

Risk Factors for Acute Respiratory Tract Infections in Children

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ABSTRACT

Acute respiratory tract infections (ARTI) are the most common cause of childhood morbidity and an important public health problem. The aim of this study was to identify the significant risk factors for ARTI in children. The study took place in Ivankovo which is a rural area of Eastern Slavonia and with small socio-economic differences. The study population were 159 children who were 3–5 years old at the time of the study, and who were registered at doctor's office Ivankovo. The study was conducted retrospectively through a questionnaire from January 2008 to December 2008. The risk factors studied were the gender, breastfeeding history, any atopic manifestation in the form of atopic eczema, rhinoconjunctivitis and/or asthma, the size of the family, parents smoking habits and main form of childcare. The number of ARTI requiring the consultation of a doctor throughout 2007 were measured; and whether ARTI had been treated with antibiotic or there were recommendation for symptomatic treatment only. Results of this research show that the risk factor for consulting a doctor because of ARTI in children was passive exposure to cigarette-smoke. For receiving antibiotics because of ARTI in children, the risk factors were passive exposure to cigarette-smoke and atopic manifestation. By giving the available evidence, parents must be told that ceasing smoking offers a significant opportunity to reduce the risk of ARTI in their children.

Key words: children, acute respiratory infections, risk factors

Introduction

Acute respiratory tract infections (ARTI) are the most common cause of childhood morbidity and an important public health problem with approximately 20% of all doctor consultations in the western world¹. Various interventions have been done to reduce ARTI in children, and one of the important is the identification the risk factors. There were many studies trying to identify the risk factors for ARTI in children and most of them were conducted in infants and children aged up to three years. The factors mostly investigated were gender, the age of child, breastfeeding history, environmental tobacco smoke exposure, form of childcare and number of siblings.

Most of them found that the smallest children have the highest number of ARTI with a peak at the age of two^{2,3}. Also, an attending day-care centers was found to be an important risk factor for ARTI in children⁴⁻⁶. The occurrences of ARTI are reduced in children who have

been breastfed, although this is more relevant in early childhood⁷. Arifeen et al. obtained that partial or no breastfeeding in the first few months of life was associated with higher risk of death attributable to ARTI⁸. Passive smoking has been found to be associated with a large number of childhood disorders⁹⁻¹². Unfortunately, child could be exposed to cigarette smoke even intrauterine if mother smokes during pregnancy, which leads to higher risk of having low-birth length and low-birth weight baby¹³. Most attention has been paid to the effects of passive smoking on the respiratory tract. It has been demonstrated that passive exposure to cigarette smoke is a significant risk factor for respiratory tract infections and it increased the incidence of childhood asthma and bronchial hiper-responsiveness^{14,15}. The influence of mother's smoking habits seems to be the most important¹⁴, but it doesn't exclude additional effects of smoking habits of

the other family members. Jin et al. obtained that respiratory illness in children passive smokers are correlated with the number of smokers in the house and the quantity of cigarettes consumed in the presence of the children¹⁶. The importance of the occurrence of atopy is likewise uncertain as is the size of the family^{2,17}.

The aim of this study was to identify the significant risk factors for ARTI in children. The study took place in Ivankovo which is a rural area of Eastern Slavonia, with about 6000 citizens and with small socio-economic differences.

Subjects and Methods

The target populations were 177 children who were 3–5 years old at the time of the study, and who were registered at doctor's office Ivankovo. The study was conducted retrospectively through a questionnaire from January 2008 to December 2008. The questionnaires were distributed by mail to the parents of all 177 children. The parents filled out standardized questionnaire. There were questions about the gender; whether they were breastfed or not; any atopic manifestation in the form of atopic eczema, rhinoconjunctivitis and/or asthma; the size of the family; parents smoking habits; main form of childcare; the number of ARTI requiring the consultation of a doctor throughout 2007; whether ARTI had been treated with antibiotic or with symptomatic treatment only.

For the statistical analyses we used the SPSS (SPSS Inc. Chicago IL, USA). The odds ratio and 95% confidence interval (CI) were calculated to evaluate the presence of associations between examined variables. Values of $p < 0.05$ were considered statistically significant. Chi-squared test was used for univariate analysis to determine the significance of each separate factor for consulting a doctor because of ARTI; for receiving symptomatic treatment or receiving at least one antibiotic course. Then multivariate analysis was performed in the form of logistic regression models.

