

Original article

Factors associated with asthma in Albania

Background: This study was undertaken to see whether asthma in Albania (where it is particularly uncommon) is associated with certain 'western' characteristics, and with dietary and lifestyle factors that affect its occurrence elsewhere.

Methods: A screening survey was conducted among 2653 persons aged 20–44 years. A more detailed enquiry was conducted among a random subsample plus all others whose response indicated possible asthma. Three groups were compared: 495 probable nonasthmatics ('nonsymptomatics'); 106 with asthma-like symptoms and positive skin tests ('possible allergic asthmatics'); and 116 with similar symptoms and negative skin tests ('other symptomatics').

Results: The possible allergic asthmatics were less likely than the nonsymptomatics to have attended school or nursery under the age of 5 years or to have shared a bedroom with an older child before that age. Continued education after the age of 18 years also appeared to be protective. Allowing for other factors, a strong negative relation was found with fruit and vegetable consumption, and weak positive relations with prepackaged food and fizzy drinks. Symptoms in skin prick test-negative subjects were associated with personal and parental smoking habit.

Conclusions: This survey provides limited evidence linking asthma with aspects of western lifestyle. It supports the hypothesis that opportunities for infection during early childhood and the consumption of fruit and vegetables protect against asthma.

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International surveys show very wide variations in the prevalence of wheeze and other symptoms of allergic disease (1, 2). The prevalence of asthma tends to be high in the more developed countries, and some aspect of the 'western' lifestyle is thought to be responsible. In seeking an explanation for these variations, evidence from low-prevalence areas may be helpful in at least two ways. Firstly, it can show whether those individuals who acquire asthma tend to be those who take up a western lifestyle (ubiquitous in developed countries and so more difficult to investigate there). Secondly, factors that are associated with asthma in high-prevalence countries can be re-examined in very different environments; it is more probable that associations are causal if they are found in contrasting circumstances where the confounding factors are likely to be different.

In two recent surveys, among children (2) and young adults (3) respectively, the prevalence of wheeze was lower in Albania than in any other European country. Symptoms of allergic rhinoconjunctivitis and atopic eczema were less common in Albania than in any other country participating in the survey of children. The factors associated with asthma and allergy in Albania

are therefore of particular interest. This survey tests the hypotheses that asthma in Albania is associated with aspects of 'westernization', and with factors that seem to be protective or causative elsewhere, especially fruit and vegetables (4), liability to infection in childhood (5), and housing conditions such as indoor mould (6).

Material and methods

The Albanian Respiratory Health Survey was set up to investigate the prevalence of asthma and allergy in Albania when that country was beginning to emerge from several decades of economic isolation. The protocol was a simplified version of that used by the European Community Respiratory Health Survey (ECRHS) (7). A random sample of 60 electoral wards was selected from the 224 electoral wards in Tirana (total population 250 000 in 1992). Within each ward, a random sample was chosen of persons aged 20–44 years.

The survey was conducted in two stages. Firstly, a short screening questionnaire was distributed to these subjects, enquiring about respiratory symptoms. Secondly, a more detailed enquiry was conducted in a random subsample of the respondents, together with all others whose answers to any of three questions suggested possible asthma. This group comprised those who reported:

- 1) being woken by an attack of shortness of breath in the last 12 months;
- 2) an attack of asthma in the last 12 months;

3) any current treatment for asthma.

The second stage involved the administration of a detailed questionnaire and skin prick tests for certain allergens (*Dermatophagoides pteronyssinus*, cat, grass pollen, *Alternaria*, *Cladosporium*, *Parietaria*, olive, ragweed, *Artemisia*, and *Betula*); a positive reaction was defined as a weal of 1 mm or more, in accordance with ECRHS recommendations for a multicentre survey (8). Three questions were asked about current dietary habits, enquiring: 'How often do you eat prepackaged food (such as tinned food or pre-prepared frozen meals)?'; 'How often do you drink sweet fizzy drinks?'; and 'Do you take snacks between meals?'; the last question asked whether any of the following were taken as a snack at least once a week: savoury biscuits or crisps; sweets, chocolates or sweet biscuits; fruit or vegetables. Further questions enquired about: current pet ownership; housing conditions (including the presence of fitted carpets and mould growth); active and passive smoking; numbers of older and younger siblings; regularly sharing the bedroom with an older child before the age of 5 years; attendance at a school before the age of five ('Did you go to a school, playschool or nursery with older children before the age of 5 years?'); respiratory infections in early childhood ('Did you have a serious respiratory infection before the age of 5 years?'); and the age at which full-time education was completed. Other questions related to matters not relevant to the above hypotheses, and the findings are not presented here.

