Asthma Patterns in Saudi Arabian Children

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ABSTRACT

IN A STUDY of 2006 school children living in two urban areas of the Kingdom of Saudi Arabia, we used a questionnaire to collect details of age, sex, areas of residence, occupation, education, social class, parental history of asthma and information relating to parental smoking habit. The relative importance of these factors on the likelihood of children having bronchial asthma was assessed using a linear modelling analysis. The extent to which these factors affected the severity of bronchial asthma was also examined. A number of statistically significant associations between bronchial asthma and 'breathlessness' ($P < 0.0087$), 'Father smoker' ($P < 0.0001$), 'usually cough' ($P < 0.0001$), 'pets' ($P < 0.0067$) and 'Family history of allergy' ($P < 0.007$), were found.

INTRODUCTION

THE PREVALENCE of asthma cannot be measured accurately because there is no clear definition of the condition that allows an objective measurement to be made[1], most estimates of the prevalence of asthma have been based on data from questionnaires which ask about symptoms, usually wheezing, or about asthma diagnosed by a doctor. These estimates are likely to be inaccurate because of differences in interpretation of the term 'wheezing' and differences in criteria for diagnosing asthma. The prevalence of asthma cannot be measured in terms of the prevalence of lung function abnormalities since asthmatic children may have normal lung function[2,3].

In the clinic, bronchial hyper-responsiveness (BHR) is an almost universal characteristic of adults and children with asthma[4,5,6] and in population studies, BHR has been shown to have a close association with symptoms of asthma and of wheeze[7,8]. Although different provocation tests and different criteria to define BHR were used in two studies[9], it is clear that not all children with BHR have symptoms of asthma. It is important to define the factors associated with BHR.

Asthma during childhood is known to be associated with early bronchitis[10]. Although it is possible to measure bronchial responsiveness in infants[11] and young children[12], the factors associated with BHR are not documented and it is possible that they may be different or of different importance, from those associated with asthma.

The impact of childhood asthma on the health delivery system is considerable, as the most common chronic disease of children, asthma is the most frequent cause of emergency room visits and hospital admissions[13]. There have been many prevalence studies of asthma in developed countries. For example, the prevalence of asthma among children ranged from 1% to 1.5% in Scandinavian countries, 2% to 5% in the United States, to as high as 7% in New Zealand school children; but, little information on asthma epidemiology has been reported from the rest of the world. Childhood asthma may be uncommon in some developing countries, i.e. a population survey in the New Guinea Highlands[14] found no asthmatic under the age of 10 years, and childhood asthma is rare among hospital attenders in South Africa[15], Nigeria[16] and Kenya[17]. Childhood asthma seems common, however, in Barbados and Cuba[19].

The knowledge of factors affecting prognosis remains incomplete. There are two factors that have been thought to be of prognostic significance, namely, the age of onset and the relationship to allergy. It has been found that the majority of children develop asthma during the first two years of life and their prognosis is much worse than those children who develop asthma later in childhood[13]. The presence of atopic disease such as eczema, or hay fever signifies a poor outlook. Also, the more severe the symptoms in early childhood, the more likely it is that asthma will continue into adulthood.

There is no study on the prevalence or etiology of childhood asthma in Saudi Arabia. The aim of the present study was to investigate some epidemiological and clinical aspects of asthma in two populations of Saudi Arabian school children, and to ascertain some of the problems encountered by asthmatic Saudi children and their families.

MATERIAL AND METHODS

THE CHILDREN studied were the subject of the cross-sectional population study conducted in Riyadh and Dammam regions of the Kingdom of Saudi Arabia between January 1986 to February 1989. Those regions were chosen because of their different climates. Riyadh is located in a dry inland area, and Dammam is located in a humid coastal region.

Riyadh, which has a dry hot climate, is the capital of Saudi Arabia and has a population of 2.2 million. Dammam, which has a very humid temperature climate, has a population of approximately 1 million people living on the coastal area.

The methods used included a self-administered questionnaire completed by parents under the supervision of qualified physicians, nurses, and residents, to collect information on: area of residence, social class, father's occupation, mother's occupation, age, sex, asthma, hay fever, eczema, cough, pets, family history of respiratory allergy, parental smoking habits, and overall family smoking and cigarette consumption at home by parents or others per day.

