

Institute for Pulmonary Diseases of Vojvodina, Sremska Kamenica, Serbia¹
 Hospital for Pulmology, Clinical Center of Serbia, Belgrade, Serbia²
 Center for Pulmonary Diseases, Internal Clinic, Clinical Center, Kragujevac, Serbia³

Stručni članak
 Professional article
 UDK 616.24/.248-07
 DOI: 10.2298/MPNS1302046V

EARLY DETECTION OF ASTHMA AND CHRONIC OBSTRUCTIVE PULMONARY DISEASE IN PRIMARY CARE PATIENTS

RANO OTKRIVANJE ASTME I HRONIČNE OPSTRUKTIVNE BOLESTI PLUĆA KOD PACIJENATA U PRIMARNOJ ZDRAVSTVENOJ ZAŠTITI

**Marija VUKOJA¹, Predrag REBIĆ², Zorica LAZIĆ³, Marija MITIĆ MILIKIĆ²,
 Branislava MILENKOVIĆ², Biljana ZVEZDIN¹, Ivan ČEKEREVAC³,
 Mirjana JOVANČEVIĆ DRVENICA¹, Sanja HROMIŠ¹ and Ivan KOPITOVIĆ¹**

Summary

Introduction. Asthma and chronic obstructive pulmonary disease are often unrecognized and undertreated. The aim of this study was to describe the frequency of chronic obstructive pulmonary disease and asthma in primary care patients in Serbia, and to examine the agreement between general practitioners and pulmonologists on the diagnosis of chronic obstructive pulmonary disease and asthma. **Material and Methods.** In this multicenter observational study, the general practitioners identified eligible patients from October 2009 to June 2010. The study included all adult patients with respiratory symptoms and/or smoking history based on structured interview. The patients were referred to a pulmonologist and underwent a diagnostic work-up, including spirometry. **Results.** There were 2074 patients, 38.4% men, their mean age being 54±15.5 years. The patients were mostly current (40.3%) or ex-smokers (27.4%). The common symptoms included shortness of breath (84.9%), cough (79.1%) and wheezing (64.3%). The diagnosis of chronic obstructive pulmonary disease was confirmed by pulmonologists in 454 (21.9%) and asthma in 455 (21.9%) patients. The chronic obstructive pulmonary disease was newly diagnosed in 226 (10.9%) and asthma in 269 (13%) of the cases. There was a moderate agreement between the pulmonologists and general practitioners on the diagnosis of chronic obstructive pulmonary disease (kappa 0.41, 95%CI 0.36-0.46) and asthma (kappa 0.42, 95% CI 0.37-0.465). **Conclusion.** A significant number of patients seen in the general practitioner's office were diagnosed with chronic obstructive pulmonary disease or asthma and half of them represent new cases. A substantial proportion of patients referred to a pulmonologist by primary care physicians have been misdiagnosed.

Key words: Asthma; Pulmonary Disease, Chronic Obstructive; Primary Health Care; Diagnosis; Signs and Symptoms; Adult; Middle Aged; Smoking; Spirometry

Introduction

Asthma and chronic obstructive pulmonary disease are the most common chronic diseases of

Sažetak

Uvod. Astma i hronična opstruktivna bolest pluća često su neprepoznate i neadekvatno lečene. Cilj ove studije je da se sagleda učestalost astme i hronične opstruktivne bolesti pluća kod pacijenata u primarnoj zdravstvenoj zaštiti i utvrdi stepen slaganja dijagnoza između lekara opšte prakse i pulmologa. **Materijal i metode.** U ovoj multicentričnoj, opservacionoj studiji, lekari opšte prakse odabrali su pacijente u periodu između oktobra 2009. i juna 2010. godine. Studija je uključivala odrasle pacijente sa respiratornim simptomima i/ili pušače koji su odabrani na osnovu posebno dizajniranog upitnika. Pacijenti su zatim upućeni na specijalistički pulmološki pregled, koji je uključivao spirometriju. **Rezultati.** Studija je obuhvatila 2 074 pacijenata, prosečne starosti 54±15,5 godina. Među pacijentima najviše je bilo aktuelnih (40,3%) i bivših pušača (27,4%). Najčešći simptomi bili su osećaj nedostatka daha (84,9%), kašalj (79,1%) i sviranje u grudima (64,3%). Dijagnozu hronične opstruktivne bolesti pluća potvrdio je pulmolog kod 454 (21,9%), a astme kod 455 (21,9%) pacijenata. Hronična opstruktivna bolest pluća je prvi put dijagnostikovana kod 226 (10,9%), a astma kod 269 (13%) ispitanika. Registrovano je umereno slaganje u dijagnozi HOBP (kappa 0,41, 95% CI 0,36-0,46) i astme (kappa 0,42, 95% CI 0,37-0,465) između lekara opšte prakse i lekara pulmologa. **Zaključak.** Rezultati studije ukazuju na značajnu učestalost hronične opstruktivne bolesti pluća i astme u primarnoj zdravstvenoj zaštiti, od čega su polovina novodijagnostikovani slučajevi. Postoji značajna razlika u dijagnozi astme i hronične opstruktivne bolesti pluća između lekara opšte prakse i lekara specijalista.

