

Smoking and asthma in children

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ABSTRACT

Aim To investigate a possible association of asthma prevalence in schoolchildren aged 7-14 years in relation to their tobacco smoke exposure.

Methods Case-control study was realized at the Public Health Centre in the City of Novi Sad, the Province of Vojvodina, Republic of Serbia, between 2003 and 2005 and included 504 participants. The study explored the relation between asthma in children and tobacco smoke exposure during pregnancy, the first year of life and/or onwards. The reports on smoking exposure were obtained by a questionnaire.

Results The cases comprised 252 schoolchildren with asthma confirmed by the specialist. The controls (n=252) were respectively matched by age, gender and place of residence, selected from children's classmates, without any diagnostic or anamnestic records of asthma. Multivariate logistic regression analysis identified one positive characteristic associated with asthma occurrence in children - current environmental tobacco smoke exposure by persons other than parents (p=0.0132).

Conclusion The smoking habit has an influence on risk factors for the development of asthma in childhood and indicates a need of deeper understanding of lifestyle in asthma occurrence in children.

Key words: asthma, children, smoking, risk factor, case-control study

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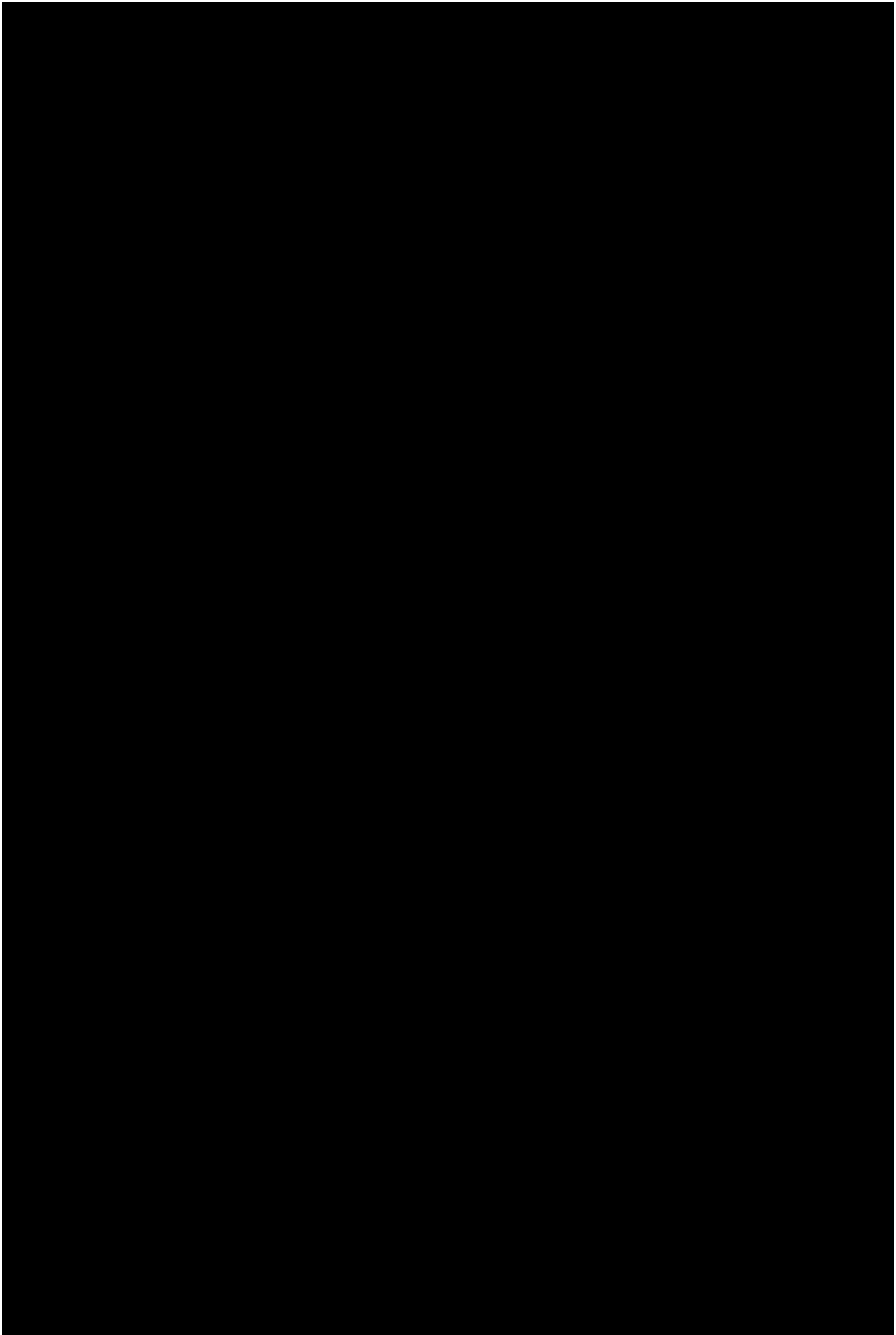
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with a biological mother. If the mother was not available, the child's guardian was interviewed.

