

# Environmental pollution and parental smoking influence on the appearance of pseudocroup in children

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## Abstract

**Objective:** The aim of the study was to assess the effect of environmental pollution and parental tobacco smoking on the occurrence of pseudocroup in children.

**Material and methods:** A questionnaire-study was performed in 345 children with pseudocroup admitted to the ENT Dept between 1997–2007. 116 children had smoking and 229 had non-smoking parents. Both groups were compared with respect to environmental pollution (urban, rural), parents' level of education, household crowding and breast feeding period. The prevalence of upper and lower respiratory tract infections and the presence of allergy were also analysed. The results were compared to those performed in the ENT Dept in 1977–1986.

**Results:** In the group of rural children, 21 were children with pseudocroup from smoking parents and 36 children of non-smoking parents. Among children living in the urban areas there were 95 from smoking parents and 193 from non-smoking parents. Both non-smoking parents presented a large group of people with a higher level of education, and in the smoking families both parents presented a lower level of education. Analysis of the breast feeding period revealed that it was the longest (up to 9 months) in non-smoking mothers – 21% of the group, and only in 4.3% of smoking mothers.

## Key words

environmental pollution, parental smoking, pseudocroup in children

## INTRODUCTION

According to Rosekrans, the average age at infection is 18 months and is more common in boys. Most cases of pseudocroup, which is caused by viruses, occur in the autumn and early winter (October – November) or in the early spring (March – April). The most common are Parainfluenza viruses, being responsible for 74.2 % cases. The type 1 Parainfluenza virus is causes about 65% of pseudocroup cases, type 3 – 23.5% cases, and the type 2 – 11.5% cases. Bacterial infection usually occurs secondarily [1, 2].

The anatomic hallmark of pseudocroup is narrowing of the subglottic region of the trachea as a result of mucosal oedema and swelling. In severe cases, the subglottic space can be narrowed to a diameter of 1 – 2 mm. There are certain factors that predispose to such airway narrowing. These are: anatomic stenosis of the child's airway, and hyperactive airways – aggravated by atopy or gastroesophageal reflux, and acquired narrowing of the airways (for example, post-intubation scarring) [1]. There are studies presenting the influence of environmental factors (e.g. SO<sub>2</sub> and CO) that can increase the incidence of recurrent respiratory tract infections in children [3, 4]. Many authors link parental

smoking with the atopic state and exacerbating asthma in children [5]. According to American studies, the tobacco smoke affects about 43% of children between 2 – 11 years of age, and is a cause of sudden infant death syndrome, low birth weight, bronchial asthma, otitis media, pneumonia and upper respiratory tract infections [6]. Swedish studies in a group of 5,000 infants revealed that maternal smoking is a risk factor of bronchitis in infants [7]. There is also the strong role of air pollution on the incidence of respiratory tract infections in children. Urbanization, with high levels of vehicle emissions and westernized lifestyle, in comparison to living in rural environment or in small villages, are connected to the rising frequency of pseudocroup in children observed in most industrialized cities of Poland [8].

## MATERIALS AND METHODS

The population under study consisted of 345 children with severe pseudocroup who were admitted to the Paediatric ENT Department between 1997–2007, and on whom a questionnaire study was performed. 155 children had smoking and 190 had non-smoking parents. Both groups were compared with respect to environmental pollution (urban, rural), parents level of education (higher education – post-secondary education, university; secondary education – gymnasium, secondary schools; primary/basic education – primary school, basic vocational education), household

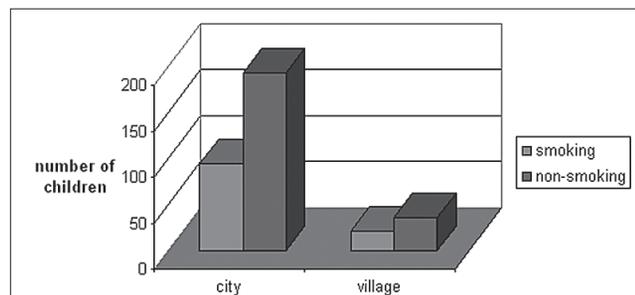
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conditions (good, medium, bad), household crowding (1, 2, 3 or 4 children), and breast feeding period (artificial alimantation, breast feeding up to 3, 6, 9 and 12 months of age). The prevalence of upper and lower respiratory tract infections and presence of allergy were also analyzed. The results were compared with those performed in the ENT Department in 1977 – 1986 [4].

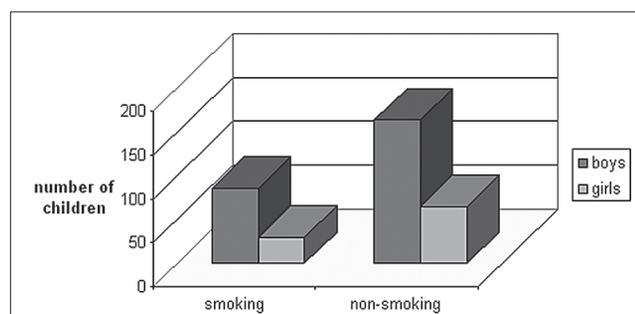
## RESULTS

288 children with pseudocroup lived in a big city (83.6% of group) and 57 lived in a village (16.4%) (Fig.1).



**Figure 1.** Incidence of pseudocroup in the city and village in smoking and non-smoking families.

In the group of children from the village, there were 21 children (14 boys and 7 girls) with pseudocroup from smoking parents and 36 children (21 boys and 15 girls) of non-smoking parents (Tab. 1). Among children living in the urban areas there were 95 (72 boys and 23 girls) from smoking parents and 193 (143 boys and 50 girls) from non-smoking parents (Fig. 2).