Results

Of the 177 children in the actual study population there were 18 (10%) children whose parents didn't return questionnaire. The participation rate was 90% i.e. 159/177 children, 73 (46%) girls and 86 (54%) boys. Most of the children (98%) were taken care at their homes, only 3 (2%) children attended child-care centre. There was a history of breastfeeding in 83% of the responses. 58 (36%) of children had some atopic manifestation in the form of atopic eczema, rhinoconjunctivitis and/or asthma. 103 (65%) of children had brother and/or sister, while 56 (35%) were the only child in the family. In 61% of the households the father and/or mother were smoker, while in 39% of the households were non-smokers. 150 (94%) children consulted a doctor because of ARTI on at least one occasion during 2007. 123 (82%) of them received at

TABLE 1
RISK FACTORS ANALYSIS FOR CONSULTING A DOCTOR BECAUSE OF ARTI

	Consulting doctor %		Univariate analysis			Multivariate analysis		
			OR	95% CI	p	OR	95% CI	p
Gender (m/f)	86/73	95/93	1.0731	0.2481–4.6413	0.9248	0.5091	0.1007–2.5744	0.8284
Breastfeeding (yes/no)	132/27	33/41	0.0000	0–0	0.9952	0.0000	0–0	0.1922
Atopic manifestation (yes/no)	58/101	97/93	2.2770	0.419–12.3735	0.3407	1.0814	0.1528–7.6531	0.3938
Siblings (yes/no)	103/56	95/93	1.0080	0.2307–4.4048	0.9915	2.7594	0.4755–16.0139	0.9215
Smoking parents (yes/no)	97/62	99/87	15.5240	1.7602–136.918	0.0135	16.9756	1.5753–182.9322	0.0027
Childcare (yes/no)	3/156	33/34	1.24×10 ⁻⁶	0–0	0.9986	0.0000	0–0	0.9602

TABLE 2
RISK FACTORS ANALYSIS FOR SYMPTOMATIC TREATMENT BECAUSE OF ARTI

	Symptomatic treatment %		Univariate analysis			Multivariate analysis		
			OR	95% CI	p	OR	95% CI	p
Gender (m/f)	86/73	71/68	0.9121	0.4557–1.8253	0.7948	0.9441	0.4244–2.1002	0.7866
Breastfeeding (yes/no)	132/27	68/78	0.7257	0.259–2.0336	0.5420	0.6484	0.2042–2.059	0.5824
Atopic manifestation (yes/no)	58/101	69/70	0.9051	0.4427–1.8503	0.7846	0.9898	0.43–2.2785	0.8096
Siblings (yes/no)	103/56	66/77	0.6534	0.3016–1.4155	0.2806	0.5561	0.2312–1.3372	0.2985
Smoking parents (yes/no)	97/62	68/73	0.8547	0.4074–1.7929	0.6778	1.0131	0.4322–2.3751	0.6858
Childcare (yes/no)	3/156	100/69	18.4×10 ⁻⁶	0–0	0.9947	0.0000	0–0	0.3647

TABLE 3
RISK FACTORS ANALYSIS FOR RECEIVING ANTIBIOTICS BECAUSE OF ARTI

	Receiving antibiotics %	Univariate analysis			Multivariate analysis			
		OR	95% CI	p	OR	95% CI	p	
Gender (m/f)	86/73	80/74	0.8274	0.3532–1.9384	0.6627	1.1429	0.4149–3.1481	0.7303
Breastfeeding (yes/no)	132/27	80/74	1.1393	0.3465–3.7458	0.8299	1.8519	0.3866–8.8713	0.8704
Atopic manifestation (yes/no)	58/101	88/74	3.6502	1.2774–10.4308	0.0156	3.3167	0.8945–12.2984	0.0121
Siblings (yes/no)	103/56	81/75	1.0325	0.4275–2.4938	0.9433	2.2413	0.6481–7.7513	0.9564
Smoking parents (yes/no)	97/62	85/69	2.9809	1.2598–7.0535	0.0129	1.6186	0.5002–5.2377	0.0110
Childcare (yes/no)	3/156	100/81	4.64×10 ⁻⁶	0–0	0.9935	0.0000	0–0	0.5408

least one course of antibiotics, while 111 (74%) of them received at least one course of symptomatic treatment.

Table 1, 2 and 3 present the results of the univariate and multivariate risk factors analyses. According to the univariate analysis the greatest importance for consulting a doctor because of ARTI was the children exposure to tobacco smoke at home (OR 15.52; 95%CI 1.76–136.92; $p=0.01$).

The risk factors of the greatest importance for antibiotic treatment were atopic manifestations (OR 3.65; 95% CI 1.28–10.43; $p=0.01$) and parental smoking (OR 2.98; 95% CI 1.26–7.05; $p=0.01$).

The factor that was shown by the multivariate analysis to be of the greatest importance for consulting a doctor because of the ARTI was the children exposure to tobacco smoke at home (OR 16.98; 95%CI 1.58–182.93; $p=0.003$). According to the multivariate analysis the risk factors of the greatest importance for receiving antibiotics because of ARTI were atopic manifestations (OR 3.32; 95%CI 0.89–12.30) and parental smoking (OR 1.62; 95% CI 0.05–5.24; $p=0.01$). We didn't identify any significant risk factor for symptomatic treatment (Table 1).

Discussion

The risk factor for consulting a doctor because of ARTI in children was passive exposure to cigarette smoke. For receiving antibiotics because of ARTI in children, the risk factors were passive exposure to cigarette smoke and atopic manifestation in the form of atopic eczema, rhinoconjunctivitis and/or asthma.

