THE IMPACT OF THE HAZE ON CHILDREN WITH CHRONIC ASTHMA

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ABSTRACT: To determine the impact of the haze on asthma symptomatology in children with chronic asthma on inhaled prophylaxis. The study was prospective and collected information on asthma symptoms from children attending the asthma clinic. A comparison of peak expiratory flow rate (PEFR) measurements before and during the haze was performed for children above 7 years. A total of 97 children were included into the study. Forty (41%) children complained of increased respiratory symptoms during the haze. The most common complaint was an increase in nocturnal cough (55%) followed by nasal symptoms (40%), daytime cough (40%) , nocturnal wheeze (25%) and daytime wheeze (18%). About half of the children who had increased symptomatology during the haze had to limit outdoor activities. In the 43 children in whom PEFR studies were available, 29 (67%) of them had a fall in the PEFR. However, children with no increase in asthma symptomatology showed a similar fall in PEFR measurement when compared to children with increased asthma symptomatology. The haze appeared to be detrimental to the well being of some children with chronic asthma despite being on inhaled prophylaxis. *(JUMMEC 1997 2(2): 99-102)*

KEYWORDS: Haze, cough, wheeze, peak expiratory flow rate

Introduction

Air pollution secondary to widespread forest fires resulting in a haze is peculiar to parts of the world where deforestation for land cultivation is achieved by open burning of the land. Many parts of Malaysia were shrouded with a thick haze for the most part of August to October in 1997. The haze then was attributed to uncontrolled forest fires that raged in parts of Sumatra and south Borneo. The severity of the haze was locally monitored by Alam Sekitar Malaysia Sendirian Berhad (ASMA) using the Air Pollutants Index (API). The API was a uniform measurement that took into account 5 different air pollutants namely carbon monoxide (CO), sulphur dioxide (SO_2), nitrogen dioxide (NO_2), suspended particulate matter less than 10 microns (PM 10) and ozone (1). An API level above 100 was considered unhealthy and a potential health threat.The haze became a major environmental disaster and health threat when the API in parts of Sarawak reached unacceptably hazardous levels and prompted the state government to declare a state of emergency causing closure of schools, businesses and public services.

The most worrying effect of the haze was, of course, the impact it had on the health of the nation's population, both young and old who were continuously exposed to the unhealthy air. Children and the elderly who already have chronic respiratory problems appeared to be exceptionally vulnerable to the effects of the haze. There was a significant correlation between the daily number of children and adults seeking treatment for acute asthma at the emergency unit of University Hospital Kuala Lumpur with the API index in the Klang Valley during this period (personal communication Lim Kim Hatt, Department of Medicine, UHKL).

This study looks at the asthma symptomatology during the haze in a group of children with chronic asthma whose illness severity warrants inhaled prophylaxis treatment and who attend regular follow up at the paediatric asthma clinic of University Hospital Kuala Lumpur.

Materials and methods

The study was prospective in nature. Children who fulfilled the following criteria:

1) aged 1 - 12 years
2) diagnosed to have chronic asthma of moderate severity

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3) receiving inhaled prophylaxis as regular treatment (either steroids - beclomethasone/budesonide or mast cell stabiliser - sodium cromoglycate)
4) reside in the Klang Valley

were included into the study. The children and parents were interviewed individually using a standard questionnaire concerning asthma symptomatology during the period from August to October 1997 when the haze surrounding the Klang Valley had API values above the unhealthy levels. The asthma symptomatology enquired during the interview included daytime and nocturnal cough, daytime and nocturnal wheeze, nasal symptoms i.e. nasal stuffiness, running nose and sneezing attacks and exercise induced cough and wheeze. Patients were also asked if the presence of the haze influenced a change in their life style namely the use of a facial mask when going outdoors or limiting their outdoor activities. PEFR measurements were obtained for children above 7 years during the clinic visit and were compared to the PEFR measurement done at the last paediatric asthma clinic visit for 1997 before the month of June.

Data collected was analysed using a statistical programme SPSS Version 6.13 for Windows 95. The Students t test was used to compare quantitative data and the Fisher's exact test was used to compare dichotomous variables.

Results

A total of 97 children were included into the study. The mean age of the children was 7.1 ± 3.5 years with a median age of 7.1 years. There was a marked male preponderance with a male:female ratio of 1.85:1. Malays (50%) constituted the majority of children and this was followed by Chinese (28%) and Indians (22%).

Forty (41%) children complained of increased asthma symptomatology during the haze. The most common troublesome asthma symptoms were nocturnal cough (55%) followed by daytime cough (40%), nasal symptoms (40%), daytime wheeze (18%), exercise induced cough (15%) and exercise induced wheeze (15%). Six children required a course of systemic corticosteroids and four children needed in - patient care for acute asthma during

Table 1. Clinical characteristics of children with/without increased asthma symptomatology during the haze

Clinical parameter	Children with increased asthma symptomatology (n = 40)	Children with no increased asthma symptomatology (n = 57)	*p* value
Mean age ± SD (years)	7.4 ± 3.2	7.2 ± 3.6	0.71
Children above 5 years	27 (68%)	36 (63%)	0.65
Mean age ± SD at time of asthma diagnosis (years)	2.8 ± 2.0	2.8 ± 2.1	0.91
Sex (Male : Female)	2 : 1	1.6 : 1	0.66
Race			
Malay	40%	56%	
Chinese	38%	21%	0.34
Indian	22%	23%	
Inhaled steroids for prophylaxis	77%	91%	0.06
Change in lifestyle	48%	23%	0.015*

*significant p value

Table 2. Fall in PEFR measurements for children above 7 years with/without increased asthma symptomology during the haze

PEFR	Children with increased asthma symptomatology (n = 22)	Children with no increased asthma symptomatology (n = 21)	*p* value
Number who have PEFR fall	17 (77%)	12 (57%)	0.16
Mean PEFR fall	17.8 ± 9.2%	17.6 ± 8.3%	0.90
PEFR fall more than 15%	13 (59%)	7 (33%)	0.26

this period.