Questionnaires

Targeted epidemiological questionnaire was used to obtain data including exposure to risk factors for asthma in the past as well as current exposure for each participant. The interview was performed by the author.

In the case-control study, more detailed information about the maternal tobacco smoke exposure for our participants as well as about the timing, intensity, and cessation of smoking during the index pregnancy was collected. In particular, the role of maternal smoking during the pregnancy, in the first year of life and in current period was examined for asthma risk in children.

Information on the household smoking status of each participant's mother, father and other household members was collected. To investigate the independent and joint effects of *in utero* and environmental exposure to tobacco smoke, the exposure was categorized into the following categories: never, ever (*in utero* exposure to maternal smoking only, any current or past household ETS only, or both *in utero* and household ETS exposure). The current number of household smokers and the current number of cigarettes smoked inside the house per day (≤ 1 pack/day, > 1 pack/day) were recorded.

The participants were interviewed during their attendance to a doctor. The structured face-to-face interview took approximately two hours and included information on certain demographic and anthropometric characteristics, personal medical history, family history of asthma and smoking habits. The questionnaire was aimed at assessing the home environment, various indoor environmental exposures such as maternal smoking during pregnancy and after the child's birth, as well as current smoking habits of both parents. *In utero* exposure to maternal smoking was defined as maternal daily smoking of one cigarette or more during any trimester of pregnancy. Information on paternal smoking during the period *in utero* and in the first year was not collected. Environmental tobacco smoke exposure was defined as the exposure to maternal or paternal, and other smoking of one cigarette or more daily during any period of the child's life. Quantitative information i.e. the

number of cigarettes smoked and the length of smoking of both mother and father was obtained for any period of life of the child (prior to onset of disease), respectively. Information was also obtained on parental education (primary, secondary school, university), family income and marital status. Detailed information was collected about perinatal and breastfeeding history.

Statistical analysis

Categorical variables were presented as percentages. Relations between category variables and asthma were first evaluated using contingency table analysis and χ^2 test or Fisher's exact probability test and method univariate logistic regression analysis. All variables that were related to asthma at a significant level of $p \leq 0.100$ according to χ^2 test or Fisher's exact probability test as well as univariate analysis were included in the multivariate logistic regression model. A multivariate stepwise logistic regression model was used to identify variables that were significantly associated with the occurrence of asthma in children, while the effects of other potentially confounding risk factors were simultaneously being controlled. Statistical significance was considered when $p < 0.050$. All statistical analyses were conducted using the Statistical Package for Social Sciences software (SPSS Inc, version 7.50, Chicago, IL).

RESULTS

Two hundred and fifty-two patients and ditto controls were matched to age, gender, school/classroom and place of residence. The mean age of cases was 10.13 ± 2.35 years, and 10.38 ± 2.34 years for controls. Male/female ratio was 2:1. About 70% of the participants lived in urban and 30% in rural areas (Table 1).

In the univariate logistic regression analysis, the main categories of education and marital status were associated with asthma. The majority of parents were married at the study moment (88.3% of the cases, versus 94.0% of the controls) ($p=0.0261$). Cases and controls did not differ in educational level of parents and family income. Pregnancy and gestational age data were not differed among the participants. Delivery was more frequently complicated among cases; cesarean section and other complications were more frequent with asthma children. Among the parti-

