

# Asthma and Chronic Bronchitis Symptoms among Adult Population of Belgrade

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## SUMMARY

**Introduction** Over the last three decades the prevalence of respiratory diseases has been increasing worldwide thus increasing economic burden on the healthcare system. Recent studies have shown that the prevalence of asthma in West European countries ranges from 6-9%, while of chronic obstructive pulmonary diseases (COPD) is 8.0% worldwide.

**Objective** The aim of the study was to estimate the prevalence of respiratory symptoms and smoking habits, and to assess the prevalence of asthma and chronic bronchitis among adults in Belgrade, Serbia.

**Methods** To collect data we used a questionnaire based on the European Community Respiratory Health Survey (ECRHS) protocol, which was mailed to 10,208 randomly selected subjects.

**Results** There were 58.3% of responders to our questionnaire. We noted a higher prevalence of respiratory symptoms in subjects who responded promptly. The majority of the respondents were current or former smokers (37.5% and 17.5% respectively) and 79.9% of them reported respiratory symptoms. The most frequent symptoms were longstanding cough (32.2%), sputum production (30.4%) and wheezing (30.3%). Asthma attacks were reported in 4.4% of cases and 5.6% of subjects were using asthma medications. The prevalence of respiratory symptoms increased with age. Women reported coughing, attacks of breathlessness and coughing, chest tightness by night, allergic rhinitis and chronic coughing, more frequently than men. Productive cough was more frequent in men. The prevalence of almost all symptoms was higher in smokers compared to nonsmokers.

**Conclusion** In Serbia there is a high prevalence of respiratory symptoms, asthma and chronic bronchitis smoking addiction.

**Keywords:** asthma; chronic obstructive pulmonary disease (COPD); symptoms; epidemiological survey; questionnaire

## INTRODUCTION

In the last three decades the prevalence of respiratory symptoms has been increasing worldwide thereby imposing an ever greater economic burden on the health care system and society. The most common chronic respiratory diseases are asthma and chronic obstructive pulmonary disease (COPD). The natural history and response to therapy of asthma and COPD are different, but these two chronic disorders share one common functional feature, i.e. airflow limitation.

Recent studies have shown that the prevalence of asthma in several West European countries varies from 6 to 9% [1, 2, 3]. A lower incidence of asthma has been reported in Eastern Europe, e.g., 2% in Estonia [4]. The worldwide prevalence of COPD is 0.8% according to the World Health Organization (WHO) published data [5]. Other reports note that the prevalence rate of COPD is substantially higher, at approximately 4 to 6% in countries of both Northern and Southern Europe [6]. Reliable asthma and chronic bronchitis prevalence data are lacking for many parts of the world, including South Eastern Europe. To our knowledge, there are no published data regarding respiratory symptoms in adults in the Balkan countries. The

current study was the first large epidemiological investigation of the prevalence of obstructive airway diseases in South Eastern Europe, following European Community Respiratory Health Survey (ECRHS) protocol [7].

## OBJECTIVE

The aim of this study was to estimate the prevalence of respiratory symptoms and smoking habits, and to assess the prevalence of asthma and chronic bronchitis among adults in Belgrade, Serbia, as determined by mailed questionnaire.

## METHODS

### Study area

Serbia is a country located in the Balkans. The study covered Belgrade, the capital of Serbia. The area of Belgrade is 3224 km<sup>2</sup> with a population of 1,576,124 inhabitants, as recorded in 2002.

Measurements of the daily mean concentrations of sulphur dioxide (SO<sub>2</sub>), black smoke and nitrogen dioxide (NO<sub>2</sub>) often show substantial

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air pollution in Belgrade, the inner city zone being the most affected. Atmospheric pollution data are reported as annual mean values, obtained from the official Belgrade environmental control office. In 2001, the mean concentration for SO<sub>2</sub> was 11 g/m<sup>3</sup>, for NO<sub>2</sub> 21 µg/m<sup>3</sup>, and for black smoke was 32 µg/m<sup>3</sup> [7].

