

Parental environmental tobacco smoking and the prevalence of respiratory diseases in primary school children

Oana Cristina Arghir¹,
Elena Dantuş¹,
Ramona Stoicescu²,
Irina Baicu³, Stela
Halichidis¹, Camelia
Ciobotaru¹, Milena
Adina Man⁴, Simona
Claudia Cambrea¹

1. Faculty of Medicine, "Ovidius"
University of Constanța, Romania
2. Faculty of Pharmacy, "Ovidius"
University of Constanța, Romania
3. Medical Office of "Spiru Haret"
Primary School Medgidia, Constanța
County, Romania
4. Faculty of Medicine, UMF "Iuliu
Hatieganu", Cluj Napoca, Romania

Contact author:
Arghir Oana Cristina,
MD PhD, Senior lecturer
Faculty of Medicine, "Ovidius"
University Constanta, Romania
Clinical Pneumophysiology Hospital,
Constanta, Romania
e-mail: arghir_oana@yahoo.com

Abstract

Introduction. The inhaling tobacco smoke to which a child is exposed, in a home environmental area, could affect respiratory system.
Material and methods. The aim of the study consists in detecting the prevalence of respiratory diseases in home exposure to secondhand smoke among primary school children. A 6-month prospective case-control study based on questionnaire survey was carried out among school children of "Spiru Haret" Primary School, Medgidia, Romania, with absences for respiratory diseases, related to exposure to parental passive smoking, in their home environmental. 136 school children and their families informed, consented to complete the questionnaire and were surveyed for respiratory diseases and domestic environmental tobacco smoking, from the 1st of October, 2011 to the 31st March, 2012. The method consists in collecting data about any respiratory illness events, correlating them with the questionnaire - reports of parental smoking in home environmental.
Results. Participants were divided in 88 cases exposed to SHS (E) and 48 controls without exposure (NE). The most sick children with more than one episode of respiratory illness were among cases (n=61/88; 69.31% vs 19/48; 39.58%; OR=3.45; RR=1.62; $\chi^2=12.25$; $p<0.0008$). The most important source of parental passive smoking is the father (n= 67/88; 76.13%), being a single parent in most of the cases (n= 46/88; 57.95%). The prevalence of bronchial asthma was 0.34% in cases, being related with prenatal maternal smoking exposure (1.11%).
Conclusion. The prevalence of respiratory diseases is higher among children with environmental parental tobacco exposure, in particular, smoking father.
Keywords: home environmental tobacco smoke, school children, passive smoking, respiratory pathology

Rezumat

Fumatul pasiv intradomiciliar și prevalența afecțiunilor respiratorii în rândul copiilor școlari de la Școala Generală „Spiru Haret”, Medgidia
Introducere. Inhalarea pasivă a fumului de țigară de către copiii expuși în mediul ambiental al căminului părintesc poate induce afecțiuni respiratorii.
Material și metodă. Scopul studiului a constat în determinarea prevalenței afecțiunilor respiratorii în rândul copiilor școlari expuși intradomiciliar fumatului pasiv, de către părinți. Un studiu prospectiv de 6 luni, de tip caz-control, bazat pe chestionar, s-a derulat în Școala Generală „Spiru Haret” din Medgidia, județul Constanța, în perioada 1 octombrie 2011 - 31 martie 2012. Au participat 136 de elevi ai claselor I-IV ai căror părinți au acceptat atât completarea chestionarului, cât și includerea copiilor în studiu. Au fost înregistrate evenimentele legate de absenteismul școlar, diagnosticul afecțiunilor tractului respirator, datele referitoare la expunerea copiilor la fumatul pasiv intradomiciliar parental.
Rezultate. Participanții au fost divizați în 88 de cazuri expuse la fumatul pasiv (E) și 48 de copii fără expunere (NE). Printre copiii cu expunere intradomiciliară, s-a înregistrat un risc crescut de îmbolnăviri respiratorii (mai mult decât un episod de boală) (n=61/88; 69,31% vs. 19/48; 39,58%; OR=3,45; CI 95%; RR=1.62; $\chi^2=12,25$; $p<0,0008$). Cea mai importantă sursă de fumat pasiv parental este tatăl (n= 67/88; 76,13%), identificat ca singur fumător intradomiciliar în 57,95% din cazuri (n= 46/88). Prevalența astmului bronșic a fost de 0,34% în rândul cazurilor, fiind legată de expunerea prenatală maternală la fumat (1,11%).
Concluzie. Prevalența bolilor respiratorii este crescută în rândul copiilor școlari ai ciclului primar care au expunere parentală intradomiciliară la fumat și, în mod particular, se distinge tatăl fumător.
Cuvinte-cheie: fumatul pasiv parental intradomiciliar, copii școlari, patologia respiratorie

