

## EFFECT OF METEOROLOGICAL FACTORS ON RESPIRATORY SYMPTOMS OF ASTHMATICS IN KONYA †

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### SUMMARY :

**Purpose :** The objective of this study was to determine the effect of meteorological factors on the symptomatology of asthmatics in Konya. **Methods :** Patients with asthma completed a questionnaire by interview. They were asked if various weather conditions (fog, damp, cold, hot, wind, or rain) induced one or more of the following symptoms : breathlessness, wheezing, coughing and chest tightness. **Results :** Only 2 (1.9 %) patients were not affected by weather. More people were affected by fog. The prevalence of respiratory symptoms induced by fog versus those induced by damp, cold, hot, wind, and rain was compared; a highly significant difference was found between fog - hot, fog - wind, or fog - rain ( $p < 0.0001$ ) for all comparisons. **Conclusion :** Although the respiratory symptoms of asthmatics in Konya are aggravated predominantly by fog, the interaction of the weather conditions with other factors such as air pollution should be investigated.

**Key Words :** Asthma, Respiratory Sounds, Weather.

### INTRODUCTION

Asthma is characterized by bronchial hyperresponsiveness. In asthmatic subjects, exposure to a wide variety of stimuli produces airway obstruction. Because the conducting airways of the respiratory tract are continuously exposed to the gas phase of the environment, it is not surprising that asthmatic patients, with their low threshold for bronchial reactivity, experience changes in their symptoms with variations in the weather (1 - 3). The effect of these climatic changes may be either direct by airway cooling, or indirect by influencing the level of air pollutants or airborne

allergens (2 - 5).

Hospital admission rates of asthma have seasonal variability in different places around the world (1, 3, 6). Considering the wide variety of agents proposed to provoke asthma attacks, it is probable that the etiologies associated with the observed seasonal alterations in different locations are also different. Therefore, the influence of meteorological conditions on asthma is still a controversial subject. To our knowledge, the seasonal distribution of asthma has not been studied in Konya previously.

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The present study was undertaken to determine which weather conditions, if any, were associated with the aggravation of the respiratory symptoms of patients with asthma in Konya.

### MATERIALS AND METHOD

This study was carried out in asthmatic subjects from Konya. Patients were referred to our Department of Chest Diseases of Selçuk University Hospital between March 1993 and July 1995. All patients presented a typical history of bronchial asthma according to the criteria of the American Thoracic Society (ATS) (7). The patients completed a questionnaire by interview (Fig. 1). The questionnaire was developed in the University of Edinburgh, Scotland (8).

We compared the weather and prevalence of the symptoms with McNemar Chi-square test. A p value < 0.005 was regarded as statistically significant.

### RESULTS

The study population included 105 patients with asthma. There were 90 women and 15 men with a mean age of 49.04 years (range 16 to 80 years). Only one patient was an ex-smoker; the remaining subjects were nonsmokers. Table 1 shows the number and percentage of patients whose symptoms were

provoked by different weather conditions. Only 2 (1.9 %) patients were not affected by weather. More people were affected by foggy weather. When the percentage of symptoms in fog was compared with those in other conditions, highly significant differences were noted for fog-hot, fog-wind, and fog-rain ( $p < 0.0001$  for all comparisons). However, no significant difference was found between fog-damp or fog-cold ( $p > 0.05$ ).

### DISCUSSION

This study has shown that patients with asthma have increased sensitivity to foggy weather. The respiratory symptoms of our patients were aggravated by foggy weather rather than hot, wind, or rain. Bitsakou et al. have reported that more asthmatics were affected by high humidity weather (fog or damp) and wind than by frosty weather (8). Lopez et al. suggested that high humidity is detrimental to asthmatics, and their clinical observations showed constant high humidity with increasing symptoms in many patients (9). Packe et al. have suggested that there was a notable change in several climatic factors either prior to or coincidental with the increase in asthmatic admissions. Most prominent were the decrease in wind speed during the preceding week and an abrupt rise in relative humidity (4). In our study, windy weather affected fewer patients

1. Does the weather affect your chest Yes ( )						
No ( )						
2. If "Yes" what kind of weather?						
	Fog ( )	Damp ( )	Cold ( )	Hot ( )	Windy ( )	Rain ( )
3. Which of the following breathing problems do you have?						
	Breathlessness	Cough	Wheezing	Chest tig.		
Fog	( )	( )	( )	( )		
Damp	( )	( )	( )	( )		
Cold	( )	( )	( )	( )		
Hot	( )	( )	( )	( )		
Windy	( )	( )	( )	( )		
Rain	( )	( )	( )	( )		
4. Which weather do you find the most troublesome?						
5. Which weather is good for your breathing?						

Fig - 1 : Questionnaire Used in the Study.



Table 1 : The number and percentage of patients whose symptoms were induced by the different weather conditions.

Symptoms	Fog		Damp		Weather Conditions		Cold		Hot		Windy		Rain	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Breathlessness	97	(92.4)	77	(73.3)	75	(71.4)	51	(48.6)*	73	(69.5)*	44	(41.9)*		
Cough	83	(79.0)	71	(67.6)	74	(70.5)	33	(31.4)*	60	(57.1)*	34	(32.4)*		
Wheezing	92	(87.6)	70	(66.6)	74	(70.5)	40	(38.1)*	68	(64.8)*	41	(39.0)*		
Chest tightness	81	(77.1)	68	(64.6)	65	(61.9)	38	(36.2)*	60	(57.1)*	38	(36.2)*		

\*p < 0.0001 versus the corresponding values of fog.

than foggy weather, where the speed of wind is minimal and relative humidity is high.

Several potential confounders, such as air pollutants, could also interfere with the meteorological effects on acute exacerbations of asthma (3, 10). The levels of air pollution, such as sulfur dioxide, are influenced by weather conditions, especially by temperature inversions and low wind velocity (2). Air stagnation and cold temperatures during atmospheric pollution inversions cause pollutants to collect at ground level. These episodes have been associated with excessive acute mortality in the elderly, infants, and subjects with chronic cardiopulmonary disorders. It has also been shown that even in healthy adolescents and adults, acute exposure to high concentrations (> 5 ppm) of sulphur dioxide uniformly results in bronchoconstriction (11). Sheppard et al. have shown that asthmatics are more sensitive to the bronchoconstrictor effects of sulphur dioxide than nonasthmatics. The bronchoconstrictor effect of this gas (as low as 0.10 ppm) can be potentiated in asthmatics by oral breathing (12). In our study, we could not obtain all air pollution data for Konya prospectively. Therefore, the correlation between these data and symptoms of asthmatics could not be evaluated. However, meteorological and air pollution data recorded between 1990 and 1994 in Konya showed that winter had the highest number of foggy days (5.6-9.4 days), sulphur dioxide (309-392 mg/m<sup>3</sup>) and smoke levels (93-139 mg/m<sup>3</sup>). The relative humidity (75-79 gr/m<sup>3</sup>) increased and the wind speed during this season was minimal (1.3-1.4 m/sec). We suggest that these data emphasize the interaction of weather conditions with other environmental factors such as air pollution.

Our findings support the suggestion that decreased speed of wind and increased number of foggy

days and air pollution (sulphur dioxide and smoke) during winter in Konya may have contributed to the aggravation of respiratory symptoms of asthmatic patients. However, to strengthen this suggestion, further prospective studies are required.

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