Epidemiology of asthma and allergic rhinits in two coastal regions of Saudi Arabia

A.R. AL FRAYH, MD, FACHARZT*, M. AL NAHDI, MD**, A.R. BENER, PH. D.***, T.Q. JAWADI, MD****

Summary

In a study of 1953 school children living in two coastal 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 those factors on the likelihood of children having bronchial asthma was assessed using logistic regression and 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" ($P < 0.001$), "Fathers smoker" ($P < 0.001$), "usually cough" ($P < 0.001$), "pets" ($P < 0.001$), and "Family history of allergy" ($P < 0.01$), were found.

Keywords : Bronchial Asthma, Wheeze, Cough, Eczema, Rhinitis, Family asthma, Parental smoking, Pets, Jeddah, Dammam, School children.

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 most asthmatic children have normal lung function (2, 3).

In the clinic, bronchial hyperresponsiveness (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 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 causes for emergency room visits and hospital admissions (13). There have been many prevalence studies of asthma in developed countries. For example, 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). None was found in a survey of 191 children in the Gambia (19). 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 as poor outlook. Also, the more severe the symptoms is early childhood, the more likely it is that asthma will continue into adulthood.

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

MATERIALS AND METHODS

The children studied were the subject of the cross-sectional population study conducted in Jeddah and Dammam regions of the Kingdom of Saudi Arabia (K.S.A.) between January 1986 and February 1989. Those regions were chosen because of their different climates. Dammam is located in a humid coastal region. Dammam which has a very humid temperature

* Department of Paediatrics College of Medicine King Saud University – P.O. Box 2925, RIYADH 11461 (SAUDI ARABIA).
** Department of Medicine King Y Faisal University – P.O. Box 2208, ALKHOBAR (SAUDI ARABIA).
*** Department of Statistics College of Science King Saud University – P.O. Box 2455, RIYADH 11451 (SAUDI ARABIA).
**** Department of Paediatrics College of Medicine King Abdulaziz University – P.O. Box 9025, JEDDAH 21431 (SAUDI ARABIA).

climate, a population of approximately 1 million people living on the coastal area. Jeddah is located on the western coast of K.S.A., has a humid climate; a mountainous chain (altitude 2 000-3 000 m) south-eastern of Jeddah, Taif, contributes to more rainfall in the western coast.

The methods used included a self-administered questionnaire to parents. This self-administered questionnaire was completed by the parents of each child and were returned to the hospital and concerning doctor. In study of Saudi school children, we used a questionnaire completed by parents under supervision of physicians to collect details of bronchial asthma survey, 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 cigarettes consumption at home by parents or else per day.

Data were analyzed on the IBM computer of College of Medicine, at the King Saud University. The statistical package program SAS was used to calculate chi-square values to assess the statistical significance of 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 calculate odds rations (OR) and their 95 % confidence interval (C.I.). The correlation was used to see 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 2 150 children. Parents of 1953 children (90.8 %) gave consent for study. There was no difference in the consent rate in the two regions (Dammam and Jeddah). 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 9.84 years; 56 % were male, and 44 % were female. There was no statistically difference in area of residence.

Results are summarized in Table 1. This table show that children with wheeze occur more commonly in Jeddah with 12.56 % and Dammam 6.54 of the children questioned ($P < 0.001$). The attack of breathlessness or tightness occur more commonly in Jeddah 14.78 than Damman with 6.10 % ($P<0.001$). Similarly, cough occur more frequently in Jeddah 6.76 %, than in Dammam 5.99 % ($P<0.001$). When a more formal diagnosis of asthma is sought, this having been made by a doctor, the figures are 7.05 for Jeddah 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 Jeddah city describe this more commonly.

The frequency of eczema is significantly more common in Jeddah, with 15.27 %, 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 most common in Jeddah with 23.96 % and 12.09 % in Dammam ($P<0.001$).

The frequency of asthma, eczema and rhinitis among parents reflects the same pattern seen in the children, Dammam once more showing the lowest level of risk whereas the fathers and mothers compared with Jeddah (Table 1). The same pattern is shown when relatives with asthma are identified with Dammam showing only 6.10 % of the children reporting relatives with asthma compared with 13.72 % in Jeddah ($P < 0.001$). Once again the eczema and rhinitis symptoms are more common in Jeddah than in Dammam.