Passive smoking was a strong risk factor for both consulting a doctor because of ARTI and receiving antibiotics because of ARTI in children, confirming findings from other authors^{18–20}.

Catzimicael et al. found that children who were passively exposed to cigarette smoke had a higher risk for respiratory tract infections in comparison to children who lived in a cigarette smoke free environment²¹. The frequency of occurrence of disease symptoms in the respiratory system in children remains in significant relation with passive smoking²². Nilsson et al. found that children whose parents smoke have been prescribed antibiotics up to 24 percent more²³. Infants from smoking families have a higher incidence of ARTI requiring antibiotic treat-

ment than infants from non-smoking families²⁴. It is known that some components of cigarette smoke cause damage of mucocilliary clearance and the airway epithelium, disrupted phagocytises by weakening effects of alveolar macrophages and reduced the number of natural killer (NK) cells. In that way, exposure to cigarette smoke could induce inflammation and accelerate the colonization of pathogens in the respiratory tract. Also, the mechanism by which cigarette smoke could be related to respiratory infection in children passive-smokers may be through toxicity of low levels of certain toxins that are not easily detected by conventional methods²⁵.

The study shows that the children with atopic manifestations received antibiotics because of ARTI significantly more. Bohme et al. founds that the use of antibiotics for treatment respiratory infections were more frequent in children with atopic dermatitis²⁶. Patients with allergic rhinitis have been noted to have a high incidence of bacterial diseases such as otitis media and sinusitis²⁷. Rylander and Megevand found that allergy was a risk factor for respiratory infections in children aged 4–5 years²⁸. The mechanism by which atopic manifestations may be related to ARTI in children is not entirely clear, but may be through promotion of adherence of infection agents because of the inflammatory state of the mucosa in atopic disease.

Many studies showed that attending child-care centres is significant risk factor for ARTI in children^{28–30}. Unfortunately, only 3 of our participants were attending child-care centre, so we couldn't confirm these findings in our research.

The influence of breastfeeding on the incidence on respiratory infection disease after the cessation of breastfeeding is likewise uncertain. Although some authors found protective effect of breastfeeding due to protective influences on the immune system^{31–34}, we didn't confirm these findings in our research. Our findings are consistent with the studies by other authors, who found no significant association of breastfeeding with the appearance of respiratory infection disease after the cessation of breastfeeding^{4,35,36}. Further investigation is needed to determine the possible positive effect of prolonged breastfeeding on the subsequent occurrence of respiratory infections later in childhood. That will help us in promoting the prolonged breastfeeding.

Some limitations of our study should be mentioned. First, because the study was conducted retrospectively the information obtained in this study may be imprecise at the level of individuals, as parents were required to recall events over a 1 year period. Secondly, questionnaire data were used to measure exposure to examined potential risk factors, which could be less reliable compared with observational data.

In conclusion, the harmful effect of passive smoking on respiratory infection rate in children is approved in many articles and by this investigation, too. Smoking parents should be aware that their children may become ill as a result of exposure to second-hand smoke. By giving the available evidence, parents must be told that ceasing smoking offers a significant opportunity to reduce the risk of ARTI in their children.

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RIZIČNI FAKTORI ZA AKUTNE RESPIRATORNE INFEKCIJE U DJECE

SAŽETAK

Akutne respiratorne infekcije su najčešći uzrok pobola u djece i važan su javnozdravstveni problem. Cilj istraživanja bio je utvrditi značajne faktore rizika za akutne respiratorne infekcije kod djece. Studija je provedena u Ivankovu, ruralnoj sredini istočne Slavonije sa malim socio-ekonomskim razlikama. Ispitivanjem je obuhvaćeno 159 djece u dobi od 3–5 godina koja su bili pacijenti ambulante Ivankovo. Istraživanje je provedeno retrospektivno od siječnja do prosinca 2008. godine. Ispitivani faktori rizika bili su spol, dojenje, atopijske manifestacije u vidu atopijskog ekcema, rino-konjuktivitisa i/ili astme, veličina obitelji, pušačke navike roditelja i način čuvanja djeteta. Pratio se broj posjeta doktoru zbog akutne respiratorne infekcije tijekom 2007. godine, te da li su liječene simptomatskom terapijom ili antibioticima. Rezultati ovog istraživanja pokazuju da je rizični faktor za konzultaciju doktora zbog akutne respiratorne infekcije pasivna izloženost djeteta duhanskom dimu. Rizični faktori za primjenu antibiotika zbog akutne respiratorne infekcije su pasivna izloženost djeteta duhanskom dimu i atopija u djeteta. Uz dostupne znanstvene dokaze, roditelji bi trebali biti upoznati s činjenicom da s prestankom pušenja značajno smanjuju rizik za oboljevanje od akutnih respiratornih infekcija kod njihove djece.