Data were analyzed on the IBM computer of the College of Medicine at King Saud University. The statistical package program SAS was used to calculate chi-square values to assess the statistical significance of the Contingency Table[20]. The computer package program GLIM was used to fit a generalized linear model to the data and to assess interaction between measured variables. The Mantel-Haenzel procedure was used to

Table 1: Summary of bronchila asthma study in Dammam and Riyadh regions of Saudi Arabia.

Prevalence	Dammam Total No=918 N	%	Riyadh Total No=1088 N	%	Significance of difference P*
History of wheeze	60	6.54	129	11.86	P<0.001
Attack of breathlessness or tightness	56	6.10	132	12.13	P<0.001
Cough	55	5.99	86	7.90	P<0.001
Diagnosis of asthma	33	3.59	101	9.28	P<0.001
History of eczma	64	6.97	107	9.83	P<0.008
Hay fever (rhinitis)	111	12.9	185	17.00	P<0.001
Father with asthma	21	2.29	59	5.42	P<0.001
Father with rhinitis	76	8.28	127	11.67	P<0.001
Father with eczema	17	1.85	42	3.86	P<0.001
Mother with asthma	24	2.61	69	6.34	P<0.001
Mother with rhinitis	88	9.59	107	9.83	P>0.10
Mother with eczema	21	2.29	31	2.85	P>0.10
Relative with asthma	56	6.10	135	12.41	P<0.001
Relatives with rhinitis	74	8.06	15	10.57	P>0.10
Relative with eczema	20	2.18	48	4.41	P<0.001
Father smoker	88	9.59	107	9.83	P>0.10
Mother smoker	27	2.94	43	3.95	P>0.10
Pets	137	14.92	160	14.71	P>0.10

*Determined by the X^2 method.

Table 2: ANOVA for diagnostic asthma, children aged 7-12 years in Dammam and Riyadh regions of Saudi Aravia.

Main effects	D.F.	Mean square	F		Odds ratio (95% confidence)
Wheezing bronchitis	1	135.80	3.37	n.s.	1.53 (1.12-2.07)
Breathlessness	1	34.92	6.90	0.0087	1.66 (1.20-2.26)
Usually cough	1	14.81	54.65	0.0001	1.24 (0.91-1.70)
Father smoker	1	4.95	18.27	0.0001	1.08 (0.83-1.41)
Mother smoker	1	36.77	1.93	n.s.	1.30 (0.80-2.03)
Pets	1	1.13	7.37	0.0067	1.02 (0.82-1.27)
Family history of allergy	1	1.80	7.26	0.007	6.75 (2.75-16.56)

calculate odd ratios (OR) and their 95% confidence interval (C.I.). The correlation was used to ascertain the relations between measured variables[21].

RESULTS AND DISCUSSIONS

IN THE population study, questionnaires, with a letter of explanation, were distributed to the parents of 2150 children. Parents of 2006 children (93.3%) gave consent for the study. There was no difference in the consent rate in the two regions (Dammam and Riyadh). The age and sex distribution are identical in the two regions. The area range of the children studied was 7-12 years, with a mean of 9.84 years; 56% were male, and 44% were female in the Dammam region; and 47% were male and 53% were female in the Riyadh region. There was no statistical difference in area of residence.

Results are summarized in Table 1. This table shows that children with wheeze occur more commonly in Riyadh with 11.86%, than Dammam 6.54% of the children questioned (P<0.001). Attacks of breathlessness or tightness occur more commonly in Riyadh 12.13%, than Dammam with 6.10% (P<0.001). Similarly, cough occurred more frequently in Riyadh 7.90, than in Dammam 5.99% (P<0.001). When a more formal diagnosis of asthma is sought, this having made by a doctor, the figures are 9.28% for Riyadh, 3.59% for Dammam, (P<0.001). These figures show a major difference between the regions in the frequency of wheezing with Dammam being relatively low risk whereas children in the other city describe this more commonly.

The frequency of eczema is significantly more common in Riyadh, with 9.83%, and 6.97% in Dammam (P<0.008). The frequency of rhinitis is significantly more common in each area than wheeze but once again is more common in Riyadh with 17% and 12.09% in Dammam, (P<0.001).

