been involved in their development. There is also a role for asthma education at schools focused on improved recognition of asthma by staff, encouragement of participation in sport by asthmatic children, the management of acute attacks and provision of support for parents.[38]

A start to a national strategy has been made with the National Asthma Education Programme.[39] However, cost of medication has to be recognised as a barrier to effective asthma care in South Africa. A local cost-effectiveness analysis of asthma management would therefore be useful for assessing the likelihood of achieving compliance with recommended management protocols in low-income communities. Also, while there is evidence from elsewhere that targeted house dust avoidance measures can reduce symptoms in asthmatic children,[40] the effectiveness of these measures on a large scale has yet to be confirmed in this population.[41]

Finally, an asthma strategy should also add force to activities aimed at reducing maternal and household smoking and fighting the penetration of tobacco marketing into poor communities.[42]

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APPENDIX I. QUESTIONS USED IN SELF-ADMINISTERED AND/OR INTERVIEW QUESTIONNAIRE AS BASIS OF CASE DEFINITION

1. Has your child had *wheezing* or *whistling* in the chest in the last 12 months?
   - 1.1 *How many* attacks of wheezing or whistling in the chest has your child had in the last 12 months?
2. In the last 12 months how often, on average, has your child *woken up* due to chest wheezing or whistling? (every week / not every week / never)
3. In the last 12 months, has wheezing or whistling in the chest ever been so bad that your child *couldn't talk properly or had to whisper*?
4. In the last 12 months, has your child's chest ever sounded wheezy or whistly, *during or after running or playing hard*?
5. In the last 12 months has the child had a troublesome dry cough in the night that was not from a cold or chest infection?
6. In the last 12 months, has the child had a *tight chest*?
7. * In talking about these symptoms (wheeze, tight chest, night cough) with your doctor, family or friends, what name do *you* use to describe the problem? (record)
8. * During the past 12 months, has the child received any treatment from a doctor for any of the following symptoms? (wheezing/whistling in the chest, tight chest, difficulty sleeping because of cough)

8.1* What name(s) did the doctor use to describe the child's chest problem? (record)
8.2* Where did the child go for treatment for this chest problem? (private doctor, day hospital, Red Cross Hospital, other hospital or clinic, other (specify))

9*. Is the child *currently* on any treatment for any of the following: wheezing/whistling in the chest, tight chest, night cough or asthma?
9.1* If *yes* what treatment? (tablets, syrup, inhaler, nebuliser (oxygen), injection, other (specify))

10.* Do you know of anything you can do *inside the child's bedroom* to prevent allergy or breathing problems? (record)

11.* Do you know of anything your child can avoid *eating or drinking* so as to prevent allergy or breathing problems? (record)

12.* Has the child ever been asked by a doctor or nurse to blow into a peak flow meter? (show picture of meter)

13.* Has the child ever had asthma?
13.1* Does s/he still have asthma?

* Interview (2nd) questionnaire only.

LUNG FUNCTION IN SOUTH AFRICAN CHILDREN WITH CYSTIC FIBROSIS

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Objective. To determine the pattern of lung function in stable cystic fibrosis (CF) patients and to investigate the relationship of abnormal lung function to demographic variables, CF genotype and pulmonary colonisation with *Pseudomonas aeruginosa* (PA).

Design. A descriptive study done at the CF clinic at Red Cross War Memorial Children's Hospital in Cape Town.

Methods. Data were recorded and pulmonary function testing (PFT) was performed in 42 CF patients.

Results. 29 patients (69%) had mild disease, while 11 (26%) and 2 (5%) had moderate and severe disease respectively. Twenty-four patients (57%) demonstrated lower airway obstruction (LAO). Patients with moderate or severe disease were significantly older than those with mild disease (13.3 (3.7) years (mean (SD)) compared with 11.1 (3.0) years ($t = 2.1$; $P = 0.04$)). PA colonisation status differed significantly with the pattern of lung function ($\chi^2 = 6.6$; $P = 0.04$) and severity of lung disease ($\chi^2 = 12.6$; $P = 0.002$). Nine (35%) of the 26 patients tested before and after bronchodilator therapy showed a positive response.

Conclusion. The majority of patients had mildly impaired or normal lung function, with LAO predominating. A minority of patients were bronchodilator-responsive. PA colonisation may be associated with the development of abnormal lung function and more severe pulmonary disease.

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Cystic fibrosis (CF) is one of the most common serious inherited disorders among South Africa's white and coloured populations[1] and may be more common than formerly realised in the black population.[2] Clinical manifestations include pancreatic insufficiency, hepatic dysfunction, infertility and pulmonary disease. Of these, pulmonary disease, characterised by endobronchial bacterial infection and neutrophil-dominated

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