Introduction

Tobacco smoke contains at least 4,000 toxic chemicals, including carcinogens, and children, in particular, seem to be more susceptible to its harmful effects^{1,2}. Secondhand smoke (SHS) has been found to be causally associated with a large number of diseases in various organs. It is also known as environmental tobacco smoke (ETS)². Exposure to ETS in children is considered a global problem by the World Health Organization,

which estimates that almost a half of the world's children are breathing air polluted by tobacco smoke at home². When non-smokers are exposed to SHS, it is called *involuntary smoking* or *passive smoking*. Children are exposed to ETS mainly in their homes^{1,2}. In children, prenatal exposure to ETS is associated with an impaired lung function and increases the risk of developing asthma, while postnatal exposure mainly acts as a trigger factor for respiratory symptoms and illness and severe

Table 1 Table of contingency and the prevalence of respiratory diseases among school children, by environmental home smoking exposure

Environmental home smoking	Respiratory illness cases	Healthy school children	Total	Prevalence of respiratory disease
Exposure + (E)	61	27	88	69.31%
Exposure – (NE)	19	29	48	29.58%
Total	80	56	136	58.82%

asthma attacks¹⁻⁵. Children have smaller airways and greater oxygen demands than adults and their health may become particularly vulnerable to the effects of passive smoking⁶. Parental smoking inside the home leads to significant disturbances of the pediatric respiratory health and increases the prevalence of respiratory tract infections among exposed children¹⁻⁶. Additional factor, that increases children's exposure to ETS, is the closeness of the children to their parents, family members, or caregivers, who bring them a closer source of pollutants, than other passive smokers¹⁻³.

Aims consist in detecting the prevalence of respiratory diseases and disorders in home exposed schoolchildren to secondhand smoking (SHS), identification of the respiratory diseases spectrum and quantification the risk of respiratory diseases related with home environmental parental tobacco smoke exposure.

Material and methods

A prospective case-control study based on questionnaire survey was carried out, in the same primary school "Spiru Haret" from Medgidia, Romania, among children with absences for respiratory diseases, related to exposure to a certain parental passive smoking in a home environmental, versus controls without domestic exposure. The participants consisted in 136 primary school children, aged from 7 to 10 years. Their families were informed by flyers and voluntary consented to complete the survey-questionnaire about home environmental tobacco smoking. The response rate was 100%, so all 136 children were surveyed for a 6-month period. Any absence with or without related hospital admission because of a respiratory disease, reported from the 1st of October, 2011 to the 31st of March, 2012, was counted. Method consists in collecting data about any schoolchildren respiratory illness, correlating with the questionnaire - reports of parental smoking or other household members in a home environmental setting, at least 1 year. The study population was divided in 88 schoolchildren exposed to second hand smoking at home, representing the cases (Group 1=G1 or E) and 48 without exposure, representing the controls

(Group 2= G2 or NE). A special analysis to smoking families permitted to identify a small group of prenatal and postnatal maternal smoking, which was formed by 27 children previously included in G1.

Statistical evaluation was performed by the software EPI INFO version 3.5.1. Data were compared using the Chi² tests. The odds ratio was chosen as a measure of association for a case-control study. The 95% confidence intervals were respected within a predefined error probability accepted at $p \leq 0.05$. Odd ratios were calculated for smoking by either parental smoking (mother or father or both) versus other family or household members. The risk of respiratory illness was estimated for more than one episode of illness related with ETS exposure.

Results and discussions

Tobacco passive smoking is widely believed to be the most common and dangerous of the environmental toxins to which a child could be involuntary exposed. There are many studies which noticed a direct association between ETS exposure and a wide range of childhood conditions such as respiratory tract infections, asthma, otitis media (middle ear infection), infantile gastrointestinal dysregulation, cognitive deficits, and, even, sudden infant death syndrome^{1-5,7,8}.

Our interest consists mainly in respiratory diseases related with environmental tobacco smoking (ETS) at home, considering it as a major component of indoor air pollution. Among 136 primary schoolchildren aged 7-10 years, who were included in the study group, more than a half were found involuntary exposed to home environmental tobacco smoke ($n = 88$; 64.71%).

Study participants were divided into 2 groups:

- 88 cases (G1) mean aged 9.8 years, 52 girls and 36 boys, all receiving care from a smoker or more than one at home and having an involuntary exposure to home parental environmental tobacco smoke;
- 48 controls (G2) mean aged 10.4 years, 36 boys and 12 girls, without exposure to SHS.