The frequency of asthma and rhinitis among parents reflects the same pattern seen in the children, with Dammam once more showing the lowest level of risk whereas the fathers and mothers compared with Riyadh, (Table 1). The same pattern is shown when relatives with asthma are identified with Dammam showing only 6.1% of the children reporting relatives with asthma compared with 12.41% in Riyadh (P<0.001). Once again the eczema and rhinitis symptoms are more common in Riyadh than in Dammam.

The influence of two variable, but clearly recognized, environmental factors had been identified which seem strongly to influence the expression of wheeze and asthma in children. 15.91% of wheezy children in Riyadh have fathers who smoke compared with only 5.14% of non-wheezing children in Dammam. Similarly, 23.36% of wheezy children have fathers who smoke compared with only 8.79% of non-wheezing children in Riyadh. These figures show a major difference between the two regions in the frequency of wheezing children having fathers who smoke; in Dammam being a relatively low risk whereas children in the Riyadh region describe this more commonly. 16.79% of wheezy children have pets compared with less than this number, 4.73% of non-wheezy children in Dammam. 18.13% of wheezy children have pets compared with less than half this number, 10.67% of non-wheezy children in the Riyadh region.

However, these results show that the frequency of wheeze, and the formal incidence of asthma diagnosed by a doctor is very significant in the two regions and in

Table 3: Correlation matrix for bronchial asthma in Dammam and Riyadh regions.

	Father Smoker	Mother Smoker	Else Smoker	Child Wheezing	Child Asthma	Child Rhinitis	Child Eczema	Father Asthma	Father Rhinitis	Father Eczema	Mother Asthma	Mother Rhinitis	Mother Eczema
Father smoker	1.00000												
Mother smoker	0.89010	1.00000											
Else smoker	0.01841	0.03070	1.00000										
Child wheezing	0.81175	0.82375	0.01576	1.00000									
Child wheezing	0.57873	0.59209	0.02813	0.61979	1.00000								
Child asthma	0.59613	0.58202	0.01503	0.57645	0.82226	1.00000							
Child eczema	0.59663	0.65333	0.02162	0.59991	0.85663	0.88225	1.00000						
Father asthma	0.53760	0.55427	0.03207	0.56366	0.70889	0.67090	0.69215	1.00000					
Mother asthma	0.53890	0.52071	0.02619	0.52474	0.65189	0.67528	0.67090	0.83686	1.00000				
Father eczema	0.52994	0.57254	0.01677	0.54172	0.67138	0.66587	0.70918	0.90273	0.86119	1.00000			
Mother asthma	0.53578	0.56640	0.01081	0.58585	0.73056	0.68486	0.70275	0.78936	0.73964	0.75974	1.00000		
Mother rhinitis	0.52389	0.51336	0.00722	0.52309	0.67057	0.67442	0.66213	0.72342	0.75447	0.72312	0.84763	1.00000	
Mother eczema	0.53289	0.57943	0.00105	0.55434	0.67911	0.66531	0.72128	0.74258	0.74584	0.77340	0.89700	0.87989	1.00000

particular shows strong regional differences ranging from most common in Riyadh and least common in Dammam. The secondary evidence, that father smoking and owning pets are major contributing factors to the expression of wheeze strongly implies that other factors in the environment are likely to contribute to the higher frequency of asthma in Riyadh compared with Dammam.

Table 2 summarizes the Analysis of Variance (ANOVA) for diagnosis of asthma, children aged 7-12 years in Dammam and Riyadh regions of Saudi Arabia. A number of statistically significant associations were found between diagnostic asthma children and 'breathlessness or tightness' ($P<0.0087$), 'usually cough' ($P<0.0001$), 'father smoker' ($P<0.0001$), 'pets' ($P<0.007$); but wheezy bronchitis and mother smoker were not found statistically significant.

Table 3 shows the correlation matrix between respiratory symptoms for all asthmatic children. Most variables were significantly and positively correlated with the diagnosis of asthma ($P<0.001$), except the smoker at home, which showed a non-significant negative relation to the explanatory respiratory symptoms.

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