Both questionnaires were Albanian translations of those used in the ECRHS. The wording was therefore the Albanian equivalent of that used in the ECRHS questionnaires which does not always conform to recent recommendations (9). Other details of the random subsample have already been published (3). The local ethics committee gave its approval, and the survey took place during 1995 and 1996.

Logistic regression was used to examine the associations between the factors of interest and symptoms suggestive of asthma. Adjusted odds ratios were calculated allowing for age, sex, and history of cigarette smoking for as long as a year. All the logistic regressions were carried out in spss.

Results

A total of 3670 names and addresses were randomly selected from the electoral register for stage 1 of the study. Of these, 2653 (72.3%) completed the screening questionnaire. This gives an underestimate of the response rate, because many subjects had left the country after the electoral register was compiled and some addresses could not be located, so the true denominator is unknown. Table 1 shows the numbers of subjects who were selected for and participated in the second stage of the survey, classified according to their answers to the screening questionnaire. 'Symptomatics' were those who gave a positive response to any of the three questions suggesting possible asthma, whether or not the subjects were in the random subsample. Being

woken by an attack of breathlessness was by far the commonest of the three symptoms, being reported by 224 of the 234 symptomatics; asthma in the last 12 months and current treatment for asthma were reported by 56 and 40 subjects, respectively. 'Nonsymptomatics' were selected for stage 2 only if they were in the random subsample. The response rates for this stage were above 90% for all subgroups.

In subsequent tables the symptomatic subjects are divided according to whether or not any of the skin prick tests gave a positive reaction ('possible allergic asthmatics' and 'other symptomatics', respectively). Table 2 shows the prevalence of certain conditions in the three groups. Persons with 'chronic cough' were those who said they usually coughed during the day, or at night, in the winter, on most days for as much as 3 months of each year. 'Chronic phlegm' was similarly defined. These symptoms were more frequently reported by symptomatic than by nonsymptomatic subjects, with little or no difference between those with positive and negative skin tests. Asthma and 'hay fever' were most frequently reported among the possible allergic asthmatics; the prevalence of eczema was similar in the three groups.

Table 3 shows associations between asthmatic symptoms and various factors related to family history and housing. The associations are expressed as odds ratios (ORs) relative to the nonsymptomatic group, adjusted for age, sex, and whether the subject had ever smoked for as long as a year (although adjusting for this factor made very little difference). A few missing answers have been excluded. The other symptomatics showed significant associations with smoking by the mother and the subject. Regular exposure to tobacco smoke ('Exposed to smoke') was not associated with the symptoms selected by the screening questionnaire. Possible allergic asthma was significantly associated with a maternal history of asthma. Indoor mould, pet ownership, fitted carpets, and a history of ever having moved from one area to another showed no significant relationships.

Table 4 examines associations with various aspects of life during the subjects' childhood. Having older siblings was significantly associated with being symptomatic and skin test negative; younger siblings showed no significant associations. 'Shared bedroom' refers to sharing a bedroom with an older child before the age of 5 years; it was negatively related to possible allergic

Table 1. Numbers of subjects participating in stages 1 and 2 of the survey

	Nonsymptomatics			Symptomatics		
	Males	Females	All	Males	Females	All
Responded to stage 1	1174	1245	2419	86	148	234
Selected for stage 2	235	293	528	86	148	234
Participated in stage 2 (%)	217 (92.3)	278 (94.9)	495 (93.8)	78 (90.7)	144 (97.3)	222 (94.9)

