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ABSTRACT

A cross-sectional study showed that 130 out of 1758 (8%) primary school children without a previous asthma diagnosis had undiagnosed asthma. Thirty-eight per cent of their parents refused to visit a general practitioner for this disorder. Factors associated with the refusal were high maternal education, mild symptoms and absence of airway reversibility.

Screening for asthma in children is controversial.[1] The success of screening programmes is dependent on parental recognition and report of asthma symptoms, adherence to recommendations after a positive test, and doctor's recognition and management of asthma symptoms.[2] Easily accessible general practitioners (GPs) are the first level of care in the Dutch healthcare system. The aim of this study was to assess the willingness of parents of children with possible asthma to visit their GP.

METHODS

The study methods have been described previously.[3] Briefly, children aged 7–10 and their parents in 41 primary schools were asked to participate. Participating parents completed the International Study of Asthma and Allergies in Childhood questionnaire on respiratory symptoms.[4] Children with asthma symptoms in the preceding 12 months or reversible airway obstruction were invited for bronchial challenge with hypertonic saline. A child was considered to have "diagnosed asthma" if a doctor had diagnosed asthma in the preceding 12 months. A child was considered to have "possible asthma" if the child had (1) no physician-diagnosed asthma in the preceding 12 months, (2) asthma symptoms in the preceding 12 months, and (3) either reversible airway obstruction or bronchial hyper-reactivity.

Parents of children with possible asthma were sent a letter recommending medical evaluation by their GP. The GPs received a letter including telephone numbers for questions with the results of the questionnaire and lung function tests. A research nurse contacted parents to conduct a structured telephone interview concerning the response of the parents and the GP. Data on adherence to the recommendation to visit a doctor were collected. Approval was obtained from the National Committee on Research involving Human Subjects. Informed consent was obtained from the parents of all participating children. χ^2 tests were used to analyse differences between the groups of children with possible asthma who visited or did not visit a doctor. Univariate regression analysis was used to analyse predictors of non-adherence to the recommendation. Variables with $p<0.1$ were entered into a multivariate logistic regression model to analyse independent predictors of non-adherence to the recommendation.

RESULTS

Participants

The final study population has been described in detail elsewhere and comprised 1614 children.[3] Of the 2745 invited children, 1758 (64%) participated in the study, of whom 144 were excluded from further analysis. According to our criteria, 81 (5%) had diagnosed asthma and 130 (8%) had possible asthma, which represented our study population. A follow-up interview was completed in 114 (88%). Non-responders did not differ from responders with respect to sociodemographic characteristics (parental education, child's sex and age) and clinical parameters (asthma symptoms, lung function, airway reversibility and bronchial hyper-reactivity) (table 1).

Seventy-one (62%) children visited a doctor (GP, $n = 69$; paediatrician, $n = 2$). Adherence to the recommendation to visit the GP was similar in parents with a lower level of education: 17% visiting and 11% non-visiting mothers, and 20% visiting and 14% non-visiting fathers. To increase statistical power, we combined low and moderate educational levels in subsequent analyses. Bivariate logistic regression yielded significant associations of airway reversibility (odds ratio (OR) 2.2; 95% CI 1.1 to 4.7; $p = 0.04$) and a maternal university education degree (OR 0.4; 95% CI 0.2 to 0.9; $p = 0.02$) with willingness to follow-up the recommendations. Multivariate logistic regression did not change the results (airway reversibility: OR 2.1, 95% CI 0.9 to 5.1, $p = 0.07$; maternal education: OR 0.4, 95% CI 0.2 to 0.9, $p = 0.02$).

The main reason for parents not to visit a GP was absence or mildness of symptoms (63%, $n = 27$). Most of these parents stated in the interview that they would visit their GP if the symptoms worsened; eight (20%) of the children had already made a visit to the GP in the preceding year, and seven of these children were using medication (one, inhaled corticosteroids; six, bronchodilator on demand). Of the seven children already being treated, three had highly educated parents. Reasons for not visiting the GP did not differ between highly educated parents and those with moderate/low education. All of the children referred to a paediatrician received a prescription for asthma medication during the visit. Table 2 gives data on the result of the visit to the GP as reported by the parents.

DISCUSSION

Two-thirds of parents visited a GP after they had been informed that their child might suffer from asthma. Willingness to follow-up the recommendations was greater for children with more severe

Table 1 Characteristics of the groups who did or did not visit a general practitioner (GP)

	Visited GP (n = 71)	Did not visit a GP (n = 43)	p Value (χ^2 test)
Child characteristics			
Male	32 (46)	21 (47)	0.3
Mean (SD) age (years)	9.4 (0.7)	9.3 (0.8)	0.5
Symptoms in the last 12 months			
Wheeze	36 (52)	25 (56)	0.8
Dry cough at night	49 (71)	30 (70)	0.8
Lung function parameters			
Mean baseline FEV_1 (% predicted)	92	96	0.1
Mean baseline FVC (% predicted)	88	91	0.2
Mean change in FEV_1 after BD (%)	12	4	0.01*
Reversibility ⩾10%	40 (58)	17 (39)	0.04
Bronchial hyper-reactivity	48 (71)	36 (80)	0.4
Inhaled corticosteroids	5 (7)	3 (7)	
Family characteristics			
Mother asthma ever	10 (16)	7 (18)	0.8
Father asthma ever	2 (4)	3 (8)	0.5
Mother current smoker	12 (19)	10 (26)	0.5
Father current smoker	15 (24)	9 (23)	0.9
Education level			
Mother university or high vocational degree	17 (27)	20 (51)	0.02*
Father university or high vocational degree	16 (30)	19 (54)	0.02*
Current pet ownership	44 (73)	27 (69)	0.2

Unless otherwise indicated, values are number (%).
*$p<0.05$.
BD, bronchodilation; FEV_1, forced expiratory volume in 1 s; FVC, forced vital capacity .

airway reversibility and if the mother was not highly educated. Previous studies reported parent-initiated response rates in the range 12–40%.[5–7] In addition, we have shown that parents underestimated the severity of current symptoms in their child.