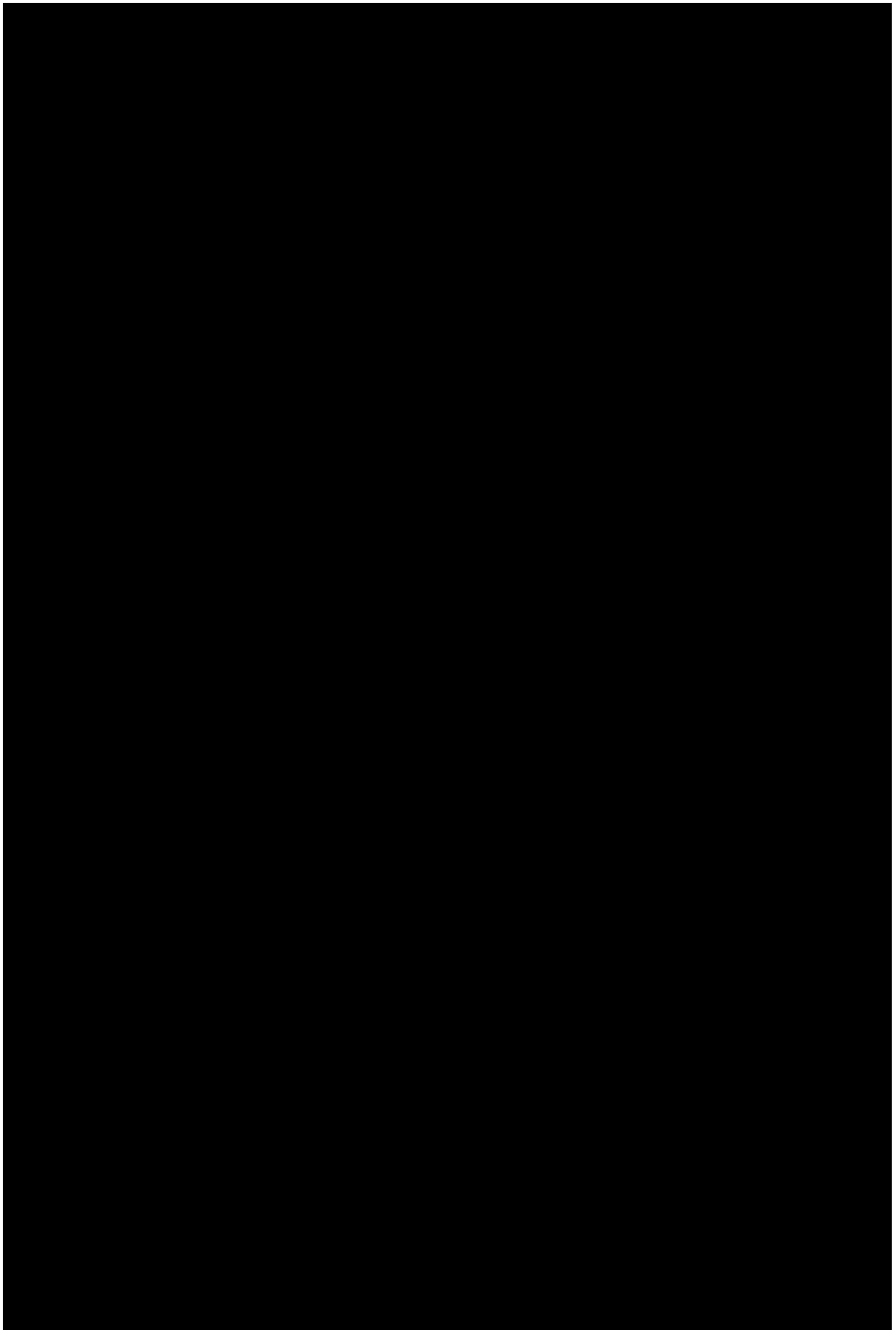


Table 3. Independent predictors by multivariate logistic regression analysis*

Characteristics	B	SE	p
Current ETS* exposure by persons other than parents	1.9733	0.7966	0.0132

* ETS, environmental tobacco smoke; B, coefficient logistic regression analysis; SE, standard error of coefficient logistic regression analysis; p, probability value according to multivariate logistic regression analysis

trols, while heavy smokers were more numerous in cases than in controls, but this difference was not significant.

Approximately the same number of cases (85.8%) and controls (86.5%) was reported for smoking in the presence of a child.

Active smoking by a child was noted only in two cases and one control case.

All variables that were related to asthma at a significant level of $p \leq 0.100$ according to univariate analysis (marital status of parents, complicated delivery, cesarean section, other complications in delivery, premature delivery, ever tobacco smoke exposure, maternal smoking in pregnancy, maternal smoking in the first year, maternal/governess smoking in first year, current ETS exposure by both parents only, current ETS exposure by other person) were included in the multivariate logistic regression model. Multivariate logistic regression analysis identified one positive characteristic associated with asthma occurrence in children - current ETS exposure by person other than parents ($p = 0.0132$) (Table 3).