### Study population

The study population was randomly selected from the city population register and stratified according to age (20-80 years), male/female ratio 1:1, from three Belgrade areas: two central, and one on the outskirts. Each of these areas had a total population of approximately 150,000 people. Apart from the area of residence, the sample was divided into subgroups according to age, gender and smoking habits.

Individuals who returned the questionnaire were called "responders". A subject was defined as a non-responder if he had not returned the third questionnaire after 120 days.

### METHODS

The study was a postal survey with similar design as other studies, following ECRHS protocol [8-11].

#### The questionnaire

The questionnaire used was an ECRHS modified version of the International Union Tuberculosis Lung Diseases (IUATLD) questionnaire, which had been previously used in multinational studies [4, 9, 11]. In addition, five questions regarding bronchitis related symptoms and smoking, based on the British Medical Research Council (BMRC) questionnaire were included [12]. This version of the ECRHS questionnaire has already been used in an extensive multinational survey [10]. The English version of the questionnaire was translated into Serbian, with back translation into English. The questionnaire included 14 questions about respiratory symptoms; the questions required either "yes" or "no" answers. Nine questions were used for the diagnosis of asthma and five questions for bronchitis-related symptoms and smoking habits. Subjects who currently smoked or had stopped smoking within 12 months prior to the study were classified as smokers. Those who had stopped smoking for more than 12 months before the survey were classified as ex-smokers.

A copy of the questionnaire is shown in Appendix 1, and is referred to in the text below by the numbers given in Appendix 1.

The questionnaire was mailed to chosen participants in February 2003, with an explanatory letter and reply paid envelope (Mailing I). A reminder and new questionnaires were sent after two months if no reply was received (Mailing II) and a second reminder was sent four months later (Mailing III). To increase response rate the follow-

ing strategies were implemented: a short custom-designed coloured questionnaire with a personalized letter signed by a Faculty senior, and postage paid return envelope. Recipients were informed of the survey's University of Belgrade sponsorship. The significance of the survey was widely covered in daily newspapers and on TV.

Approval for the study was obtained from the Ministry of Science, Technology and Development. Return of the questionnaire was taken as informed consent to participate.

### Classification

Diagnoses of asthma and chronic bronchitis were based on answers to questions or the combinations of questions concerning respiratory symptoms. Subjects reporting use of asthma medications or having asthma attacks (Q5 or Q6) during the previous year were classified as having an asthma-related disorder (AD). Positive answers to questions related to wheeze occurring in the absence of colds (Q1 and Q1a and Q1b) combined to form a complex of asthmatic symptoms (AS). Those reporting problems with long-term cough and/or morning cough (Q8 and/or 9) and with phlegm (Q10) were classified as having bronchitis symptoms (BS).

### Statistical analysis

Descriptive statistical analysis and frequency tables were done using the Statistica, version 6.0. The following initial

#### APPENDIX 1. Questionnaire

The following questions are common to all centres of the ECRHS:

- Q1. Have you had wheezing or whistling in your chest at any time in the last 12 months?
- Q1a. Have you been at all breathless if wheezing noise is present?
- Q1b. Have you had wheezing or whistling even if without cold?
- Q2. Have you woken up with a feeling of tightness in your chest at any time in the last 12 months?
- Q3. Have you been woken by attack of shortness of breath at any time in the last 12 months?
- Q4. Have you been woken by attack of coughing at any time in the last 12 months?
- Q5. Have you had asthma attack over the last 12 months?
- Q6. Are you currently taking any medicine (including inhalers, aerosols or tablets) for asthma?
- Q7. Do you have any nasal allergies including "hay fever"?
- Q8. Have you had problems with pro-longed cough over recent years?
- Q9. Do you usually cough in the morning?
- Q10. Do you usually cough up phlegm?
- Q11. Do you smoke (answer yes even if you smoke only a few cigarettes or pipes per week, or if you quit smoking less than one year ago)?
- Q12. Are you an ex-smoker (quitted smoking for over one year ago)?

analyses were undertaken: response rate and distribution of symptoms in relation to age, gender, and smoking history.

