

# Asthmatic children and risk factors at a province in the southeast of Turkey

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## SUMMARY

*Background:* The prevalence of asthma appears to be on the increase and the risk factors are not well established. Environmental and demographic characteristics of asthmatic children were investigated to identify the risk factors accompanying asthma.

*Methods:* 140 asthmatic children aged at 3-15 years were compared with 96 age-matched control subjects admitted to the paediatric outpatient clinics of Dicle University Hospital. Information about the children were obtained from parents and patients' charts.

*Results:* Patients with asthma were most frequently admitted in May-June and November-January months. Association of the disease with allergic rhinitis was found in 84 children (60 %), allergic conjunctivitis in 63 (45 %), atopic dermatitis in 29 (21 %) and gastrointestinal symptoms in 18 (13 %). Mean age of the cases was  $6.8 \pm 3.3$  and  $6.9 \pm 3.2$  years ( $p > 0.05$ ); male to female ratios were 91/49 and 43/53 ( $p = 0.002$ ) in the study and control groups, respectively. There were significant differences at number of cases stated to have any symptoms induced by air pollution (25.6 %, 3.1 %,  $p < 0.001$ ), exercise (47.5 %, 4.2 %,  $p < 0.001$ ) and cold exposure (33 %, 15.6 %,  $p = 0.03$ ), but not by damp, dust, indoor smoking, foods, drugs, and animal contact ( $p > 0.05$ ) between the study and the control groups, respectively. Family history of atopy was 66 % and 8.4 %, ( $p < 0.001$ ) in the study and control groups, respectively. Family crowding index, duration of breast feeding, parental education and number of consanguineous married parents were not different between both groups. History of upper respiratory tract infections were more frequent in

asthmatic children than controls. Children with an earlier age of onset ( $\leq 5$  years) in the study group was more frequently associated with allergic rhinitis in comparison with the asthmatic children with an age of onset  $> 5$  years.

*Conclusion:* Many risk factors, both individual and environmental are associated with asthmatic children in Diyarbakır. Among many risk factors that aggravating asthma in children in Diyarbakır, air pollution, cold exposure and upper respiratory infections are preventable.

**Key words:** Asthma. Risk factors. Child. Environment. Indoor allergens.

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## INTRODUCTION

The prevalence of asthma has increased dramatically over the last decades, and numerous published studies have reported that prevalence rates and increases in prevalence appear to be greatest in children and young adults. It is estimated that, worldwide, between 1 % and 20 % of children and young adults have asthma (1). The major risk factors established for asthma are family history and exposure to one or more indoor allergens and triggering factors like house dust mites, moulds and tobacco smoke. Outdoor air pollution including various polluting gas like  $\text{NO}_2$ ,  $\text{SO}_2$  and ozone, climatic and life-style factors may also play a role in the development of the disease.

An allergic disposition has long been recognized as a risk factor for asthma; however, it has been

**Table I**

**Number of children affected by the mentioned risk factor**

Risk factor	Asthmatics		Control group		$\chi^2$	p
	n	%	n	%		
Exercise	67	47.8	4	4.2	56.3	< 0.001
Air pollution	36	25.6	3	3.1	16.1	< 0.001
Passive smoking	50	35.7	22	22.9	2.9	NS
Damp	16	12.9	6	6.7	1.2	NS
Dust	33	23.6	16	16.6	1.3	NS
Cold exposure	45	32.1	15	15.6	7.3	0.007
Food	8	6.1	2	2.1	1.1	NS
Drugs	6	4.5	0	3.1	0.01	NS
Animal contact	4	2.9	0	0.1	0.2	NS

suggested that, irrespective of genetic factors, exposure to environmental agents is of major importance in the development of asthma. Environmental modifications are implicated in various ways for the increasing frequency of childhood allergic diseases: new habits, dietetic evolution, changes in atmospheric pollution. All these factors lead us to the conclusion that regional risk factors should be investigated in order to propose efficient preventive measures for the risk of developing allergic diseases. For this purpose, this study has been carried out to determine the triggering and risk factors associated with asthma in children in Diyarbakır region.

**MATERIAL AND METHODS**

The study was performed at the pediatric outpatient clinics of Dicle University Hospital, Turkey, during 1995-1997. There were 140 asthmatic children aged at 3-15 years in the study population and 96 healthy children constituted the control group. Children in the control group were those who did not ever have asthma diagnosed by a doctor and who did not suffer from asthmatic symptoms such a shortness of breath with wheezing during their previous lives. Positive or negative answer to that question was inquired: "Has your child ever revealed any symptoms by the effect of the mentioned parameter?" Information about the children were obtained from parents and patients' charts. Parental histories of asthma and allergies were obtained from the questionnaire administered to the parents, inquiring if a doctor has ever said that they had asthma or other allergic diseases. Subjects' data were analyzed by using Chi-square test. P value < 0.05 was accepted as significant.

