

Asthma and climatic conditions – Experience from Kuantan, Malaysia

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Summary

Data on number of cases of acute asthma seen at casualty department in 1987 as well as daily meteorological data for 1987 were obtained and analysed for relation between climatic factors and acute asthma. Ambient temperature was significantly associated with acute asthma; the lower the temperature, the more the number of cases of asthma were seen. No association however was observed between asthma and the other climatic factors viz, rainfall, humidity, daily change in humidity and daily drop in temperature. We further discuss our finding.

Keywords : Acute Exacerbation of Bronchial Asthma, Climate.

Introduction

The association between climatic changes and incidence of asthmatic attacks have long been observed, the most well documented are those observed over many years in New Orleans¹. In this country, many patients or their parents as well as doctors believe it to be true that rainy days can provoke an attack of asthma. However it has been difficult to obtain the evidence to support this belief from the literature^{1,3-7}

We therefore present here an investigation into the relation between local climatic factors and asthmatic attacks.

Methods

Data on the number of cases of Acute Exacerbation of Bronchial Asthma seen in the casualty department were obtained from the attendance record book. This only recorded attendances between 7 p.m. to 7 a.m. on the following day. This was suitable for the purpose of this study as 7 p.m to 7 a.m. was the peak period for acute asthmatic attendance at the casualty department. Fewer cases were seen throughout the day and further, many were often seen at the concurrently running out patient clinic

(which in this general hospital, is run with the casualty as a unit) and thus their attendances were often not recorded in the casualty attendance record book. From 7 p.m. to 7 a.m., of course the out patient clinic was closed and all acute asthmatic attendances must be seen and recorded at the casualty department. As the number of attendances was large (2106), we believe the sample size is sufficient and representative of each day's attendance, so that the extra effort in tracing down 150,000 out patient cards (the estimated annual out patient attendances) in order to pick up the few extra acute asthmatic seen in the day is probably unjustified.

Daily climatic data (minimum temperature, maximum temperature, mean relative humidity, maximum and minimum humidity, rainfall) for 1987 were obtained from Jabatan Kajicuaca, Kuantan. The daily rainfall was recorded from midnight to midnight. Note that this differs from the period of record for asthmatic attendance which is from 7 p.m. to 7 a.m. This is to allow for late effect of climatic changes on acute asthma, if there were any and to allow for late attendance after onset of asthma.

Statistical Analysis

Significance of results were evaluated using X test.

Results

In 1987, a total of 2106 patients attended the casualty department between 7 p.m. and 7 a.m. the following day with a diagnosis of Acute Exacerbation of Bronchial Asthma (AEBA). The mean daily attendance for AEBA was 5.77.

There was no significant relation between daily attendances with acute asthma and daily relative humidity or daily drop in relative humidity. ($x = 1.6978$ and 11.503 respectively, $P > 0.05$) (Table I and II).

Table I
Mean No. of AEBA and relatix humidity

| | Daily Relative Humidity (%) | | | | |
|------------------|-----------------------------|-----------|-----------|-----------|------|
| | < 80.9 | 81 – 83.9 | 84 – 86.9 | 87 – 89.9 | > 90 |
| Mean No. of AEBA | 5.83 | 5.78 | 5.70 | 5.51 | 5.40 |

Table II
Mean no. of AEBA and drop in humidity (dh)

| | Daily drop in humidity (%) (dh = maximum humidity – minimum humidity) | | | | | | |
|------------------|---|---------|---------|---------|---------|---------|------|
| | ≤ 25 | 26 – 30 | 31 – 35 | 36 – 40 | 41 – 45 | 45 – 50 | ≥ 51 |
| Mean No. of AEBA | 5.83 | 4.61 | 6.44 | 6.18 | 5.59 | 5.51 | 5.50 |

Table III
Mean no. of AEBA and drop in temperature (dt)

| Mean No. of AEBA | Daily drop in temperature °C dt = maximum daily temp. – minimum daily temp | | | | | | | |
|---------------------|--|-----------|---------|---------|---------|---------|---------|------|
| | ≤ 11 | 10 – 10.9 | 9 – 9.9 | 8 – 8.9 | 7 – 7.9 | 6 – 6.9 | 5 – 5.9 | ≤4.9 |
| | 5.71 | 5.41 | 6.18 | 5.79 | 5.0 | 6.83 | 5.07 | 6.0 |