The influence of two variables, 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 have fathers who smoke compared with only 5.14 % of non wheezing children in Dammam. Similarly, 17.65 % of wheezy children have fathers who smoke

Table 1 : Summary of bronchial asthma study in dammam and jeddah regions of Saudi Arabia

PREVALENCE	DAMMAM TOTAL NO = 918 N	%	JEDDAH TOTAL NO = 1 035 N	%	SIGNIFICANCE OF DIFFERENCE P*
History of wheeze	60	6.54	130	12.56	$P<0.001$
Attack of breathlessness or tightness	56	6.10	153	14.78	$P<0.001$
Cough	55	5.99	70	6.76	$P<0.001$
Diagnosis of Asthma	33	3.59	73	7.05	$P<0.001$
History of Eczema	64	6.97	158	15.27	$P<0.001$
Hay fever (Rhinitis)	111	12.09	248	23.96	$P<0.001$
Father with Asthma	21	2.29	57	5.51	$P<0.009$
Father with Rhinitis	76	8.28	116	11.21	$P>0.10$
Father with Eczema	17	1.85	50	4.83	$P<0.018$
Mother with Asthma	24	2.61	44	4.25	$P<0.02$
Mother with Rhinitis	88	9.59	122	11.79	$P<0.02$
Mother with Eczema	21	2.29	62	5.99	$P<0.001$
Relatives w/ Asthma	56	6.10	142	13.72	$P<0.001$
Relatives with Rhinitis	74	8.06	130	12.56	$P<0.001$
Relatives w/ Eczema	20	2.18	50	4.83	$P<0.001$
Father's Smoker	88	9.59	150	14.49	$P<0.001$
Mother's Smoker	27	2.94	59	5.70	$P<0.001$
Pets	137	14.92	130	12.56	$P>0.10$

* Determined by the X^2 method.

compared with only 5.88 % of non wheezing children in Jeddah. These figures shows a major difference between the two regions in the frequency of wheezy children have fathers who smoke in Dammam being relatively low risk whereas children in Jeddah region describe this more commonly. 16.79 % of wheezing children have pets compared with less than this number, 4.73 % of non wheezy children in Dammam. 22.42 % of wheezing children have pets compared with less than half this number, 14.25 % of non wheezy children in Jeddah region.

However, these results shows that the frequency of wheeze, and the formal incidence of asthma by diagnosis from a doctor is very significant in the two regions, and in particular shows strong regional differences ranging from most in Jeddah and least common in Dammam. The secondary evidence, that smoking fathers and owning pets, are major contributing factors to the expression of wheeze strongly imply that other factors in the environment are likely to contribute to the higher frequency of asthma in Jeddah compared with Dammam.

Table 2 shows the results of logistic regression analyses for both Dammam and Jeddah regions giving the association between respiratory symptoms independent variables and diagnosed asthma for the all children aged 7-12 years. Multivariate logistic regression were estimated which predicted asthma among children from wheezing bronchitis ; breathlessness or tightness ; usually cough ; father smoker, mother smoker, animal and pet exposure ; and family history of allergy. A variety of other variables are not included

Table 2 : Coefficient estimates from logistic regression predicting asthma aged 7-12 years in dammam and jeddah regions of Saudi Arabia

VARIABLES	REGRESSION COEFFICIENT ± STANDARD ERROR	t – STATISTICS TEST	ODDS RATIO # (95 % CONFIDENCE INTERVAL)
Wheezing Bronchitis	0.125 ± 0.063	4.25**	1.58 (1.15 – 2.82)
Breathlessness or tightness	0.111 ± 0.024	4.54**	1.91 (1.18 – 3.28)
Usually cough	0.239 ± 0.023	10.40**	1.12 (1.40 – 2.60)
Fathers smoker	0.035 ± 0.030	1.16 n.s.	1.32 (1.01 – 1.72)
Mothers smoker	0.008 ± 0.028	0.28 n.s.	1.51 (1.04 – 2.37)
Animal, pet exposure	0.032 ± 0.013	2.43*	1.26 (1.02 – 1.57)
Family history of allergy	0.069 ± 0.033	2.10*	1.89 (1.15 – 3.08)

N.S. – Not significant.
* $P < 0.01$.
** $P < 0.001$.
# The odds ratio was computed as the ratio of the cross product.