**Figure 2.** Appearance of pseudocroup in boys and girls from smoking and non-smoking parents.

There was significant difference in the level of education between smoking and non-smoking parents. Both non-smoking parents presented a large group of people with a higher level of education (35.8% of mothers and 31.4% of fathers), and in the smoking families both parents presented a lower level of education (Tab. 2).

Comparison of household conditions and household crowding did not reveal any significant differences between smoking and non-smoking families. Generally, non-smoking families provided better living conditions for their children. Analysis of the breast feeding period was performed among the non-smoking and smoking mothers. The data revealed that the breast feeding period was the longest (up to 9 months) in non-smoking mothers – 21% of the group, and only in 4.3% of the smoking mothers (Fig. 3).

**Table 1.** Parents level of education, household conditions, household crowding and breast feeding period in smoking and non-smoking families of children with pseudocroup.

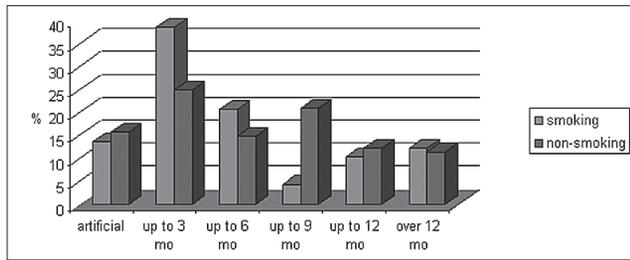
	No. of children N=345	Smoking Families N=116	Non-smoking Families N=229
<b>Level of education</b>			
		<b>Smoking</b>	<b>Non-smoking</b>
<b>Mother</b>	Higher education	10 (8.6%)	82 (35.8%)
	Secondary education	90 (77.6%)	143 (62.4%)
	Primary education	16 (13.8%)	4 (1.8%)
<b>Father</b>	Higher education	9 (7.8%)	72 (31.4%)
	Secondary education	96 (82.7%)	142 (62%)
	Primary education	11 (9.5%)	15 (6.5%)
<b>Household conditions</b>			
Good		21 (18.1%)	58 (25.3%)
Medium		85 (73.3%)	156 (68.1%)
Bad		10 (8.6%)	15 (6.6%)
<b>Household crowding</b>			
4 children		3 (2.5%)	1 (0.4%)
3 children		8 (6.9%)	28 (12.2%)
2 children		52 (44.8%)	99 (43.2%)
1 child		55 (47.4%)	101 (44.2%)
<b>Breast feeding period</b>			
<b>Artificial alimantation</b>		16 (13.7%)	36 (15.7%)
Up to 3 mo		45 (38.7%)	57 (24.9%)
Up to 6 mo		24 (20.7%)	34 (14.8%)
Up to 9 mo		5 (4.3%)	48 (21%)
Up to 12 mo		12 (10.3%)	28 (12.2%)
Over 12 mo		14 (12.3%)	26 (11.4%)
<b>Incidence of upper and lower respiratory tract infections</b>			
Boys		57 (66.3%)	78 (47.6%)
Girls		18 (60%)	36 (55.4%)

**Table 2.** Number of girls and boys living in a city or village, from smoking or non-smoking families, with or without allergic background.

288 living in a city	193 non-smoking families	143 boys (75 allergic)
	95 smoking families	50 girls (21 allergic)
57 living in a village	36 non-smoking families	72 boys (35 allergic)
	21 smoking families	23 girls (11 allergic)
345 children		21 boys (10 allergic)
		15 girls (6 allergic)
		14 boys (10 allergic)
		7 girls (3 allergic)

The incidence of upper respiratory tract infections was higher in boys from smoking parents. According to the questionnaire, the presence of allergy did not significantly increase the appearance of respiratory tract infections in both groups of smoking and non-smoking families.

Finally, comparison with the earlier results of the analysis performed in 1977 – 1986 revealed only a significant decrease of smoking in Polish families, both from the cities and villages. The smoking to non-smoking families ratio in 1977 – 1986 was 3:1, and in 1997 – 2007 – 1.9:1. In 1977 – 1986,



**Figure 3.** Breast feeding period in smoking and non-smoking mothers of children with pseudocroup.

11.2% of the patients lived in the countryside and 89.8% in the city. Nowadays, 16.5% live in villages and 83.5% in cities.

## DISCUSSION

The presented study does not support the theory that parental cigarette smoking increases the incidence of pseudocroup in children. According to Salzman, there is also no relationship between passive smoking and croup in children [5]. Pruikkonen even found that smoking by both parents was associated with a decreased occurrence of croup and recurrent croup [9]. However, there are also studies which link parental smoking with the atopic state of children, croup, exacerbation of asthma, and other respiratory infections in children [9, 10]. It has also been proved that the relationship between parental smoking and respiratory symptoms is causal, and the raised risk in households where the father, but not the mother, smokes, argues for a postnatal effect [10, 11, 12].

In the non-smoking families there was a higher level of education and parents provided their children with better housing conditions. Johansson et al. also proved that indoor smoking was connected with the parents level of education, which was also the most prevalent among single parent families [13]. Jurado et al. underlined a greater influence of exposure to maternal smoking than postnatal paternal smoking on the development of respiratory symptoms in children [14].

The presented study reveals a strong role of air pollution in the appearance of pseudocroup. Children living in big cities (with high levels of vehicle emission) suffer more often from subglottic laryngitis than children from small villages. In both groups (from the village and from the city), boys were affected by pseudocroup more frequently than girls. Jaklin

et al. also demonstrated a significant increase in morbidity to severe air pollution, as well as to the existence of continental air mass [8].

Finally, the presented data proves that in non-smoking mothers the breast feeding period was longer than in smoking mothers, which could affect the incidence of pseudocroup. It is well established that breastfeeding is associated with reduced incidence and severity of respiratory tract diseases [15].

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