Table 2. Prevalence of certain symptoms in three subgroups (%)

Symptom	Nonsymptomatics (<i>n</i> = 495)	Possible allergic asthmatics (<i>n</i> = 106)	Other symptomatics (<i>n</i> = 116)
Asthma ever	2.2	29.2	8.6
Cough	7.1	44.3	33.3
Phlegm	10.9	34.9	34.5
'Hay fever'	11.6	54.7	34.8
Eczema ever	11.0	13.2	14.8

asthma. A serious respiratory infection before the age of 5 years was associated with being symptomatic and skin test negative, and even more strongly with being symptomatic and skin test positive. Both symptomatic groups showed strong negative associations ($P < 0.0001$) with attendance at a school, play-school or nursery with older children before the age of 5 years ('School before 5 years'), and strong positive associations with termination of education at or before the age of 18 years ($P < 0.001$).

Table 5 shows ORs for the same groups in relation to certain dietary factors. Eating prepackaged food at least once a week was reported more frequently by both groups with asthmatic symptoms than by those without them. The possible allergic asthmatics were also more likely to consume sweet fizzy drinks every week than were the nonsymptomatics, although the relationship just fell short of statistical significance ($P = 0.064$). The taking of snacks between meals appeared to protect against possible allergic asthma, and this effect was attributable to fruit and vegetables ($P < 0.01$) rather than to savoury biscuits and crisps, or to sweets, chocolates and sweet biscuits.

Educational level is probably a marker for lifestyle in this population, so the above associations were re-examined after adjustment for education beyond the age of 18 years. Most of the ORs showed little change, though some ceased to be statistically significant. Thus among the possible allergic asthmatics the OR for maternal asthma became 2.02 (95% confidence interval

(CI) 0.92, 4.44); for shared bedroom it became 0.68 (0.43, 1.05); and for prepackaged food 1.46 (0.91, 2.35). For fizzy drinks it was virtually unchanged. There were still strong inverse associations with early schooling (OR 0.40; 95% CI 0.23, 0.70) and fruit and vegetables (0.46; 0.28, 0.75).

Discussion

This survey presents evidence about the factors that appear to promote or prevent asthma in a community where it is particularly uncommon. The response rate for stage 1 was over 72% but cannot be given precisely, owing to uncertainties about the denominator. There was some migration out of Albania between the 1992 census (the sampling frame for this survey) and 1995 when the survey was conducted, so the respondents were more representative of the remaining population than the above percentage suggests. In stage 2, the response rate was over 90% in the symptomatic and nonsymptomatic groups, giving little opportunity for bias in the associations between symptoms and other factors.

The classification of the subjects into those with and without symptoms of asthma was dictated by the ECRHS study design; the latter group was unlikely to contain many patients with current asthma, and indeed only 2% of them stated that they had ever had the disease. The symptomatics were defined by a history of waking with attacks of breathlessness, or attacks of asthma, or treatment for asthma. They were subdivided into those with positive and negative skin tests so as distinguish subjects likely to have allergic asthma from those with similar symptoms caused by nonallergic factors. This is borne out by the observation that the former group tended to give a personal and parental history of asthma, while the latter group was particularly characterized by smoking by the subjects and their parents (especially the mothers). This classification is only approximate: not all the 'possible allergic asth-

Table 3. Associations between asthmatic symptoms and certain family and household characteristics

	Nonsymptomatics	Possible allergic asthmatics		Other symptomatics	
	<i>n</i>	<i>n</i>	Adjusted OR* (95% CI)	<i>n</i>	Adjusted OR* (95% CI)
Father had asthma	20	7	1.91 (0.77, 4.70)	8	1.76 (0.74, 4.17)
Mother had asthma	18	9	2.45 (1.06, 5.66)	8	1.89 (0.79, 4.51)
Father smoked	254	59	1.27 (0.82, 1.97)	72	1.42 (0.93, 2.17)
Mother smoked	25	11	2.01 (0.94, 4.27)	16	2.66 (1.35, 5.26)
Subject ever smoked	115	23	1.23 (0.69, 4.72)	36	1.98 (1.17, 3.35)
Exposed to smoke	228	55	1.30 (0.84, 2.00)	48	0.75 (0.48, 1.15)
Mould ever	54	16	1.46 (0.79, 2.68)	19	1.56 (0.87, 2.77)
Cat	51	12	1.15 (0.59, 2.25)	12	1.03 (0.52, 2.02)
Dog	37	11	1.49 (0.73, 3.07)	11	1.35 (0.66, 2.78)
Bird	10	5	2.17 (0.72, 6.53)	2	0.86 (0.18, 4.81)
Fitted carpet	95	14	0.65 (0.36, 1.20)	17	0.76 (0.43, 1.34)
Ever moved area	395	88	1.12 (0.58, 2.15)	104	1.95 (0.96, 3.96)