There was no difference between the clinical characteristics of children who complained of increased asthma symptomatology and that of those who did not (Table I). As expected, children who had increased asthma symptomatology were more likely to adjust their lifestyle to reduce exposure to the haze by limiting outdoor activities and using a facial mask. Children who used inhaled steroids for prophylaxis instead of inhaled mast cell stabiliser were less likely to have increased asthma symptomatology but this failed to reach statistical significance.

PEFR measurements suitable for comparison were available for 43 of the 49 children above 7 years of age. Six children were excluded from the analysis because a PEFR measurement before the haze was not available. Twenty nine (67%) children had a decline in PEFR measurements during the haze with a mean fall of 17.7 ± 8.8 % and a range of 3 to 33%. Only 20 (47%) children had a PEFR fall of more than 15%. Although a higher number of children with increased asthma symptomatology had a decline in their PEFR measurements when compared to children who had no increased in asthma symptomatology, this difference did not reach statistical significance (Table 2).

Discussion

There is little doubt that the quality of air that children breathe has a direct effect on their airway mucosa and lung. Rapid urbanisation resulting in the deterioration of air quality due to increased levels of air pollutants is now increasingly recognised as a potential health problem in Malaysia. The air quality is more likely to be important for children with chronic respiratory problems namely chronic asthma, bronchopulmonary dysplasia and cystic fibrosis. The study of the impact of air quality and pollution on the health of children with chronic respiratory illness is complicated as there are a number of types of air pollution and the influence of common confounding factors like exposure to cigarette smoke, indoor pollution from heat sources used for cooking and plant pollen derived airborne allergens cannot be easily excluded. Air pollutants which may affect the respiratory health of children include concentration of nitrogen dioxide (NO_2), sulphur dioxide (SO_2), ozone and suspended fine particulate pollutant less than 10 microns [PM 10] (2). Large amounts of suspended particulate matter in the air resulting in a thick haze appears to be quite unique to this part of the world and other developing nations where widespread open land burning is used by farmers for forest clearing. A thick haze secondary to forest fires that shrouded South East Asia occurred in 1994 and was associated with an increase in the emergency room attendance by children with acute asthma (3).

Children with chronic asthma of moderate severity are vulnerable to changes in the environment as unfavourable conditions like the haze can precipitate troublesome asthma symptoms. We studied a group of patients whose asthmatic symptoms were usually controlled with inhaled prophylaxis and despite on-going prophylactic treatment, 41% of them complained of increased asthma symptomatology during the haze. This is not a surprising finding as numerous studies have shown that poor quality air has a definite adverse effect on children with chronic asthma causing an increase in asthma symptomatology (4, 5, 6), hospitalisation rate (7,8) and emergency room attendance for acute asthma (9, 10). It has been shown that a transient deterioration in the pulmonary function occurs in children with increasing levels of air pollutants and that children with bronchial asthma are most at risk to the detrimental effect of these unfavourable environmental changes (11,12,13). More than three quarters of children aged 7 years and above with increased asthma symptomatology had a decline in their PEFR measurements. Fifty nine percent of them had a 15% or more reduction of their usual PEFR measurement. Interestingly, 57% of children aged 7 years and above with no increased asthma symptomatology also showed a decline in their PEFR measurements during the haze. This suggests that despite being symptom free, the poor air quality during this time did have a detrimental effect in this group of children. Although we expect that children who have a decline in their PEFR measurements to also complain of increased asthma symptomatology, a deterioration in the pulmonary function of these children especially a fall in the PEFR measurement does not always mirror an increase in asthmatic symptoms (14).

Children with moderately severe chronic asthma who attend our paediatric asthma clinic usually first receive inhaled mast cell stabiliser for prophylaxis followed by inhaled steroids if response to the former is not satisfactory. It was interesting to find that there was a trend for children who receive inhaled steroids instead of inhaled mast cell stabiliser to be less likely to experience increased asthma symptomatology although it did not reach statistical significance. This observation may suggest that the group of children on inhaled mast cell stabiliser with increased asthma symptomatology could benefit from a change to inhaled steroids for prophylaxis. The effect of the haze on children with chronic asthma also caused changes in lifestyle with limitation of outdoor activities and the use of an uncomfortable facial mask. These steps taken voluntarily by the child or imposed upon them by their parents are futile attempts at decreasing exposure to the haze.

The long term effects of the haze on the young child is just as important as the acute effects of the haze on the health of children. There is now increasing circumstantial

evidence to implicate air pollution in the pathogenesis of reactive airway disease in genetically predisposed children (15, 16, 17). Children who are continually exposed to poor quality air also show chronically depressed lung function studies that may be clinically important (18). These observations therefore suggest that the haze experienced in the Klang Valley in 1997 may have had a detrimental effect on the health of normal children that could manifest later in life.

The haze that plagued most parts of the country in late 1997 provides an insight into the tremendous impact the environment has on the health of children especially those with chronic respiratory disorders like asthma. The long term consequences of breathing polluted air in children whose lungs are growing cannot be ignored. Perhaps, the most important lesson learnt from the haze in 1997 is that keeping the environment healthy is just as, if not more important as keeping children healthy.

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