AIR PARTICULATE MATTER (PM) CONCENTRATION IN RESITA A MAJOR DANGER FOR CHILDREN'S RESPIRATORY SYSTEM

A Preda[1], I Sabau[2]
[1]Reşita County Hospital
[2]I[st] Pediatric Clinic - Clinical Hospital for Children „Louis Turcanu" Timisoara

Abstract

The paper work presents a group of school children with respiratory system diseases caused by air polution. The causes of the growing number of respiratory diseases are pointed out by the high number of hospital admissions and the increasing number of visits to the family doctors.

Key words: air pollution, breath, schoolchildren

Introduction:

According to the O.M.S. (the World Health Organization), "There is air pollution, when the presence of a foreign substance or a significant variation of the proportion of its components, are likely to cause a harmful effect on the activity and good being of the people."[1] We have decided to assess the causes of the growing number of respiratory diseases also pointed out by the high number of hospital admissions and the increasing number of visits to the family doctors[2], and we drew the conclusion that the main cause is air pollution with PM 10 (particulate matter less than 10 microns).Its concentration is over the maximum limit of 0,150 mg/cubic metre. The information was taken from the Ministry of Environment's site.

Aims:

a) Establishing the degree of modification of respiratory functions during 1 year (2004- 2005) using spirometry.

b) In this article we want to analyze the respiratory system diseases in children, a group of 300 school children was taken.

Material and Methods:

We studied a group of 300 school children aged 7-18, 150 were taken from a polluted area where they live and study, this group was considered "exposed"(E+). The other group "not exposed" (E-) lives in a less polluted area. Children from E+ study at two different schools nearby the main pollution source CSR (Combinatul Siderurgic Resita), and the second group (E-) study at two schools situated in a remote area from CSR.

We statistically analyzed the data obtained by means of questionnaires from children, teachers and parents.

The group of children was clinically examined.

We measured twice a year the respiratory functions (RF) using spirometry :

- VC (current volume),
- FVC (forced vital capacity)
- FEV1(forced expiratory volume at one second)
- PEF (peak respiratory flow).

Results:

We first noticed significant differences of RF. Children from E+ had lower RF than children from E-. We measured the parameters mentioned above and the results of VC test are presented in table 1.

Table 1.

VC								
		<50	**50-59**	**60-69**	**70-79**	**80-89**	**>=90**	**tot**
	m	24	17	9	6	3	1	60
E+	**f**	21	27	18	16	7	1	90
	tot	45	44	27	22	10	2	150
	m	0	4	20	18	11	7	60
E-	**f**	0	9	26	26	22	7	90
	tot	0	13	46	44	33	14	150
Total		**45**	**57**	**73**	**66**	**43**	**16**	**300**

We can easily see that:

- in the less polluted area there is not a single child who has VC < 50,
- in the polluted area only two children have VC >90,
- the majority of children from the polluted area have VC values between < 50 and 60.

We measured the second parameter FVC and the results are presented in table 2.

Table 2.

FVC								
		<50	50-59	60-69	70-79	80-89	>=90	tot
	m	37	11	5	4	2	1	60
E+	**f**	46	23	10	5	3	3	90
	tot	83	34	15	9	5	4	150
	m	0	9	16	19	11	5	60
E-	**f**	3	12	31	26	11	7	90
	tot	3	21	47	45	22	12	150
Total		**86**	**55**	**62**	**54**	**27**	**16**	**300**

- in the polluted area the number of children who have FVC < 50 represents 55,33% from the total number of 150,
- in the polluted area the number of children who have FVC >90 represents only 2,66% from the total number of 150 (4 children).

Fev1 values are presented in table 3 and they also underline the significant differences between the high number of children with respiratory diseases from the polluted area and the low number of children with respiratory diseases from the less polluted area. In the polluted area 70% of children have FEV1 values between < 50 si 60.