## RESULTS

### Participants

Of 10,208 randomly selected subjects, 1,496 (14.7%) were excluded because they had changed addresses, were deceased or could not correctly be identified. Among those who were excluded 58% were aged below 45 years. These subjects were not included in the sample. The remaining subjects constituted the adjusted study cohort; 3,633 (41.7%) were non-responders according to our criteria.

In total, 5,079 completed questionnaires were received, a 58.3% response rate of the actual study sample. The questionnaire response rate is given in Table 1. The response rate was higher among women (51.4% vs. 48.6%;  $p=0.05$ ). The response rate in the older age group was higher than in those younger than 45 years (56.2% vs. 43.8%;  $p<0.0001$ ). The lowest participation rate (38.9%) was in the age group aged 35-40 years, and the highest rate (64.5%) was in those aged 65-70 years. There was no gender difference in early responders (51.3% vs. 48.7%;  $p=0.07$ ). The analysis of

symptom prevalence by subsequent contacts showed that symptoms prevalence was higher in early compared to late responders (64.8% vs. 22.6%;  $p<0.0001$ ). Significantly more smokers were identified in the early compared to the late responders (36.4% vs. 25.4%;  $p<0.0001$ ).

### Smoking habits

Smoking habits are shown in Table 2. Current smokers constituted 37.2% of the total, 17.0% were ex-smokers, and 45.8% had never smoked. Of interest is that significantly more women than men were smokers (51.8% vs. 47.9%;  $p<0.001$ ) in all age groups. There were 353 current smokers younger than 30 years i.e., 22.1% of all young participants. According to age group, the highest proportion of current smokers was found in subjects aged 50-55 years of both sexes (10.2% men, and 11.9% women).

### Respiratory symptoms

No respiratory symptoms were reported by 1,021 subjects (20.1%). Among them, 22.2% were smokers, 41.2% ex-smokers, and 36.5% non-smokers.

The prevalence of respiratory symptoms according to age and smoking habits is shown in Table 3. Four-fifths of participants reported respiratory symptoms. The most common symptoms were longstanding cough, 32.2%, and sputum production, 30.4%. The prevalence of wheezing was 30.3%, nasal allergies 19.4%, and asthma attacks 4.4%. Current use of asthma medication was reported by 5.6% subjects.

The prevalence of respiratory symptoms increased with age ( $p<0.05$ ). Chronic cough increased with age ranging from 5.7% in age group 20-25 years to 12.6% in age group 65-70 years. Also, productive cough increased with age ranging from 4.6% in the 20-25 years age group to 13.3% in the 65-70 years age group.

The prevalence rates for respiratory symptoms were almost equal between men and women. Attacks of breathlessness and/or cough, waking up with chest tightness, allergic rhinitis and long-term cough were more common in women than in men. The only symptom more frequently

**Table 1.** Questionnaire response rate by sex and age for early and late responders

Parameter	Number	%
Overall	5079	58.3
Males	2466	48.6
Females	2613	51.5
<45 years	2225	43.8
≥45 years	2872	56.2
≤4 weeks	3723	73.3
5-8 weeks	847	16.7
≥8 weeks	509	10.0

**Table 2.** Smoking habits by gender

Smoking habits	Male		Female	
	N	%	N	%
Smoker	907	36.8	982	37.6
Ex-smoker	594	24.1	270	10.3
Non-smoker	965	39.1	1361	52.1
Total	2466	100.0	2613	100.0