Table IV
Mean no. of AEBA and daily minimum temperature

| Mean No. of AEBA | Daily minimum temperature °C | | | | |
|---------------------|------------------------------|-----------|-----------|-----------|--------|
| | ≤ 21 | 21.1 – 22 | 22.1 – 23 | 23.1 – 24 | ≥ 24.1 |
| | 7.5 | 6.66 | 5.76 | 5.35 | 5.5 |

Table V
Mean no. of AEBA and daily rainfall

| Mean No. of AEBA | Daily Rainfall (mm) | | | | |
|---------------------|---------------------|---------|----------|-----------|--------|
| | 0 | 0.1 – 1 | 1.1 – 10 | 10.1 – 20 | ≥ 20.1 |
| | 5.79 | 5.41 | 5.77 | 5.77 | 6.06 |

There was no significant relation between daily drop in temperature and asthma attendance. ($x = 12.32$, $P > 0.05$) Table III), however, the relation between daily minimum temperature and asthma attendances was highly significant. The lower the daily minimum temperature, the higher the number of AEBA seen. ($x = 17.454$, $P < 0.01$) (Table V) note that the rainfall recorded were from mid-night to min-night of the day whereas the AEBA attendance recorded were from 7 p.m. of the same day to 7 a.m. of the following day. Thus, there is a difference of 7 hours. This is to allow for late effect of rainfall, if there were any, or otherwise, for late attendance after onset of asthma.

Discussion

Of all the climatic factors (temperature, humidity, rainfall etc.), there is no doubt that lowering of the temperature is most consistently associated with increase in incidence of acute asthmatic attacks. This has been demonstrated in many published reports from all over the world.^{1,3-7} Our finding merely confirmed this observation. Interestingly however, in a tropical country like Malaysia where temperature in high (the lowest temperature recorded in Kuantan was 19.6 C) and the range narrow

(19.6 C - 34.5 C), the effect of lowering of temperature was still apparent. The mechanism whereby lowering of temperature brings about asthmatic attacks is also well known and is believed to be due to direct cooling of the airways^{8,9}. This direct effect of cooling on the airway probably accounts for its consistent association with asthmatic attacks.

The same however cannot be said for other climatic factors like rainfall and humidity. Both rainfall and humidity have been reported to be associated with asthmatic attacks. The associations were observed with changes of rainfall and humidity in either direction (high or low), thus, in Hongkong, increased rainfall reduced the number of admissions for asthma⁶, while, in an outbreak of asthma, in Birmingham, there was a preceding downpour⁴, as for humidity, the association is also inconsistent, in Bermuda⁷, lowering of humidity was associated with increased asthmatic attacks, while in Australia⁵, the association was reversed with increased asthmatic attacks occurring on days of increased relative humidity.

This is not surprising as the mechanism whereby changes in rainfall or humidity or other factors bring about asthmatic attacks are both direct through certain combination of changes in climatic factors at a particular time in particular place as well as indirect by its influence on concentration of aeroallergens like pollens, fungal spores or other yet unidentified intermediate factors.^{4,10}

In this study, we have been unable to find an association between asthma and humidity, we are not surprised with this as Malaysia is a high humidity country through the year with very little day to day variation in humidity. However, the lack of relation between asthma and rainfall seems to go against the grain of popular belief. There were no floods in 1987 which might have deterred attendance at the casualty department.

On its own, I don't think our finding is sufficient to disprove the popular notion that asthma is exacerbated by rain. Perhaps we have been observing trend over too broad a timescale (the data were collected on daily basis), whereas the response of asthma to weather changes may be too immediate (within minutes) for it to be apparent in our study. Hence, what is needed now is a more detailed prospective study relating the incidence of acute asthma, its exact time of onset to the preceding changes in climatic condition on a narrower time scale like hourly.

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