Table 3 : Correlation matrix for bronchial asthma study in dammam and jeddah regions of Saudi Arabia

	Father Smoker	Mother smoker	Else smoker	Wheezing	Relative Asthma	Raltive Rhinitis	Relative Eczema	Father Asthma	Father Rhinitis	Father Eczema	Mother Asthma	Mother Rhinitis	Mother Eczema
Father smoker	1.00000*												
	0.0000**												
Mother smoker	0.86525	1.00000											
	0.0001	0.0000											
Else smoker	-0.00373	-0.02269	1.00000										
	0.8768	0.3461	0.0000										
Wheezing	0.74172	0.78056	-0.02610	1.00000									
	0.0001	0.0001	0.2785	0.0000									
Relative asthma	0.50244	0.50745	-0.03369	0.56098	1.00000								
	0.0001	0.0001	0.1618	0.0001	0.0000								
Relative rhinitis	0.54661	0.51763	-0.04034	0.49551	0.80109	1.00000							
	0.0001	0.0001	0.0938	0.0001	0.0001	0.0000							
Relative eczema	0.53067	0.57732	-0.03701	0.51797	0.84096	0.86175	1.00000						
	0.0001	0.0001	0.1243	0.0001	0.0001	0.0001	0.0000						
Father asthma	0.47723	0.48638	-0.00255	0.53391	0.69896	0.63608	0.66234	1.00000					
	0.0001	0.0001	0.9156	0.0001	0.0001	0.0001	0.0001	0.0000					
Father rhinitis	0.50320	0.47335	-0.00282	0.50087	0.62650	0.65074	0.62673	0.80608	1.00000				
	0.0001	0.0001	0.9067	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000				
Father eczema	0.48466	0.52318	-0.01866	0.50214	0.67171	0.65551	0.71970	0.85646	0.82137	1.00000			
	0.0001	0.0001	0.4384	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000			
Mother asthma	0.47432	0.48329	-0.03093	0.52026	0.71148	0.65059	0.67281	0.78022	0.69838	0.75041	1.00000		
	0.0001	0.0001	0.1990	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000		
Mother rhinitis	0.48703	0.43876	-0.02850	0.45594	0.62084	0.65674	0.62389	0.68854	0.71295	0.67930	0.81225	1.00000	
	0.0001	0.0001	0.2366	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000	
Mother eczema	0.46528	0.49276	0.05334	0.46626	0.64744	0.64568	0.70077	0.72369	0.67749	0.75755	0.86817	0.81845	1.00000
	0.0001	0.0001	0.0267	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000

* Correlation Coefficient ** P value

in this table because they did not add any explanatory power to those equations. We have found significant associations between diagnosed asthma child and "wheezing bronchitis" ($P < 0.001$), "breathlessness ot tightness" ($P<0.001$), "usually cough" ($P< 0.001$), "animal and pet exposure" ($P<0.01$), and "family history of allergy" ($P<0.01$). There were not a significant association between diagnosed asthma child, "father smoker" ($P>0.10$) and "mother smoker" ($P > 0.10$).

Table 3 gives the matrix correlation and significant values between variables. For all children parental and maternal smoking were positively associated with asthma ($P < 0.0001$). Also, the findings that parental and maternal asthma is associated with diagnosed asthma rhinitis and eczema in all children ($P < 0.001$). Although there is evidence of an inherited factor in the development of asthma (23, 24), the evidence that bronchial asthma is inherited is indirect. However, except else smoker at home, which showed a non-significant negative correlation with bronchial asthma.

Both breathlessness or tightness showed a significant association with asthma and wheezy bronchitis ($P < 0.001$). The interaction between father smoker and mother smoker were not significantly associated with asthma. Then, both cough and animal and pets exposure showed a significant association with asthma ($P < 0.01$). Also, regions and cough showed a significant association with asthma.

CONCLUSION AND RECOMMENDATIONS

1) Medically and economically asthma is an extremely important disease.

2) Asthma is most prevalent in childhood and there is an unexplained predominance of girls over boys among childhood asthmatic.

3) Jeddah region is more exposed to asthma, eczema, wheezing and allergic rhinitis than Dammam region.

4) The socioeconomic differences between the asthmatic and the non-asthmatic children groups were not striking.

5) In the present study, animal and pets exposure was highly significant among asthmatic children. Cats and birds were the most common animals to which the asthmatic children were exposed.

6) In the present study, the mothers of the asthmatic children did not smoke very heavily, may be due to the Saudi culture.

7) Parental smoking is associated with an increased risk of childhood asthma. So parents should be advised to avoid smoking at home.

8) Asthmatic children often have a history of allergic rhinitis, eczema, cough, or wheezing and these conditions are also frequently in families of asthma (Asthmatic parents).

ACKNOWLEDGMENTS

The authors would like to thank King Abdulaziz City for Science and Technology for financial assistance. This research was supported by funds provided by the KACST (Project AR-7-45). We thank Mrs. Vangie S. Carrillo for her secretarial help and typing.

BIBLIOGRAPHIE

1. Gregg I.
Epidemiology aspects.
In : Clark T.J.H., Godfrey S.
Ed. Asthma. London : Chapman and Hall.
1983 : 242-84.

2. Blackhall M.J.
Ventilatory function in subjects with childhood asthma who have become symptom free.
Arch. Dis. Child. 1970 ; *45 :* 363-6.