Gender distribution is significantly different

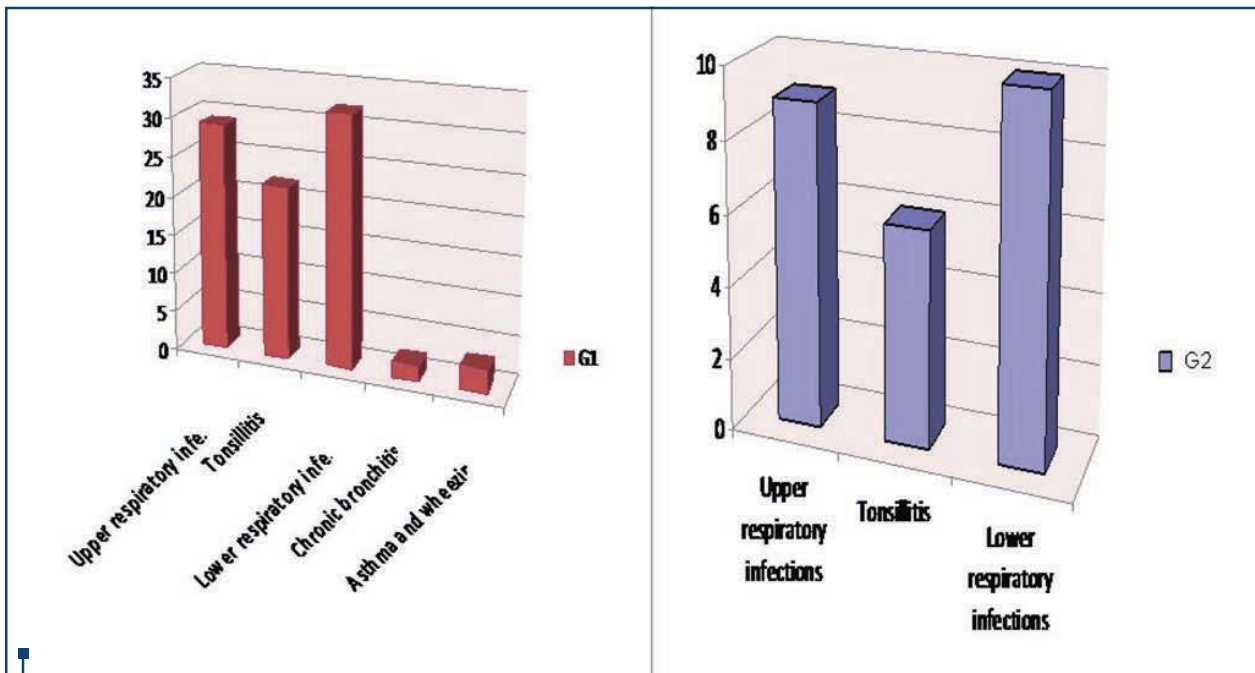


Figure 1. Respiratory illness in cases (G1) versus controls (G2)

between cases and controls, girls being 1.4 times more exposed to ETS than boys ($\chi^2 = 5.64$; $p < 0.02$).

According to our results, the prevalence of respiratory diseases was 2 times higher in the SHS exposed group of children ($n_{G1} = 61/88$; 69.31% versus $n_{G2} = 19/48$; 29.58%) (Table I).

The investigation of a single common room occupancy in both groups reveals more than 5 family members living in the same room with the schoolchild ($G1 = 17/37$; 45.95% versus $G2 = 10/12$; 83.33%; $\chi^2 = 1.31$; $p < 0.26$).

Since differences in occupancy of a dwelling space are not statistically different between cases and controls ($p < 0.26$), the relative risk of respiratory disease (more than one episode in the period analyzed), depending on exposure to secondhand smoke, is obviously increased in the group of cases G1 and statistically significant ($OR = 3.45$, $1.56 < OR < 7.71$, CI 95%, $RR = 1.75$, $1.20 < RR < 2.55$, CI 95%, $\chi^2 = 12.25$, $p < 0.0008$).

In a study performed in 1994 among English school children 5 to 7 years of age, only 8.7% of the children received care from a smoker, and in 66% of the cases, the parent was also a current smoker¹⁰.

In our study, 42% of the exposed school children received care from more than 2 smokers. These cases have a high degree of exposure to environmental tobacco family by cohabitation with more than two smokers ($n = 37/88$; 42%). The most important source of passive smoking on primary school children of classes I-IV is the father as an active smoker ($n = 67/88$; 76.13%), being a single parent in most of the cases ($n = 46/88$; 57.95%). Smoking mothers occupied the second place as a single parent ($n = 20/88$; 21.59%). Both parents are smokers in 12 cases (13.6%) and one parent with other family or household members were identified in 25 cases.

There is a positive relationship between the risk of respiratory illness and the smoking pattern of home ETS related with smoking single father ($n = 39/46$ versus $22/42$; $OR = 5.06$; $1.68 < OR < 15.70$; CI 95%; $RR = 1.62$; $1.18 < RR < 2.21$; $\chi^2 = 10.71$; $p < 0.002$).