**RESULTS**

Mean age of the cases was  $4.2 \pm 2.6$  and  $4.9 \pm 3.6$  years ( $p > 0.05$ ); male to female ratios were 91/49 and 43/53 ( $p = 0.002$ ) in the study and control groups, respectively. The monthly variation in asthma admissions peaked in May-June and November-January. Association of asthma with allergic rhinitis was found in 84 children (60%), allergic conjunctivitis in 63 (45%), atopic dermatitis in 29 (21%) and gastrointestinal symptoms in 18 (13%).

Exposures stated to cause wheezing in the children with asthma were cold in 32.1%, exercise in 47.8%, atmospheric air pollution in 25.6%, cigarette smoke in 35.7%, dust in 23.6%, cats and dogs in 2.9%, and respiratory infections in 15%.

There were significant differences at number of cases stated to have any symptoms induced by air pollution (25.6%, 3.1%,  $p < 0.001$ ), exercise (47.8%, 4.2%,  $p < 0.001$ ) and cold exposure (32.1%, 15.6%;  $p = 0.03$ ), but not by damp, dust, indoor smoking, foods, drugs, and animal contact ( $p > 0.05$ ) between the study and the control groups, respectively (table I). Family history of atopy was 66% and 8.4%, ( $p < 0.001$ ) in the study and control groups, respectively. Family crowding index (no. of persons/no. of rooms), duration of breast feeding, parental education and number of consanguineous married parents were not different between both groups ( $p > 0.05$ , data not shown). History of upper respiratory tract infections in previous years were more frequently found in asthmatic children than the controls (70% vs. 45%).

Children with an earlier age of onset ( $\leq 5$  years) in the study group was more frequently associated with allergic rhinitis in comparison with the asthmatic children with an age of onset  $> 5$  years.

**DISCUSSION**

Risk factors relating to the development of asthma and triggering factors leading to asthma exacerbation are multiple and complex. However, our understanding of the risk factors and triggering factors in childhood asthma has improved through the establishment of a more precise definition of asthma linked with information from large-scale longitudinal studies. These factors for the development and exacerbation of childhood asthma include; individual predisposing or genetic factors (atopy and bronchial hyperresponsiveness); causal factors: indoor and outdoor inhaled allergens (domestic mites, animal, cockroach and fungus

allergens, pollens from trees, grasses and weeds) and contributing factors: smoking, air pollution in particular sulfur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>). In addition, respiratory virus infection is closely associated to the development of asthma in childhood (2, 3). Owing to the geographic location and different sensitivity to allergen between races, risk factors and triggering factors vary from area to area. As we learn more about the geographic variations of these factors of asthma, we will have a better control of various environmental factors.

There were significant differences in the number of associated allergic diseases and the history of familial allergic diseases between asthmatic children and the controls in our study, reflecting the close relationship between allergic diseases and atopic sensitization. Recent data suggest that there is a much stronger association of allergic conditions in early life with allergic disease in the parents particularly in the mother (4, 5). Infants with early signs of atopic dermatitis and a positive family history were suggest as candidates for early intervention measures against respiratory allergies (6). In another study, positive familial medical history for allergic illness was not predictive for recurrence of the disease (7).

Allergic rhinitis asthma in young adults was reported to be strongly associated with perinatal events rather than asthma (8). Children with an earlier age of onset of asthma in our study group was more frequently associated with allergic rhinitis in comparison with the asthmatic children with an age of onset > 5 years. This may probably reflect a more close relationship between allergic rhinitis and atopic sensitization, whereas asthma might have a more multifactorial etiology.

The male to female ratio for the occurrence of asthma remains at about 1.5 children, 1.0 in late adolescence and less than 1.0 in adults. There are some limited number of studies with no sex-related difference in prevalence (4).

Seasonal relief of the respiratory symptoms particularly in the summer has been reported in most studies (9). Exposure to outdoor air pollution in the winter may have several adverse effects on respiratory health of children particularly living in metropolitan areas. It is suggested that there may be an effect of urban air pollution on short-term lung function and/or lung growth and development during childhood (10).

Parental smoking and at a less measure the overcrowding of the bedroom were reported to be the risk factors of asthma in early childhood (4). Cigarette smoke, dust, contact with cats and dogs were reported as the most frequent exposures

stated to caused wheezing in children in the study of Huss K et al (11). In some other studies, no significant relationship could be demonstrated between passive smoking and the risk for development of asthmatic symptoms (12). Gender and pet ownership did not appear to be risk factors for asthma-related symptoms in a study conducted in schoolchildren in Ankara, Turkey (13). The prevalence of childhood asthma was not affected by place of residence and family crowding in Istanbul, Turkey (14). The rate of children exposed to passive smoking and the crowding indices of the families were high in both asthmatic patients and the controls in our study.