Glavne reči: Astma; Hronična opstruktivna bolest pluća; Primarna zdravstvena zaštita; Dijagnoza; Znaci i simptomi; Odrasli; Srednje godine; Pušenje; Spirometrija

the respiratory system. Asthma is a global health issue, affecting over 300 million people of all age groups throughout the world, with additional 100 million subjects likely to be affected by this dis-

Abbreviations

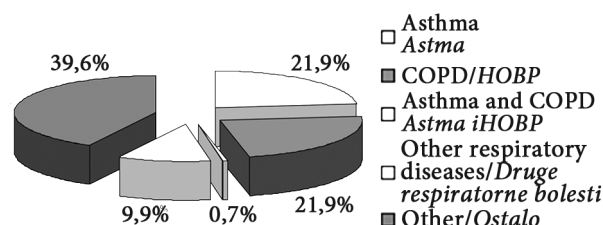
- COPD – Chronic obstructive pulmonary disease
 GOLD – Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease
 DALY – Disability adjusted life years
 GP – general practitioner

ease by the year 2025 [1]. Almost 20 million people in West Europe suffer from asthma and its prevalence was doubled over the last decade [2]. The prevalence of asthma varies, depending on the geographical region and the industrial development level [2,3]. The highest prevalence of asthma is recorded in both high developed (9.4%) and poor (8.2%) countries, while moderately developed countries have a somewhat lower prevalence of asthma (5.2%) [4,5]. In our country, about 200,000 asthmatic patients were registered in 2006 [6]. Due to increasing industrialization and urbanization, developing countries report a constant increase of asthma prevalence, although most of them lack precise data [1]. It has been estimated that about 250,000 people die of asthma each year all over the world, but the mortality rates are not in a direct correlation with the prevalence of the disease [7]. Of all European Union countries, Portugal has the highest (8.7/100,000 people), and the Netherlands the lowest (0.54/100,000 people) asthma mortality rate [1]. Our country reported a significantly reduced asthma mortality rate in the last decade, and it was 2.5/100,000 people in the year 2007 [8].

In 2007, the World Health Organization reported that the chronic obstructive pulmonary disease (COPD) affected about 210 million people in the world, and over three million people died of COPD in 2005 [9]. The COPD prevalence in Europe is 4-10% [2]. It has been estimated that about 300,000 people suffer from this disease in our country [6]. Most of COPD patients remain undiagnosed [10], or the disease is diagnosed in its advanced stages (GOLD stage III and IV; GOLD – Global Strategy for the diagnosis, management and prevention of chronic obstructive pulmonary disease) [11]. COPD mortality rates vary from 6/100,000 people in Greece to 95/100,000 people in Kyrgyzstan [2]. With the standardized COPD mortality rate of 19.0/100,000 people in 2007, Serbia ranges among the countries having a moderate risk of COPD-induced deaths [8].

According to the World Health Organization reports, COPD is the fourth leading death cause of all chronic diseases [11]. Unlike cardiac diseases, which are the leading death cause in the world, COPD has exhibited an increasing mortality rate in the last decade, which is also expected in the next decades, together with a future increasing prevalence of the disease [12]. COPD is predicted to emerge as the third leading death cause of all chronic diseases by the year 2030 [9].

Asthma and COPD have significant socio-economic consequences on both an individual and a social community. COPD and asthma take the 12th



Graph 1. Structure of the study population in relation to the diagnosis made by a pulmonologist

Grafikon 1. Struktura ispitivane populacije u odnosu na dijagnozu lekara specijaliste

and 25th position, respectively, among all Disability adjusted life years (DALY) causes; in addition, COPD is predicted to take the 5th position in 2030, and will thus emerge as the leading DALY cause of all respiratory diseases. The total asthma and COPD costs in the European Union amount to about 50 billion euros. Most of asthma and COPD-related costs are the indirect ones, resulting from the affected subjects' absence from work, followed by the costs of applied drugs and ambulatory treatment. The latest data suggest that the costs of hospitalizations of asthma and COPD patients make almost one half of hospital treatment costs of all respiratory diseases in the European Union [13].

Bearing in mind a wide spread and substantial economic impact of asthma and COPD due to their high morbidity and great consumption of hospital resources as well as a constantly increasing COPD mortality usually due to an inadequate and late diagnosis, this study has been designed with an aim to establish the frequency of asthma and COPD in primary care patients as well as to understand the basic clinical features, spirometry parameters and the level of correlation in the diagnosis of asthma and COPD between primary care physicians and pulmonologists.

Material and Methods

Within the study "Project spirometry-early detection, prevention and treatment of chronic obstructive pulmonary disease and asthma", 2074 primary care patients were selected in the following centers: Clinical Center of Serbia, Belgrade; the Institute for Pulmonary Diseases and Tuberculosis, Belgrade; Clinical Center Kragujevac, Kragujevac and Polyclinic of the Institute for Pulmonary Diseases of Vojvodina, Sremska Kamenica, Serbia. This prospective study was performed between October 2009 and June 2010 with a winter pause (January-March 2010). During regular general practitioner (GP) visits the patients were asked the following questions:

1. Are you are a current or ex-smoker?
2. Do you have expectoration in the morning?
3. Do you get breathless during exercise?
4. Do you cough at night?

