

# **Type of Fuel Consumed and Frequency of Lorry Passing Associated with Allergic Rhinitis and Asthma Symptoms in Children**

**\* M Karimi<sup>1</sup>, MH Ehrampoush<sup>2</sup>, M Mirzaei<sup>3</sup>, MH Ahmadi<sup>4</sup>**

<sup>1</sup> Dept. of Paediatrics, School of Medicine; <sup>2</sup> Dept. of Environmental Health;

<sup>3</sup> Health Center of Yazd Province;

<sup>4</sup> Dept. of Statistic & Epidemiology, School of Health, Shahid Sadoughi University Of Medical Sciences, Yazd, Iran

(First received 16 June 2005; accepted in revised form 11 October 2005)

## **ABSTRACT**

Allergic diseases are prevalent in children and their prevalence and severity are different in dissimilar areas of the world. Many studies have been carried out regarding the inspection of the causative environmental factors such as air, foods and environmental allergens. In this study, using the ISAAC standardized method, the relation between asthma and allergic rhinitis symptoms with the kind of fuel consumed at homes and the frequency of lorry passing through the streets next to the houses in 3000 children aged 6-7 years and 3000 children 13-14 years was investigated. The results indicated that in the children aged 6-7 years, the prevalence of asthma and allergic rhinitis had a meaningful relation with the type of fuel consumed at homes ( $P < 0.05$ ), so that the less pollutant fuel resulted in less symptoms. The evidence suggested that in both age group, when there was lorry passing all day long, there were more wheezing and allergic rhinitis symptoms, and the difference was meaningful regarding allergic rhinitis ( $P < 0.05$ ). The study reveals that indoor and outdoor air pollution is associated with increase in the prevalence of allergic diseases in children. Therefore, it seems that these types of air pollution can be a cause of increase of the allergic cases in childhood.

**Keywords:** *Asthma, Allergic rhinitis, Air pollution, Iran*

## **INTRODUCTION**

Asthma is the chronic inflammation of the lung ducts resulting in the obstructive attacks of air-flow and is one of the most prevalent diseases of children. Increasing the reaction of airways because of irritation, based on genetic background along with the environmental factors often justify the childhood asthma.

In the well-off societies, 20-40% of the children suffer from allergic rhinitis, which is diagnosed mostly in 6 year old children but its most preva-

lence is at the end of childhood. Some studies have indicated that the prevalence of these two diseases is increasing in different parts of the world. For example, the prevalence of asthma in two surveys in American children less than 18 years was increased from 3.1% in 1981 to 4.3% in 1988, regarded as meaningful (Weitzman et al., 1992).

Also during the last 40 years, the prevalence of allergic rhinitis in industrial areas has increased highly but in non-developed countries and rural societies, it has increased only to some extent. In Scottish children, the prevalence of hay fever has increased from 3.2% in 1964 to 12.7 % in 1994 (Ninan and Russell, 1992)

\*Corresponding author: Tel: +98 351 7247074, Fax: +98 351 7249898, E-mail: mehrankarimi1@hotmail.com

One of the most effective factors causing this increase has been indoor and outdoor air pollutants such as consuming fuel for heating or cooking, aerosol resulting from vehicles fuel and the smoke of the factories.

Increasing the irritants of airways such as sulphur dioxide and nitrogen dioxide and the particles resulting from diesel motors, leads to local inflammation of airways and allergic reactions. The aim of this study was to determine the association of the type of fuel consumed and the frequency of lorry passing near the houses with the prevalence of asthma and allergic rhinitis symptoms.

## MATERIALS AND METHODS

The study was performed by analytic cross-sectional method in 6-7 (Group 1) and 13-14 (Group 2) y old children in Yazd province during 2002-2004. The selection of the subjects was based on cluster sampling and each school was taken as a cluster. Sample size was accounted by  $P=4\%$  (prevalence of asthma),  $\alpha=0.05$  and  $d=0.01$ ; was 3000 in each group.

The indoor and outdoor air pollutants were among the inspected variables. The status of the indoor pollution was evaluated by determining the kind of fuel consuming and out door pollution status by determining the frequency of lorry passage near the houses.

The questionnaire was designed based on ISAAC (International Study of Asthma and Allergies in Childhood) study, which, after assembling and translating, the validity and reliability of the questionnaire was tested.

The data was entered into Epi6 software and then after being controlled was translated into SPSS 11.5 software. The results were analyzed using Chi-Square, Fisher-Exact, and Anova tests.

## RESULTS

Among the older age group, 3151 answered the questions related to rhinitis and 3127 related to

wheezing. This number in group 1 was respectively 2736 and 2740 (Table 1, 2).