A worse lung function in children visiting a doctor might explain their visit because they had experienced more symptoms, despite a similar prevalence of asthma symptoms. Alternatively, parents may have noticed more symptoms in retrospect, when confronted with the letter recommending medical evaluation by their GP than before the start of the study period. Clark *et al*[8] showed that children with intermittent disease reported more symptoms after following an education programme, probably because of greater awareness of symptoms. This suggests that knowledge about asthma symptoms is limited and that future healthcare programmes might benefit from improving public recognition of asthma.[9] However, we did not collect data on parental symptom perception, and thus cannot conclude if recall bias occurred.

We found an inverse relation between educational level and visiting a GP. Butz *et al*[10] found that lower education level of the caregiver was associated with the child more likely receiving adequate preventive asthma care. Other studies have shown that lower parental education is associated with underuse of medication.[11 12] Highly educated parents might refrain from visiting a GP because of fear of medical or psychosocial consequences such as pharmacological side effects, limitations to social participation, or stigmatisation. Consequently, highly educated parents might be more confident in making healthcare decisions and address environmental hygiene or change their smoking behaviour before seeking medical advice.

There are several explanations for the percentage (40%) receiving medical treatment. Parents and GPs may be convinced that, at the time of the visit, that there are too few symptoms to warrant treatment. The advice of the GP to return for evaluation if the symptoms recur takes the variability of

Table 2 Parental response in telephone interview of those who visited a general practitioner (GP) (n = 69)

	No	Yes	% of total (n = 69)	% of those with action from GP (n = 41)
Action from GP	28 (40%)	41 (60%)	–	–
Physical examination	NA	17	25	41
Allergy testing	NA	16	23	34
Lung function	NA	11	16	25
Peak flow	NA	6	9	15
Referred to a paediatrician	NA	15	22	37
Advice for new evaluation, if symptoms return	NA	14	20	34
Medication	42 (61%)	27 (39%)	–	–
Reliever	NA	26	38	96
Inhaled corticosteroids	NA	12	17	44
Other	NA	5	7	18

NA, not applicable.

asthmatic disease into account. Furthermore, the insufficient knowledge of the GP to interpret the bronchial hyper-reactivity tests may have influenced their response.

Refusal to visit a GP may represent a lack of confidence in our study's ability to identify problems or a low expectation of asthma management.[13–16] Furthermore, the asthma symptoms may have represented intermittent asthma that had resolved by the time the parents received the recommendation letter.[17 18] However, this would contradict our previous results showing a lower quality of life and greater absence from school in children with "possible" asthma than in healthy controls.[3]

Loss to follow-up may have influenced our results. However, we have no reason to believe that there was any systematic non-response. Symptom awareness and perception before and after the report of "possible asthma" may have induced recall bias either by under-reporting of symptoms on the initial questionnaire or over-reporting of symptoms after receiving the diagnosis of "possible" asthma. Furthermore, selection bias may have influenced our results—that is, parents who were aware of respiratory symptoms may have been more likely to have their children participate in our study. As we collected no data directly from the GP, parental interpretation of the visit may have influenced our results. Differences in knowledge about asthma and/or interpretation of the lung function tests between GPs may have influenced their response, as the GPs received no instructions about preferred management of possible asthma.

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Archivist

Childhood body-mass index and adult coronary risk

Coronary disease risk factors such as hypertension, dyslipidaemia, impaired glucose tolerance and vascular abnormalities may be present in overweight and obese children. Now a study in Denmark (Jennifer L Baker and colleagues. *New England Journal of Medicine* 2007;**357**:2329–37; see also Perspective, ibid: 2325–7) has confirmed that a higher childhood body mass index (BMI) increases the risk of coronary disease in adult life.

The cohort study included 276 835 people born between 1930 and 1976. They had measurements of height and weight recorded at 7–13 years of age and coronary events in adult life were ascertained by linkage to national registers. BMI z scores were calculated using school health examination data from 1955–1960 as reference data. Follow-up for coronary disease events began in 1977, or at the age of 25 years if later, and continued to the end of 2001. During 5 063 622 person-years there were 14 553 first coronary events, fatal or non-fatal. The risk of an adult coronary event increased with increasing BMI z score at any age between 7 and 13 years of age and the size of the risk increased linearly with age for both boys and girls between these ages. Thus for a 1-unit increase in BMI z score among boys at the age of 7 years, there was a 5% increase in risk of a non-fatal coronary event and a 10% increase in risk of a fatal event in adult life. Among girls at the age of 7 years the corresponding increases were 2% and 7%. Among 13-year-old boys and girls the corresponding increases were 17% and 24%, and 11% and 23%, respectively. In general the increase in risk was greater for boys than for girls and for fatal than for non-fatal events. Among 13-year-old boys an increase in BMI z score from 0 to 2 would increase the risk of a coronary event by the age of 60 from 11.7% to 15.5%, an increase of 32.5%. Among 13-year-old girls the increased risk would be from 4.6% to 5.7% (24% increase). In both sexes adjustment for birth weight increased the association between childhood BMI and adult coronary risk. A computer simulation model based on the prevalence of overweight among US adolescents in 2000 (Kirsten Bibbins-Domingo and colleagues, ibid: 2371–9) suggests that by 2020 in the USA around 30–37% of 35-year-old men and 34–44% of 35-year-old women will be obese, leading to a 5–16% increase in the prevalence of coronary disease by 2035.