

## Urban-Rural Gradient of Allergic Rhinitis: A Cross-Sectional Study in Croatian Children

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**Background:** Children living in rural areas have a lower risk for developing allergic diseases, which has particularly been observed for allergic asthma and atopic dermatitis, but less for allergic rhinitis.

**Methods:** A cross-sectional study was conducted in 39 randomly selected elementary schools in the urban environment of the city of Zagreb and the rural, surrounding area of Lonjsko polje National Park, during school-year 2017/2018. All children aged 6-7, 10 and 13-14 years were eligible to participate. The study was based on the original ISAAC questionnaires answered by parents. To assess skin sensitivity, skin prick tests on common inhalant allergens were done on 400 randomly selected children from both regions. Lonjsko polje is the biggest complex of natural and preserved lowland riparian forests in Europe and the ornithological reserve with more than 1500 species living there. The two areas differ in GDP and economy, with more than two times higher GDP in the city of Zagreb.

**Results:** A total sample of 1745 children participated in the study, 646 (37%) from Lonjsko polje and 1099 (63%) from the city of Zagreb. The children from Lonjsko polje showed a lower risk for developing symptoms of allergic rhinitis ever in their lives in the 13-14-year age group (OR 0.531, 95% CI=0.37-0.76, p 0.001) and lower risk for active rhinitis in all age groups (6-7 y; OR 0.373, 95% CI=0.21-0.63, p 0.003; 10 y; OR 0.563, 95% CI=0.32-0.98, p 0.042; 13-14 y; OR 0.173, 95% CI=0.07-0.40, p<0.0001). Also, children from urban areas reported using more medicines for allergic rhinitis ( $\chi^2$  Yates correct 0.46, p<0.0001), and visited pharmacies more often (p 0.046). In the city of Zagreb, we identified breastfeeding (OR=0.855; 95% CI=0.734-0.997), contact with cats (OR=0.64; CI 95% 0.37-0.98) and cooked vegetables (OR 0.759, CI 0.596-0.965) as protective factors. Positive family history and mother's smoking in the first year of the child's life (OR=2.885; CI 95%=1.462-5.625) were identified as risk factors in both populations, as well as contact with dogs (OR=1.49; CI 95% 1.01-2.06) in the city of Zagreb. Allergic sensitization to inhalant allergens was highly connected with symptoms of allergic rhinitis in the city of Zagreb.

**Conclusion:** We showed clear urban-rural gradient in symptoms of allergic rhinitis in Croatian schoolchildren.

**Key words:** allergic rhinitis, urban-rural gradient, risk factors