* Odds ratios relative to nonsymptomatics, adjusted for age, sex, and (except for 'Subject ever smoked') subject's smoking habit.

Table 4. Associations between asthmatic symptoms and childhood factors

	Nonsymptomatics	Possible allergic asthmatics		Other symptomatics	
	<i>n</i>	<i>n</i>	Adjusted OR* (95% CI)	<i>n</i>	Adjusted OR* (95% CI)
Older siblings	322	79	1.47 (0.91, 2.37)	93	2.09 (1.26, 3.47)
Younger siblings	348	73	0.87 (0.55, 1.38)	88	1.34 (0.83, 2.16)
Shared bedroom	239	42	0.63 (0.41, 0.98)	48	0.70 (0.46, 1.67)
Respiratory infection	47	21	3.05 (1.70, 5.48)	18	1.97 (1.08, 3.60)
School before 5 y	188	18	0.34 (0.19, 0.58)	20	0.35 (0.20, 0.59)
No school after 18 y	287	87	3.17 (1.86, 5.38)	90	2.55 (1.57, 4.14)

* Odds ratios relative to nonsymptomatics, adjusted for age, sex, and subject's smoking habit.

matics' would be diagnosed as having asthma by a clinician, while some of the other groups might be. But it provides the opportunity to see whether potential causative factors are associated with asthmatic symptoms and evidence of allergy in this population.

There is a growing body of evidence suggesting that exposure to infection during early childhood confers protection against allergic disease (10). Studies in Germany (11) and the USA (12) have shown reduced incidence of asthma and allergy amongst children who had attended nursery or day-care at an early age, presumably because they catch infections from other children. The same mechanism is thought to explain the tendency shown in several studies (12–17) for the risk of atopic manifestations to decline with increasing number of siblings, especially older siblings.

In the present study, circumstances in early childhood appear to influence the risk of symptoms in adult life. It must be acknowledged that the information about these circumstances cannot be wholly accurate, but there is no obvious reason to suspect recall bias (i.e. any difference between those with and those without symptoms in their accuracy of recollection). Having shared a bedroom with an older child when under the age of 5 years appears to protect against asthma in adulthood. An even greater protective effect derives from attending school or nursery under the age of 5 years, and this effect extends to those with negative skin prick tests, for reasons that are unclear. Having older siblings increases the risk of respiratory symptoms, particularly in subjects with negative skin tests. Presumably this factor is mediated by the increased opportunities to catch infections. These findings differ

from those of many other surveys in that the relationship between older siblings and asthma was positive (though not quite significant) rather than negative. It is curious that sharing a bedroom and attending a nursery are protective, but having older siblings is not. Perhaps these factors operate in a different way in a society where families tend to be large (only 2% of the subjects had no siblings) and childhood morbidity is high. A history of 'a serious respiratory infection' before the age of 5 years increased the risk of symptoms among the skin test-positives even more than among the skin test-negatives. This does not necessarily conflict with the hypothesis that early infections protect against atopy; there is some evidence that protection is conferred by gastrointestinal rather than respiratory infections (18).