The prevalence of wheezing and rhinitis symptoms in the younger age group who had gas oil or oil consuming equipments, was 11.8% and 16.7%, respectively and those who had gas consuming equipments was 8.7% and 13.1%, in that order and the differences was meaningful ( $P=0.014$ ) (Table 3).

In the older age group where there was lorry passing all day long, the prevalence of allergic rhinitis was 50.1%, which was higher than the cases when there was no lorry passage ( $P=0.000$ ) (Table 4).

There was a significant relation between the fuel consumed and the prevalence of asthma and allergic rhinitis symptoms in the younger age group after taking out the confounding factor of parent's cigarette smoking. (Mantel-Hanzel  $P=0.014$  [Asthma] and  $P=0.021$  [Rhinitis]). But this relation was not meaningful in the older age group (Mantel-Hanzel  $P=0.063$  [Asthma] and  $P=0.397$  [Rhinitis]).

The prevalence of wheezing from the birth time up to the time of investigation in group one was 10.9% while in the second was 20.3%. In both groups, the prevalence of wheezing in boys was more than in girls and the difference were meaningful but the difference was not meaningful on allergic rhinitis (Table 1, 2). Also the prevalence of asthma in second group was more than the first ( $P=0.000$ ) (Table 1).

**Table 1:** Wheezing from the birth time up to the time of investigation in two age groups based on sex

Age group (yr)	Sex	No.	Wheezing		P
			number	percent	
6-7	Boy	1492	193	12.9	0.000
	Girl	1248	105	8.4	
	Total	2740	298	10.9	
13-14	Boy	1437	317	22.1	0.027
	Girl	1690	319	18.9	
	Total	3127	636	20.3	

**Table 2:** Allergic rhinitis from the birth time up to the time of investigation in two age groups based on sex

Age group (yr)	Sex	No.	Allergic rhinitis symptoms		<i>P</i>
			number	percent	
6-7	Boy	1486	247	16.6	0.087
	Girl	1250	178	14.2	
	Total	2736	425	15.5	
13-14	Boy	1430	606	42.4	0.701
	Girl	1721	741	43.1	
	Total	3151	1347	42.7	

**Table 3:** Prevalence of asthma and allergic rhinitis symptoms based on the type of consuming fuel in the both age groups

Age group (yr)	Type of fuel	Wheezing			Rhinitis		
		Number	Positive case	%	Number	Positive case	%
6-7	Gas or Electricity	916	80	8.7	915	120	13.1
	Wood, oil, gas oil	1810	214	11.8	1808	302	16.7
	<i>P</i> -value		0.014			0.014	
13-14	Gas or Electricity	1460	319	21.8	1471	618	42
	Wood, oil, gas oil	1608	306	19	1621	708	43.7
	<i>P</i> -value		0.053			0.35	

**Table 4:** Prevalence of asthma and allergic rhinitis symptoms based on frequency of lorry passing through the street next to the houses in both age groups

Age group (yr)	Lorry passing	Wheeze				Allergic Rhinitis ever			
		Total	Positive cases	%	<i>P</i> value	Total	Positive cases	%	<i>P</i> value
6-7	Never	440	40	9.1	0.257	439	54	12.3	0.031
	Seldom	1072	126	11.8		1068	152	14.2	
	Often	763	74	9.7		765	135	17.6	
	Almost	413	50	12.1		414	73	17.6	
13-14	Never	355	73	20.6	0.073	350	142	40.6	0.000
	Seldom	1259	229	18.2		1269	491	38.7	
	Often	1011	225	22.3		1021	458	44.9	
	Almost	457	102	22.3		463	232	50.1	

## DISCUSSION

In our study, the indoor air pollution index was related to the type of consuming fuel to heat the house (oil, gas, gas oil) and the outdoor air pollution index was related to the frequency of lorry passage near the subjects' living place.

The results show that the prevalence of wheezing in cases of group one who lived in the houses heated by wood, coal, oil or gas oil was more than who did not. Regarding rhinitis, this difference in this group was meaningful in such a way that the rhinitis symptoms in the children living in the houses heated by gas or electricity were less than the other group.

In a study conducted on English children aged 12-14 yr, there was a weak relation between using gas to cook the food and pulmonary symptoms (Burr et al., 1999). However, the researchers concluded that the steam resulting from unusual fuels might have undesirable effects, which are matched with the results of our study.

Another study showed that there was a strong relation between cooking food by gas cookers and decrease in PEFR (Peak Expiratory Flow Rate) in women (Ng et al., 2001). In addition, the repeated cooking during last 2 weeks had a direct relation with the rate of contact with NO<sub>2</sub>, leading to an increase in taking bronchodilators drugs.