**Table 3.** Positive answers to respiratory questionnaire according to gender and smoking status

Question	Number of positive answers (%)	Gender (N)			Smoking habits (N)		
		Male	Female	p	Current smoker	Non-smoker	p
Q1	1539 (30.3)	737	802	>0.05	844	479	<0.0001
Q1a	1027 (20.2)	477	550	>0.05	506	354	<0.0001
Q1b	966 (19.0)	467	499	>0.05	576	268	<0.0001
Q2	1158 (22.8)	517	641	0.003	533	449	<0.0001
Q3	784 (15.4)	347	437	<0.01	300	343	>0.05
Q4	1306 (25.7)	556	750	<0.0001	837	499	<0.0001
Q5	223 (4.4)	100	123	>0.05	71	103	>0.05
Q6	282 (5.6)	128	154	>0.05	101	117	>0.05
Q7	987 (19.4)	414	573	<0.0001	346	482	0.056
Q8	1629 (32.1)	712	917	<0.0001	746	650	<0.0001
Q9	1121 (22.1)	567	554	>0.05	665	331	<0.0001
Q10	1542 (30.2)	868	674	<0.0001	817	484	<0.0001

**Table 4.** The prevalence of asthma disorder (AD), asthma symptoms (AS) and bronchitis symptoms (BS) according to age and gender of patients

Age (years)	Asthma disorder		Asthma symptoms		Bronchitis symptoms	
	M	F	M	F	M	F
20–35	24	22	56	62	94	73
36–64	69	88	153	182	319	293
≥65	47	77	85	95	188	141
Overall	345 (6.8%)		633 (12.5%)		1098 (21.6%)	

AS: Q1, Q1a and Q1b; AD: Q5 or Q6; BS: Q8 and/or Q9, and Q10

reported in men was productive cough. Wheezing, breathlessness, wheezing not induced by cold, asthma attacks, current asthma medication use, and morning cough were equally reported by both women and men.

The prevalence of all symptoms except morning dyspnoea attacks, asthma attacks and current use of asthma medication, were significantly higher in smokers compared to nonsmokers. Nonsmokers reported allergic rhinitis more frequently than smokers. The prevalence of allergic rhinitis was not significantly different for younger subjects compared to those older than 45 years (8.2% vs. 10.8%;  $p=0.2$ ).

### Asthma and chronic bronchitis

The overall prevalence of asthma-related disorder (AD) was 6.8%, of asthmatic symptoms (AS) 12.5%, and of symptoms of bronchitis (BS) 21.6%. Of the participants with AD, 80% had AS. Of the participants with AD, 53.7% had BS. Of the subjects with BS, 19% had AS. The prevalence of AD was significantly more common in older subjects, i.e., aged over 45 years (4.5% vs. 2.0%;  $p<0.00001$ ). There were 241 (4.7%) participants with both AD and allergic rhinitis, and 79 (1.6%) with a combination of allergic rhinitis and AS and AD. Allergic rhinitis and BS were reported by 321 (6.3%) subjects. The prevalence of AS, AD and BS according to age and gender is shown in Table 4.

### DISCUSSION

Completed questionnaire dealing with the subject suffering from respiratory diseases have high reliability and specificity in epidemiological studies. Self-administered and mailed questionnaires are the main instruments to assess the prevalence of asthma and chronic bronchitis in these studies. The data about the prevalence of chronic lung diseases show a wide variation across different studies and countries, which can be accounted for by several factors, such as different questionnaires, varying prevalence of risk factors and differences in response rate.

This study was the first large scale-study about respiratory symptoms and diseases performed in the Balkans. The study is a part of comparative epidemiological studies in progress in Serbia and was aimed to estimate the prevalence not only of respiratory symptoms, but also of smoking habits, asthma and chronic bronchitis in Belgrade. Belgrade

was selected as the study area because it is the capital of Serbia and 25% of the total population lives there. People with different ethnicities and nationalities migrated from other cities or rural areas to the capital, especially after the wars in the 1990's. Therefore, Belgrade represents a snapshot of Serbia.

We performed this study using questionnaires similar to previous European ones which are based on validated questionnaires concerning respiratory symptoms and smoking habits [1, 4, 8-13]. Comparison of our findings to those of earlier surveys that utilized identical methodology is important but difficult because of differences in location and socio-demographic characteristics.