The only index of socioeconomic status considered here is the age at which education ceased. Although occupational information was recorded, in Albania it is a very unreliable marker for relative income, and it was felt that educational level was the best available indication of general lifestyle. Continuing education beyond the age of 18 years appears to protect against symptoms, irrespective of whether skin tests are positive or negative. This is contrary to what would be expected for the hypothesis that 'westernization' increases the risk of allergy and asthma, because it might be supposed that the more educated persons are more likely to encounter those aspects of western lifestyle that promote allergy. It may be relevant that a recent study of a Finnish twin cohort found that the more-educated twin had a decreased risk of asthma compared with his or her twin sibling, so that some factor associated with educational level appeared to protect

Table 5. Associations between asthmatic symptoms and dietary factors

	Nonsymptomatics	Possible allergic asthmatics		Other symptomatics	
	<i>n</i>	<i>n</i>	Adjusted OR* (95% CI)	<i>n</i>	Adjusted OR* (95% CI)
Prepackaged food	119	34	1.61 (1.01, 2.55)	41	1.82 (1.17, 2.83)
Fizzy drinks	338	80	1.59 (0.97, 2.60)	78	1.01 (0.64, 1.57)
Snacks	242	37	0.57 (0.37, 0.89)	47	0.72 (0.48, 1.10)
savouries	30	6	1.02 (0.41, 2.55)	10	1.54 (0.72, 3.31)
sweets, biscuits	77	12	0.70 (0.36, 1.34)	11	0.58 (0.30, 1.15)
fruit, vegetables	199	25	0.46 (0.28, 0.74)	39	0.76 (0.49, 1.16)

* Odds ratios relative to nonsymptomatics, adjusted for age, sex, and subject's smoking habit.

against asthma (19). In the present study, it is possible that those who left school early were more likely to be employed in conditions where they were exposed to severe air pollution, which has been a feature of some factories in Albania. Alternatively, the causal relationship could be in the other direction: adolescents with respiratory disease may be less likely to continue in higher education than their healthier contemporaries.

The dietary questions were included in order to give some indication of the degree to which lifestyle has become 'westernized' (prepackaged foods and fizzy drinks); they also served to distinguish those with and those without sufficient resources to afford snacks between meals, and to show the intake of foods which appear to protect against asthma in other areas. These associations are particularly interesting. Recent studies in Scotland (20, 21), Italy (22), and Saudi Arabia (23) suggest that fruit, vegetables, and other natural sources of dietary antioxidants confer some protection against asthma. It seems that a similar effect occurs in Albania, in that persons who took fruit or vegetables as snacks between meals were less likely to have evidence of asthma. Eating savoury or sweet snacks conferred no benefit, so the effect was not attributable to the ability to afford snacks. The weekly consumption of prepackaged food increased the risk of symptoms, a finding that accords with the recent study in Saudi Arabia, where wheezy illness in childhood was associated with eating at fast-food outlets (23). It is not possible to say whether this is due to a direct effect of some component of fast-foods or to some other lifestyle factor that happens to be associated with this eating habit. The latter possibility is perhaps suggested by the apparent effect of fizzy drinks in the group with positive skin prick tests. Prepackaged food and fizzy drinks only became available in Albania from about 1992, when fruit consumption also increased, so these associations probably represent effects within adult life rather

than long-term implications of diet during childhood. Adjusting for prolonged education attenuated the effect of prepackaged food but not that of fruit and vegetables, which seem to have strong protective properties not attributable to confounding with the other factors studied. There is clearly a case for further investigations into the role of diet in asthma.

A number of surveys, mainly in Western Europe and North America, show indoor mould to be associated with asthma and other respiratory symptoms (6). In the present study, mould growth was not significantly associated with asthma, but the number of affected homes was small and the confidence interval was wide. The other factors examined (pet ownership, fitted carpets, and change of area of residence) do not show any clear associations either, although the confidence intervals do not exclude the possibility of a potentially important effect.

This survey provides limited evidence that asthma in Albania tends to occur in association with some aspects of a 'western' lifestyle. It shows that in a low-prevalence country asthma is negatively associated with the same factors (opportunity for infection in early childhood and regular eating of fruit and vegetables) that have been reported in high-prevalence countries. It is most unlikely that potential confounders operate in the same way in such different communities. The findings therefore give strong support for the hypothesis that these factors are protective.

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