In a study, 148 children aged 7-14 yr, were inspected the respiratory symptoms in cases of contact with NO<sub>2</sub> at home. The respiratory symptoms in the children exposed to gas consuming equipments were more prevalent (Maria et al., 1998). This was more in atopic children but the difference was not meaningful. It should also be mentioned that even after considering NO<sub>2</sub> level, the pulmonary symptoms were more prevalent in the children having contact with these equipments.

Although in our study the level of indoor NO<sub>2</sub> was not evaluated, comparison of the aforementioned studies with that of our own indi-

cates that indoor air pollution is associated with an increase of childhood respiratory symptoms.

In another study carried out in London, a relation was found between the air pollutants and the consultation done with the general practitioners related to allergic rhinitis (Hajat et al., 2002). When sulphur dioxide (SO<sub>2</sub>) (13-31 Microgram/m<sup>3</sup>) and ozone (O<sub>3</sub>) (6-9 pbb) increased, the consultations also increased meaningfully.

In addition, in our study, there was a relation between the prevalence of rhinitis symptoms and the frequency of lorry passing through the streets next to the houses, but after omitting the confounding factor of parent's cigarette smoking the relation was not significant.

Kramer et al., (2000) evaluated atopy by skin test and air pollution by measuring NO<sub>2</sub> and concluded that the air pollution from traffic increased the prevalence of atopy, allergic symptoms and related diseases

Shima and colleagues (2000) in a study in Japan reported that the prevalence of bronchitis, asthma and wheezing increased in the girls when NO<sub>2</sub> concentration heightened in the house. In addition, the prevalence of asthma increased when NO<sub>2</sub> was higher outside the house. It seems that the girls were more sensitive to the household pollutants. This study does not accord with our results because in our study, the prevalence of asthma symptoms in the boys was higher in both age group. This is in line with the results of many other researches. For example Bazdevi and colleagues (2001) concluded that in the age group of 6-7 yr, the prevalence of asthma in the boys was higher than the girls (12.5% and 8%,  $P < 0.001$ ), and in those aged 13-14 yr, the prevalence in the boys was higher but the difference was not meaningful.

In our study, the prevalence of asthma and allergic rhinitis symptoms in the older age group was more and this might be due to longer duration of contact with the environmental allergens such as air pollutants.

## ACKNOWLEDGEMENTS

The authors thank Mr Rokooei for help in this study, Mrs Mobin & Mrs Rahim for their work. Also we gratefully acknowledge financial support for this study from deputy for research of Shahid Sadoughi Medical Science University, Iran.

## REFERENCES

- Bazdawi MSR, Omar ASR, Asya AR, Lyla GJ, Ali JM (2001). Prevalence and severity of bronchial asthma. *SQU J Sci Research: Med Sci*, 21-7.
- Burr ML, Anderson HR, Austin JB, Harkins LS, Kaur B, Srrachan DP, Warner J (1999). Respiratory symptoms and home environment in children. *Thorax*, 54(1): 27-32.
- Garrett MH, Hooper MA, Hooper BM, Abramson MJ (1998). Respiratory Symptoms in Children and Indoor Exposure to Nitrogen Dioxide and Gas Stoves. *Am J Respir Crit Care Med*, 158(3): 891-95.
- Hajat S, Haines A, Atkinson RW, Bremner SA, Anderson HR, Emberlin J (2002). Association between Air Pollution and Daily Consultations with General Practitioners for Allergic Rhinitis in London, United Kingdom. *Am J Epidemiol*, 153(7): 704-14.
- Kramer U, Koch T, Ranft U, Ring J, Behrendt H (2000). Traffic-related air pollution is associated with atopy in children living in urban areas. *Epidemiol*, 11(1): 64-70.
- Ninan TK, Russell G (1992). Respiratory symptoms and atopy in Aberdeen school children evidence from two survey 25 years apart. *BMJ*, 304: 873-75
- Ng TP, Seet CSR, Tan WC, Foo SC (2001). Nitrogen dioxide exposure from domestic gas cooking and airway response in asthmatic women. *Thorax*, 56: 596-601.
- Shima M, Adachi M (2000). Effect of outdoor and indoor nitrogen dioxide on respiratory symptoms in schoolchildren. *Int J Epidemiol*, 29: 862-70.
- Weitzman M, Gortmarker SL, Sobol AM, Perrin JM (1992). Recent trends in the prevalence and severity of childhood asthma. *JAMA*, 268: 2673-77.