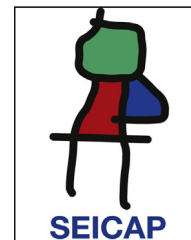




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ORIGINAL ARTICLE

Urban–rural differences in asthma prevalence among young adolescents: The role of behavioural and environmental factors



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Abstract

Background: Asthma prevalence has been reported to be lower in rural areas compared to urban areas, although this has been inconsistent. This study aims to identify the influence of urban–rural residence on asthma prevalence in adolescents in the Republic of Macedonia and to investigate characteristics that may explain observed associations.

Methods: Following International Study of Asthma and Allergies in Childhood protocol, a national sample of Macedonian urban and rural dwelling adolescents (12–16 years) was recruited in 2006. Self-completed questionnaires were used to collect data on wheeze and asthma as well as personal, environmental and dietary characteristics. Following descriptive and multiple logistic regression analyses, a mediation analysis approach was performed to help explain observed associations.

Results: A lower prevalence of current wheeze and ever-diagnosed asthma was observed in rural compared to urban dwelling adolescents (4.9% vs. 7.2% and 1.2% vs. 1.9%, respectively). After adjustment for potential confounders, the associations, although still protective, were not statistically significant (wheeze: OR=0.74, 95%CI=0.46–1.21; asthma: OR=0.97, 95%CI=0.38–2.46). The associations between urban–rural status with current wheeze and asthma were mediated by region of the country (wheeze 9%; asthma 19%) and by diet (>5% change for both wheeze and asthma). Having a dog resulted in a strengthening of the association between urban–rural status and current wheeze by 11.9%.

Conclusions: The prevalence of asthma and wheeze was lower in rural dwelling Macedonian adolescents and the association was mediated by the region of the country with diet likely to be part of the reason for this mediating effect.

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Introduction

Wide variations in the prevalence of childhood asthma have been documented worldwide with more prevalent asthma symptoms in more affluent countries.¹ 'Western lifestyle' and urbanisation have been suggested to explain the worldwide geographic variation in asthma prevalence.² In support of this, urban-rural differences in asthma prevalence have been observed, with most comparative studies in adults and children having reported lower asthma prevalence in rural compared to urban areas,³⁻⁵ although some studies have not found such differences.^{6,7} Establishing the reasons for the protective role of rural residence on asthma prevalence is very important for aetiologic understanding leading to future prevention and identification of treatment strategies, as the global asthma burden continues to rise.⁸

A number of reasons could explain the urban-rural differences in asthma prevalence, including differences in diagnosing patterns, environmental exposures, and behaviours. While microbial exposures from animals or unpasteurised milk in rural areas have been highlighted as potential protective factors,^{9,10} the aforementioned reasons should be considered as part of the Westernisation and urbanisation package.

Compared to worldwide prevalence rates of asthma, the Republic of Macedonia appears to have a moderately low prevalence of current wheeze¹ and a low prevalence of ever-diagnosed asthma.² Given this fact, the paucity of information on asthma in adolescents, and the need to investigate the underlying reasons for the apparent association between urban-rural status and asthma, the objective of this study was to determine if there was an association between wheeze and asthma with rural dwelling among a national sample of Macedonian adolescents and, if so, to investigate the characteristics that may explain this association. As part of this process, we sought to profile and compare urban and rural dwelling Macedonian adolescents.

Subjects and methods

Study population and procedures

This was a cross-sectional study conducted in 2005-2006 in eight cities and their adjacent villages in the Republic of Macedonia. The study was approved by The Ethics Committee at the Medical Faculty and The Ministry of Education and Science, Skopje, the Republic of Macedonia.

Selection of participants and data collection were performed following the International Study of Asthma and Allergies in Childhood (ISAAC) Phase 3 protocol, which has been published elsewhere.^{11,12} In brief, following random selection of primary schools, informed consent was obtained from parents and 12-16-year-old children to self-complete the standardised ISAAC Phase 3 written questionnaires on asthma, rhinitis, eczema and related factors. This was completed at the school. No additional questions were included in the original form of the questionnaires, with the exception of the questions regarding the close relative's history of allergic diseases.

The larger cities and surrounding rural areas included in the study consisted of Skopje (population = 578,144), Veles

(population = 55,108) and Tetovo (population = 86,580), with the latter two cities approximately 50 km from Skopje and all three cities located in the northern part of the country as well as Ohrid (population = 55,749), located 200 km from Skopje in the western part of the country and characterised by a similar level of affluence and urbanisation as the cities in the northern part of the country. The other four cities involved in the study (Berovo, Pehcevo, Delcevo, Makedonska Kamenica) are smaller cities (populations < 15,000) close to each other and located in the less developed eastern part of the country, approximately 200 km from Skopje.

Operational definitions

The health outcomes of interest in this study were *current wheeze* and *ever-diagnosed asthma* defined as wheeze in the past 12 months and ever having had asthma diagnosed by a doctor, respectively.^{1,12} The primary exposure of interest was *geographic location* of dwelling (urban-rural status). Respondents from the eight cities in the study were classified as urban dwelling while those living in the nearby villages were classified as rural dwelling respondents. Other personal, environmental and dietary characteristics were considered as independent factors and confounders. Their descriptions follow.

Personal characteristics: Socio-demographic characteristics were considered, including sex, age, nationality (Macedonian and non-Macedonian) and region of the country (North/Western Macedonia and Eastern Macedonia). Mother's educational level was classified as primary, secondary and tertiary (university) education. Additionally, maternal and paternal history of allergic diseases (yes or no responses) and respondent's birth order were considered.

Overweight/obesity status. According to the ISAAC protocol, self-reported weight and height were used for the calculation of body mass index (BMI) of each respondent as weight (kg)/height (m)². In some cases, the subjects did not know their height and weight. In these cases, height and weight were objectively measured. The international cut-off points for BMI for overweight and obesity, defined to pass through a BMI of 25 kg/m² for overweight and 30 kg/m² for obesity at age 18, were used.¹³ As only 1.5% of the respondents were obese, they were included in the overweight group.

Physical activity participation was based on the response to the question 'How many times a week do you engage in vigorous physical activity long enough to make your breathe hard?' The respondents were categorised into either never/occasionally, once/twice per week or three/more times a week physical activity categories.

Television (TV) watching/PC playing time was defined based on the question 'During a normal week, how many hours a day (24h) do you watch television or use a PC for playing games?' Responses were classified as less than 1 h, 1 h but <3 h, 3 h but <5 h, and 5 h or more.

Responses about average Paracetamol use in the past year were categorised into never, at least once a year and at least once a month categories.

Environmental characteristics: Maternal and paternal smoking habits anytime in the past year, cat and dog ownership in the past year, fuel usually used for home cooking (electricity, gas, open fires) and fuel usually used for home

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