The number of unidentified persons was very high in our study, more than in other surveys [1, 4, 8-14]. Belgrade city population register is not regularly updated and information on inhabitants who have moved abroad, changed address, or are deceased, is frequently unavailable. More than half of the excluded subjects were younger than 45 years and had probably emigrated because of the war in the former Yugoslavia during the 1990's.

The response rate may vary from country to country and population centres as a result of differing cultural and societal attitudes. The response rate in our study was 58.3% which corresponds closely to the 56% response rate of the Australian study [14]. However, our study response rate is much lower compared to similar ones performed in Northern Europe, which reported compliance of 72% to 90.5% [1, 4, 8-11]. It was observed in studies from 1991 to the present that response rate increased as the number of postal surveys increased [3, 8, 10-13]. Our study was the first postal health survey conducted in Serbia and we expected a lower response rate than that which actually occurred.

The response rate decreased with subsequent mailings, as in the Swedish study [10]. In our study women and older participants generally responded more frequently, as was the case in other health surveys [4, 8, 10]. Subjects with respiratory symptoms are more likely to participate than asymptomatic subjects [15]. Older subjects generally responded more promptly in our study, similar to other health surveys [10, 16]. Although other authors found that women responded sooner and more often than men, we did not find a significant difference in gender between early and late responders. In both our survey and a previous Italian one [16], late responders, and probably also non-responders, had a lower symptom prevalence than early responders.

Tobacco use is the most important risk factor for most respiratory symptoms and diseases. The prevalence of current smokers was high in our study (37.2%), but similar to Swedish and Finnish studies [8, 10]. In both a Swedish and Italian respiratory health survey [10, 16], late responders had a higher prevalence of smoking than early responders, as was the case in our study. Comparing the prevalence of smoking in the Balkans, the rate in Croatia Adriatic islands (22.7% in men and 22.1% in women) is lower than that in Belgrade [17]. In postal respiratory health surveys, the highest prevalence of smoking was noted in Estonia

where it varied from 39.1% to 42.5% [4]. In our survey current smoking was more common in early responders than late responders, which differs from other studies [10, 16]. Early responders had a higher frequency of respiratory symptoms due to smoking.

In most previous studies smoking was more common in men [4, 8, 10]. However, in our study the prevalence of female smokers was considerably higher.

In many developed countries, the proportion of smokers in the total population has decreased during the last several decades. However, smoking is a common habit among young adults in Serbia (22.1%). The percentage of young current smokers varied widely from country to country, ranging from 20.1% (Portland, USA) to 56.9% (Oviedo, Spain) [18]. Surprisingly, 48% of 20 year-old Swiss conscripts were current smokers [19]. In subjects aged 20 to 29 years, smoking was most common in Northern Finland (47% in men and 40% in women), while it was less common in Northern Sweden (16.0% in men and 25.7% in women) [20]. In Greek students, cigarette smoking was higher among adolescent females than in adolescent males (40.9% vs. 34.3%) [21]. These findings provide clear justification for initiating smoking prevention programs in schools.

In this study we divided symptomatic participants into three groups: 1) those with an "asthma-related" disorder (AD); 2) those afflicted with asthmatic symptoms (AS); and 3) those exhibiting bronchitis symptoms (BS). This classification of symptoms was used in previous epidemiological studies [10, 22].

There is a widespread variation in self-reported attacks of asthma and asthma-like symptoms. This variation includes variations among countries, among centres in different countries that use the same language, and among centers in the same country using the same language [1]. The prevalence rate of 6.8% for AD in our study is slightly higher than the 6.1% reported in a Swedish study [10]. Meren et al. [4] found that 6.6% of participants reported a combination of symptom including "attacks of shortness of breath" and "recurrent wheezing". In the Croatian islands, Zuskin et al. [17] reported the prevalence of asthma as being 3.9-4.5%.

The importance of performing clinical examination in epidemiological studies of asthma prevalence has been emphasized since 1987 [23]. In an Estonian survey, the prevalence of physician-diagnosed asthma was much lower than a combination of symptoms [4]. In our study, the definition of AD does not rely on the physician's diagnosis, but rather on related symptoms and asthma medication. Therefore, based on the results of this questionnaire we can not accurately estimate the prevalence of asthma in Serbia.