DISCUSSION

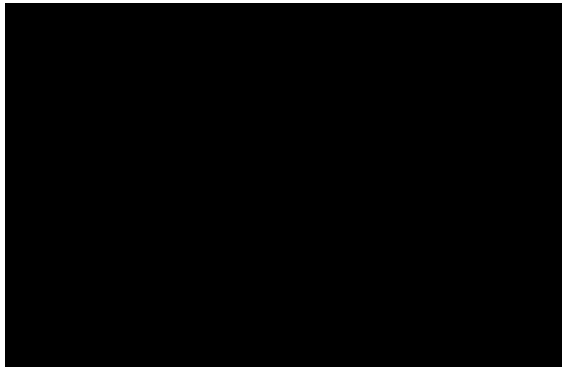
Tobacco smoke exposure is an important determinant of childhood asthma occurrence (4-9). Based on the results of the present study, in the schoolchildren aged 7-14 years, the presence of physician-diagnosed asthma was independently associated with the smoking habits of the people living at the child's home, namely current environmental tobacco smoke exposure by persons other than parents in the period of asthma risk.

These results concur with the results found in other studies carried out on schoolchildren of the same age (11,16,19). Grandparents were reported to be the most common source of ETS exposure; this was a generation with higher smoking prevalence (21,22).

Asthma and asthma medication usage were not significantly associated with ETS exposure at

home, possibly reflecting underreporting of asthma diagnosis, reported biases, or smoking cessation by parents whose child was labeled asthmatic (23). Maternal smoking during pregnancy could be a risk factor for reported wheeze during early childhood that is independent of postnatal ETS exposure (24). Similar results have been published by others, but generally without separating the effects of exposure *in utero* and exposure to ETS during the first few years of life (14, 19). A pooled risk estimate of 1.57 was found for lower respiratory illness in relation to smoking by either parent (25). Maternal smoking was associated with the increased prevalence of a wide range of wheeze subcategories, serious asthma and chronic cough, but paternal smoking had no significant effects; the results showed that prenatal and current household ETS exposure had significant adverse effects on respiratory health in children in Taiwan (26). Among Qatari schoolchildren aged 6-12 years, smoking habit of father was a significant predictor for asthma (27). In contrast, the studies conducted in the Netherlands (28), Finland (29) and New Zealand (30) found that *in utero* exposure had no effect or that the effects of ETS were independent of *in utero* exposure. Both parents and other persons' passive smoking have been linked with asthma in childhood (6,7,31,32).

Observed lack of associations between parents' smoking and asthma in children could be related to the limited sample size of this study. However, the lack of a dose-response relationship might have resulted from the underreporting of smoking by heavy smokers. The knowledge of the child's illness could affect the parents' smoking habits, and the possible association found may have been masked by the fact that families at-risk had changed their smoking habits following recent health education and prevention programmes. Secondly, since information regarding passive smoking *in utero* or in childhood was collected after the incidental event, there is a chance that recall bias has influenced the results. Information about passive smoking was difficult to validate retrospectively. There is evidence of reasonable validity of parental responses on smoking, and validation studies carried out in several countries have found a strong correlation between passive smoking exposure in children assessed by me-



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whether current exposure produces an additional decrement in lung function.

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Pušenje i astma u dece

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SAŽETAK

Cilj Ispitati moguću povezanost prevalencije astme u školske dece, uzrasta od 7 do 14 godina, s njihovom izloženošću duvanskom dimu.

Metode Anamnestička studija realizovana je u Domu zdravlja u Novom Sadu (pokrajina Vojvodina, Republika Srbija), u periodu od 2003. do 2005. godine, i uključivala je 504 ispitanika. Studija je istraživala povezanost između astme u dece i ekspozicije duvanskom dimu tokom trudnoće, u prvoj godini života i/ili nadalje. Podaci o izloženosti pušenju dobijeni su anketnim upitnikom.

Rezultati Slučajevi su uključili 252 učenika s astmom koju je potvrdio lekar specijalista. Kontrole (n=252) su, svaka posebno, sa slučajevima usklađene po uzrastu, polu i mestu stanovanja, odabrane iz istog odeljenja u školi, a bez ikakvih dijagnostičkih ili anamnestičkih podataka za astmu. Multivarijantna logistička regresiona analiza identifikovala je jednu karakteristiku koja je pozitivno povezana s pojavom astme kod dece - tekuću izloženost duvanskom dimu iz okruženja drugih lica koja nisu roditelji (p = 0,0132).

Zaključak Navika pušenja ima uticaj na faktore rizika za pojavu astme u detinjstvu i ukazuje na potrebu dubljeg razumevanja načina života u nastanku astme u dece.

Ključne reči: astma, deca, pušenje, faktori rizika, anamnestička studija