3. Kerribi Jn K.F., Fioole A.C., Van Bentveld R.D.W.
Lung function in asthmatic children after a year or more without symptoms on treatment.
Br Med. J. 1978 ; *1 :* 886-8.

4. Cockroft D.W., Killian D.N., Mellon J.J.A., Hegreave F.E.
Bronchial reactivity to inhaled histamine : a method and clinical survey.
Clin. Allergy 1977 ; *7 :* 235-43.

5. Boushey H.A., Holtzman M.J., Sheller J.R., Nadel J.A.
Bronchial hyperactivity. Am. Rev. Respir.
Dis. 1980 ; *121 :* 389-413.

6. Mellis C.M., Kattan M., Keens T.G., Levison H.
Comparative study of histamine and exercise challenges in asthmatic children.
Am. Rev. Respir. Dis. 1978 ; *117 :* 911-5.

7. Britton W.J., Woolcock A.J., Peat J.K., Sedgwick C.J., Lloyd D.M., Leeder S.R.
Prevalence of bronchial hyperresponsiveness in children : The relationship between asthma and skin reactivity to allergens in two communities.
Int. J. Epidemiol. 1986 ; *15 :* 202-9.

8. Lee D.A., Winslow N.R., Speight A.N.P., Hay E.N.
Prevalence and spectrum of asthma in childhood.
Br. Med. J. 1983 ; *286 :* 256-8.

9. Peat J.K., Britton W.J., Salome C.M., Woolcock A.J.
Bronchial hyperresponsiveness in two population of Australian school children.
Clin. Allergy 1987 ; *17 :* 283-90.

10. Gurwitz D., Mindorff C., Levison H.
Increase incidence of bronchial reactivity in children with a history of bronchitis.
J. Pediatr. 1981 ; *98 :* 551-5.

11. Prendiville A., Green S., Silverman M.
Airway response to salbutamol in wheezing infants : evidence for beta adrenergic responsiveness (abstract).
Thorax 1986 ; *41 :* 240.

12. Hoop R.J., Bewtra A., Nair N.M., Townley R.G.
The effect of age on methacholine response.
J. Allergy Clin. Immunol. 1985 ; *76 :* 609-13.

13. Hailen M., Johnston P.
Prevalence of asthma and health service utilization of asthmatic children in an inner city.
J. Allergy Immunol. 1982 ; *70 :* 367-72.

14. Cockson J.B., Makoni G.
Prevalence of asthma in Rhodesian Africans.
Thorax 1980 ; *14 :* 833.

15. Wesley A.G., Clyde J.H., Wallace H.L.
Asthma in Durban children of three racial groups.
South African Med. J. 1969 ; *43 :* 87.

16. Warrel A.A., Fawceh I.W., Harrison B.D.
Bronchial asthma in the Nigerian Savanna region.
Q.J. Med. 1975 ; *44 :* 325.

17. Rees P.M., Gitono F., Mitchell H.J.
Some aspects of the ætiology of asthma with special reference to parasites and the house dust mite.

18. Godfrey R.C.
Asthma and IgE level in rural and urban communities in the Gambia.
Clin. Allergy 1975 ; *5 :* 201.

19. Pearson R.S.B.
Asthma in Barbados.
Clin. Allergy 1973 ; *3 :* 289.

20. SAS Institute 1985. SAS user's guide : Statistics SAS Institute, Cary N.C.

21. Baker R.J., Nelder J.A.
The GLIM system manual. Release 3. Generalized linear interactive modelling London : Royal Statistical Society, 1978.

22. Fleiss J.L.
Statistical methods for rates and proportions. Second Edition. Wiley Series in Probability and Mathematical Statistics. John Wiley and Sons 1981.

To Whom Correspondence should be addressed :

A. R. AL-FRAYH, MD, FACHARZT. Associate Professor, Department of Paediatrics College of Medicine King Saud University & King Khalid University Hospital – P.O. Box 2925, RIYADH 11461 (SAUDI ARABIA).

POUR CONSERVER VOS REVUES
d'Allergie et d'Immunologie

Protégez-les grâce à cette magnifique reliure (10 numéros)

Bon de commande

☐ 1 reliure 58[F] TTC (franco)

☐ 2 reliures 107[F] TTC (franco)

☐ 3 reliures 160[F] TTC (franco)

Nom _____ Prénom _____

Adresse _____

_____ Code postal _____

Je règle par ☐ chèque bancaire ou postal ☐ mandat

à l'ordre des Éditions du PORPHYRE 4, place du 18 Juin 1940 – 75006 Paris.