We computed the Tiffeneau coefficient [3],[4],[5] using the formula FEV1* VC/ 100 and we found out that 32 children have a low coefficient and they are respiratory monitored : IgE, hemoglobin, pulmonary radiography, the research being in development.

Table 3.

Fev								
		<50	50-59	60-69	70-79	80-89	>=90	tot
	m	26	16	9	4	4	1	60
E+	**f**	30	32	18	3	2	5	90
	tot	56	48	27	7	6	6	150
	m	4	12	16	14	7	7	60
E+	**f**	9	21	25	15	9	11	90
	tot	13	33	41	29	16	18	150
Total		**69**	**81**	**68**	**36**	**22**	**24**	**300**

Another studied parameter is PEF.

The results obtained after the statistic analyze are shown in table 4.

Table 4.

PEF								
		<50	50-59	60-69	70-79	80-89	>=90	tot
	m	29	9	11	4	4	3	60
E+	**f**	49	14	18	5	3	1	90
	tot	78	23	29	9	7	4	150
	m	10	6	10	12	14	8	60
E-	**f**	11	16	24	22	8	9	90
	tot	21	22	34	34	22	17	150
Total		**99**	**45**	**63**	**43**	**29**	**21**	**300**

- in the less polluted area 71,33% of children have PEF >60.
- in the polluted area 32% of children have PEF >60.

Discussions

A very interesting aspect which is easily noticed is the fact that in the polluted area 30% of school children have VC < 50, while in the less polluted area nobody has VC < 50.

In E+ (polluted area) 12% of children have FVC>70, a very low percentage, while in E- (less polluted area) 53% of children have FVC>70, four times higher than the percentage of children from E+.

In E+ 10% of girls have FEV1>70, while in E- 44% of girls have FEV1>70, again four times higher.

Regarding PEF, a very important difference has been observed. The number of school children from the less polluted area with PEF >60 is twice higher than the number of school children from the polluted area.

Conclusions

What has undoubtedly been proven after the statistical results is that the proportion of school children with modified RF is higher in the polluted area than in the less polluted area and that the number of girls with low RF is higher than the number of boys, and one cause of this matter can be the fact that boys live a more physically active life and spend their holidays in less polluted areas. Another cause can be the fact that girls have more pets than boys. In general, the entire group of 300 children have modified RF.

A very important cause that leads to modified RF in school children is air pollution, high levels of **particulate** matter. Children are among the most sensitive, and this fact is demonstrated by the high number of hospital admissions for respiratory diseases. The number of hospital admissions for some respiratory diseases during four years (2001- 2004) is presented in table 5.

Table 5.

Disease/children 5-14 years	2001	2002	2003	2004
Sinusitis	4	0	5	12
Laryngitis and trachea illness	7	59	31	72
Asthma	54	51	52	117
Bronchitis	67	137	50	128

The growing number of visits to the family doctor and hospital admissions for respiratory diseses in 2004 dovetails with the intensive activity of CSR, and also with the increasind level of air pollution (over 52 tests exceeding the maximum concentration limit in 2004, while in the past years there were merely 10, 20 tests exceeding the limit).

Our study aims to point out the negative impact of air pollution on children's health from Resita.

References:

1. Petrescu C *Unele aspecte privind poluarea aerului si influența asupra populatiei in Turnu Severin*, Ed. Solness, 2000
2. Preda A *Infuența poluării atmosferice asupra aparatului respirator al şcolarilor din Resita*, (in press), 2005
3. Popescu V *Patologia aparatului respirator la copil*, Ed. Teora, 1999
4. Iordăchescu F *Pediatrie Vol.I-II*, Ed. Național, 1998
5. Georgescu A *Compendiu de pediatrie*, Ed. BIC ALL, 2001

Correspondence to:

Adrian Preda
G.A.Petculescu Street, bl.1, sc.2, ap.6
Resita 320060, Romania
Phone: +40745098409
E-mail: predaad@yahoo.com