Wheezing exclusively induced by exercise or colds were at high rates in our study as reported in previous studies (4). There was not a difference in number of children presenting self-reported symptoms at exposure to damp between asthmatic and nonasthmatic children in our study. We consider it constitutes a significant public health problem in particularly subtropical area, rather than our region. In another case-control study (15), 193 children with asthma and 318 controls were evaluated and heredity, environmental tobacco and home dampness were found to be significant risk factors for asthma. Although more knowledge about underlying mechanisms for the association are needed, children living in a damp house are reported to be more likely to suffer from respiratory symptoms and it has been suggested that exposure to fungi is an important contributing factor (16). In addition, raised indoor humidity was suggested to reflect low air exchange and to lead to increased doses of inhaled aeroallergens and tobacco smoke (15).

There is also limited advice about the role of breastfeeding in childhood asthma (17), and we did not find such a relationship in our study. In a prospective randomized double-blind study exclusive breast-feeding was found to be associated with lower incidence of atopic diseases (18), while breast feeding was not found to be predictive for recurrence of the disease in another study (7).

Social advantage with higher socioeconomic status based on type of housing and total family income has been reported to appear as an independently consistent determinant of atopic disease in a recent study (19, 20). Maternal smoking was an additional risk factor for wheeze in that study, primarily in low socioeconomic groups. Likelihood of having symptoms of asthma was not influenced by parental education and/or socioeconomic status in various studies as indicated in our study (4, 13, 14, 21).

Four different measures were associated with the prevalence of asthma in a study in Hong Kong: the presence of eczema, high serum IgE level, high number of upper respiratory infections and a relatively high family income (22).

Children with current symptoms, persistent symptoms, and late-onset symptoms were identified in a recent study and gender, social class, number of children in the household, passive smoking, and personal and family history of atopy were determined as associated risk factors for one or more of the symptom groups (23).

In conclusion, the knowledge of the risk factors and triggering factors for asthma would supply the physicians to recommend preventive and potentially preventive strategies to parents whose children are at high risk for the development or the exacerbation of the disease. Most promising environmental interventions at the current time in our region would seem those which address exposure to air pollution, cold, exercise and respiratory infections.

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## RESUMEN

*Antecedentes:* La prevalencia del asma parece ir en aumento y los factores de riesgo no parecen quedar muy claros. Se investigaron las características medioambientales y demográficas de un número de niños asmáticos para identificar los factores de riesgo que acompañan al asma.

*Métodos:* 140 niños asmáticos de edades comprendidas entre los 3 y los 15 años fueron comparados con 96 sujetos de las mismas edades admitidos en el hospital pediátrico de día de la Universidad de Dicle. La información sobre los niños se obtuvo a través de los padres y la historia clínica de los pacientes.

*Resultados:* Los pacientes con asma acudían con más frecuencia en los meses de mayo-junio y de noviembre-enero. La enfermedad se asoció con rinitis alérgica en 84 niños (60 %), con conjuntivitis alérgica en 63 niños (45 %), dermatitis atópica en 29 niños (21 %) y síntomas gastrointestinales en 18 niños (13 %). La edad media de los casos era de

6,8 ± 3,3 y 6,9 ± 3,2 años ( $p > 0,05$ ); la relación entre varones y mujeres fue de 91/49 y de 43/53 ( $p = 0,002$ ) en los grupos de estudio y los controles, respectivamente. Hubo diferencias importantes entre el número de casos en los que existían síntomas inducidos por la contaminación del aire (25,6 %, 3,1 %,  $p < 0,001$ ), el ejercicio (47,5 %, 4,2 %,  $p < 0,001$ ) y la exposición al frío (33 %, 15,6 %,  $p = 0,03$ ), pero no los debidos a la humedad, al polvo, al humo del tabaco en interiores, alimentos, medicamentos, y contacto animal ( $p > 0,05$ ) entre los grupos estudiados y los controles, respectivamente. La historia familiar de atopia fue del 66 y del 8,4 % ( $p < 0,001$ ) en los grupos estudiados y los controles, respectivamente. Entre ambos grupos no existían diferencias entre el número de miembros en la familia, la duración de la lactancia materna, la educación de los padres y número de progenitores consanguíneos. Los casos de infecciones en las vías respiratorias altas eran más elevados en los niños asmáticos que en los controles. Los niños pertenecientes al grupo de estudio con aparición temprana de la enfermedad ( $< 5$  años) se asociaban más frecuentemente con rinitis alérgica en

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comparación con los niños asmáticos con aparición inicial de la enfermedad en edades  $> 5$  años.

*Conclusión:* En Diyarbakır, los niños asmáticos se asocian con muchos factores de riesgo, tanto individuales como medioambientales. Entre muchos de los factores de riesgo que agravan el asma de los niños de Diyarbakır, la contaminación del aire, la exposición al frío y las infecciones de las vías respiratorias altas son evitables.

**Palabras clave:** Asma. Factor de riesgo. Niños. Contaminación ambiental. Alergenos domésticos.

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