The high degree of household over-crowding in a single common room (more than 5 members) in both groups of schoolchildren ($G1 = 17/37$; 45.95% versus $G2 = 10/12$; 83.33%) indicates a poor housing and a high possible load bacterial level, mainly in controls. Since differences in occupancy of a dwelling space are not statistically different between cases and controls ($\chi^2 = 1.31$, $p < 0.26$), the relative risk of disease (more than one episode in the period analyzed) depending on exposure to secondhand smoke can be seen as obviously increased in the group of cases and statistically significant ($OR = 3.45$, $1.56 < OR < 7.71$, CI 95%, $RR = 1.75$, $1.20 < RR < 2.55$, CI 95%, $\chi^2 = 12.25$, $p < 0.0008$).

The spectrum of respiratory diseases is presented in Figure 1.

In the first 5 years of life, only diagnosed asthma is associated with ETS.

We identified three children with asthma in the group exposed to home parental passive smoking and all of them were also prenatal exposed by their smoking mothers. The prevalence of bronchial asthma is 0.34% among children receiving home care from a smoker and 3 times higher (1.11%) in the subgroup of prenatal smoking exposed children by their mothers ($n = 27$). Interestingly, asthma or wheezing, the major symptom of bronchial asthma, are not diagnosed in our study in schoolchildren without ETS exposure.

Several researchers reported previously that ETS exposure approximately doubles the prevalence of asthma in

children⁹. However, studies linking ETS to the incidence of asthma have found conflicting results. There is a study performed in New Zealand, where ETS was not associated with the development of asthma¹⁰. In some other studies, ETS exposure was associated with asthma in children in some special situations: Arizona children developed asthma only if their mother had 12 years of education, or not among the children of more highly educated women¹¹; Canadian children with atopic dermatitis exposed to ETS developed asthma, whereas others exposed to ETS did not develop asthma¹².

In our study, the healthier individuals with no chronic bronchitis or asthma are schoolchildren without domestic environmental tobacco exposure.

A valid estimation of the risks associated with tobacco exposure depends on accurate measurement¹.

A lack of our study consists in no measurements of smoking biomarkers in exposed children. Even there is no ideal method to quantify a child's exposure to ETS, it seems that cotinine measurements give some results when classifying children in regards to ETS exposure¹³.

Conclusions

1. ETS home exposure is significantly related to a higher prevalence of respiratory diseases among primary school children.

2. Children exposed in a home environmental to a smoking father, in particular, seem to be the most susceptible group to the respiratory diseases.

3. Asthma was identified in the group exposed to pre-natal maternal smoking and health education for young women is recommended. ■

References

1. Hwang SH, Hwang JH, Moon JS, Lee DH, Environmental tobacco smoke and children's health. *Korean J Pediatr* 2012; 55(2): 35-41.
2. Chan-Yeung M, Dimich-Ward H, Respiratory Health of exposure to environmental tobacco smoke. *Respirology* 2003; 8:131-139.
3. Janson C, The effect of passive smoking on respiratory health in children and adults. *Int J Tuberc Lung Dis.* 2004; 8 (5): 510-516.
4. Cheraghi M, Salvi S, Environmental tobacco smoke (ETS) and respiratory health in children. *Eur J Pediatr* 2009; 168: 897-905.
5. Kum-Njl P, Meloy L, Herrod HG, Environmental tobacco smoke exposure: prevalence and mechanisms of causation of infections in children. *Pediatrics* 2006; 117: 1745-1754.
6. www.who.int/ceh: Children's Health and the Environment. *WHO Training Package for the Health Sector World Health Organization* (updated 2009).
7. Chimonczyk BA, Salmun LM, Megathlin KN, Neveux LM, Palomaki GE, Knight GJ, Pulkkinen AJ, Haddow JE, Association between exposure to environmental tobacco smoke and exacerbations of asthma in children. *N Engl J Med* 1993; 328: 1665-1669.
8. Gortmaker SL, Walker DK, Jacobs FH, Ruch-Ross H, Parental smoking and the risk of childhood asthma. *Am J Public Health* 1982; 72: 574 -579.
9. Weitzman M, Gortmaker S, Walker DK, Sobol MA, Maternal smoking and childhood asthma. *Pediatrics* 1990; 85: 505-511.
10. Murray AB, Morrison BJ, It is children with atopic dermatitis who develop asthma more frequently if the mother smokes. *J Allergy Clin Immunol.* 1990; 86: 732-739.
11. Martinez FD, Cline M, Burrows B, Increased incidence of asthma in children of smoking mothers. *Pediatrics* 1992; 89: 21-26.
12. Horwood LJ, Fergusson DM, Hons BA, Shannon FT, Social and familial factors in the development of early childhood asthma. *Pediatrics* 1985; 75: 859 - 868.
13. Hurwitz ES, Gunn WJ, Pinsky PF, Schonberger LB, Risk of respiratory illness associated with day-care attendance: a nationwide study. *Pediatrics* 1991; 87: 62- 69.