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The prevalence of AS in our study (12.5%) was higher than in Sweden (7.4%) [10]. We anticipated the higher prevalence of such symptoms in Serbia, because of the influence of tobacco smoke and the greater percentage of smokers. The combination of AD and allergic rhinitis was reported as being 4.7% and it can be assumed that 69.7% patients with AD also reported allergic rhinitis. It is well known that 40-70% of patients with asthma have allergic rhinitis [24]. Bronchitis symptoms were reported by 21.6% of subjects in our study, which is higher than in similar studies. Variations in prevalence rates for chronic bronchitis have been well documented in various countries. For example, these symptoms were reported in Finland in 4.8% [9], in Sweden 12.9% [10], in England 16.7% [15], and in Nepal in 18.3% [25] of adults. Cerveri et al. noted the incidence of chronic bronchitis to be 3.7% and 2.8% in young adult males and females, respectively [18]. It was reported that the prevalence of chronic bronchitis is higher in Eastern than in Western Europe [9].

Various risk factors such as exposure to polluted air, cigarette smoke, and overcrowded small apartments influence the prevalence of respiratory symptoms. In all these studies chronic bronchitis was strongly correlated to smoking. Exposure to tobacco smoke may contribute to the high prevalence of chronic bronchitis in nonsmokers [20].

The main shortcoming of the present study is a rather low response rate to the questionnaire which created systematic bias in the results. Nevertheless, this study confirms the high prevalence of smoking, respiratory symptoms, asthma and chronic bronchitis symptoms in Serbia. Our results confirm gender and age differences with respect to most symptoms.

## NOTE

This study was a part of the respiratory health survey of the Ministry of Science and Technological Development of the Republic of Serbia "Prevalence and risk factors of asthma and chronic obstructive disease in adults", supported by the School of Medicine, University of Belgrade.

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## Симптоми астме и хроничног бронхитиса код одраслих становника Београда

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### КРАТАК САДРЖАЈ

**Увод** У последње три деценије повећава се преваленција респираторних болести у читавом свету, што постаје све веће оптерећење за систем здравствене заштите. Преваленција астме у земљама западне Европе је 6-9%, а хроничне опструктивне болести плућа (ХОБП) у свету 0,8%.

**Циљ рада** Циљ истраживања је био да се процени преваленција респираторних симптома и навике пушења и испита преваленција астме и хроничног бронхитиса код одраслих становника Београда.

**Методе рада** За прикупљање података коришћен је упитник заснован на протоколу Епидемиолошке студије о здрављу респираторног система европске заједнице (*European Community Respiratory Health Survey – ECRHS*), који је послат поштом на адресе 10.208 случајно одабраних испитаника.

**Резултати** На упитник је одговорило 58,3% испитаника. Запажена је већа учесталост респираторних симптома код ис-

питаника који су брже одговорили. Већина испитаника су били активни (37,5%) или бивши (17,5%) пушачи. Међу њима је 79,9% имало респираторне симптоме. Најчешћи симптоми су били: дуготрајан кашаљ (32,2%), искашљавање спутума (30,4%) и звиждање у грудима (30,3%). Нападе астме је навело 4,4% испитаника, а 5,6% је користило лекове за астму. Преваленција респираторних симптома се повећавала са старосним добом испитаника. Жене су чешће од мушкараца наводиле да кашљу, имају нападе диспнеје и кашља, стезање у грудима ноћу, алергијску кијавицу и хронични кашаљ. Продуктивни кашаљ је био чешћи код мушкараца. Преваленција скоро свих симптома је била већа код пушача него непушача.

**Закључак** У Србији је висока преваленција респираторних симптома, астме, хроничног бронхитиса и навике пушења.

**Кључне речи:** астма; хронична опструктивна болест плућа (ХОБП); симптоми; епидемиолошко истраживање; упитник