5. Do you cough or have wheezing after you exercise?

6. Do you have shortness of breath, wheezing or cough after being exposed to allergens or air pollution?

If the patients answered "yes" to one or more of the questions, they were referred to a specialized institution for a diagnostic work-up that included spirometry. During GP visits these selected patients were given the 11-item closed questionnaire with questions regarding demographic data, smoking status, history of pulmonary diseases, respiratory symptoms and frequency of doctor visits. On the same occasion, the GPs filled in the protocol that included patients' age, diagnosis of respiratory diseases, and satisfaction with the level of disease control. During their visit to the pulmonologist, every patient underwent spirometry. The spirometry was performed according to the 2005 European respiratory society/American thoracic society (ERS/ATS) recommendations [14]. Detailed medical history was taken and clinical exam was performed by the pulmonologist and the relevant parameters were written in a specially designed protocol that included data on diagnosis, spirometry and level of disease control.

The continuous variables are presented as the mean value $\pm$ standard deviation, while the categorical variables are presented as full numbers and percentages. The continuous variables were compared by a Student's t-test and Mann-Whitney U test, while the comparison of categorical variables was done by χ^2 test. The agreement on diagnosis between GPs and pulmonologists was calculated using κ (kappa) coefficients ($\kappa > 0.75$ excellent agreement; $\kappa \geq 0.4$ and $\kappa \leq 0.75$ good agreement; $\kappa < 0.4$ weak agreement). The p value $p < 0.05$ was considered statistically significant.

Results

The study included 2074 patients in primary care practice, 61.6% women and 38.4% men, their average age being 54 ± 15.5 years. The baseline characteristics of the patients are presented in **Table 1**.

Most of the patients were current 40.3%) or ex-smokers, while 27.3% were non smokers. The most frequent symptoms which made them visit the doctor were shortness of breath (84.9%), mostly during stair climbing (53.7%); cough (79.1%), mostly in the morning after waking up (35.6%); and wheezing (64.3%). More than half of the patients

Table 1. Baseline characteristics

Tabela 1. Osnovne karakteristike pacijenata

Age, years, $\bar{x} \pm SD$ Godine života	54 $\pm$ 15.5	
	n	%
Male/Muški pol	796	38.4
Smoking history/Pušački status		
Smokers/Pušači	836	40.3
Ex-smokers/Bivši pušači	568	27.4
Non-smokers/Nepušači	567	27.3
Symptoms/Simptomatologija		
Shortness of breath/Nedostatak daha	1610	84.9
Cough/Kašalj	1481	79.1
Wheezing/Sviranje u grudima	1168	64.3
Complaints/Tegobe		
Do not affect daily life/Ne utiču na svakodnevni život	368	20.1
Affect me as much as my peers/Utichu koliko i na moje vršnjake	379	20.7
Affect me more than my peers/Utichu znatno više nego na moje vršnjake	353	19.3
Have major affect on daily life/Izuzetno me ometaju u svakodnevnom životu	525	28.7
Disturb sleep/Ometaju me u spavanju	383	20.9
Previous visits to the doctor/Prethodne posete lekaru		
None/Nije posetilo lekara	546	28.6
Visited doctor/Posetili su lekara	1364	71.4
Once or twice/1-2 puta	643	47.8
3-6 times/3-6 puta	371	27.6
≥ 7 times/ ≥ 7 puta	204	15.2
Do not know how many times/Ne zna koliko puta	146	10.8
Satisfaction with their own health status/Zadovoljstvo sopstvenim zdravstvenim stanjem		
Completely dissatisfied/Potpuno nezadovoljni	125	6.8
Mostly dissatisfied/Uglavnom nezadovoljni	315	17.0
Neither satisfied nor dissatisfied/Ni zadovoljni ni nezadovoljni	489	26.5
Mostly satisfied/Uglavnom zadovoljni	364	19.7
Completely satisfied/Potpuno zadovoljni	99	5.6
Do not know the answer/Ne znam odgovor	456	24.7

Table 2a. Differences in the diagnosis of asthma among general practitioners and specialist physicians
Tabela 2a. Razlike u dijagnozi astme između lekara opšte prakse i lekara specijaliste

Specialist physician's diagnosis/ <i>Dijagnoza lekara specijaliste</i>							
		Asthma/ <i>Astma</i>				Total/ <i>Ukupno</i>	p
				Yes/ <i>Da</i>	No/ <i>Ne</i>		
General practitioner's diagnosis <i>Dijagnoza lekara opšte prakse</i>	Asthma	Yes	n	186	86	272	<0.001
		<i>Da</i>	%	9.0	4.1	13.1	
		No	n	269	1533	1802	
		<i>Ne</i>	%	13.0	73.9	86.9	
		Total	n	455	1619	2074	
		<i>Ukupno</i>	%	21.9	78.1	100.0	

(59%) stated that those symptoms had major affect on their daily lives. The complaints were characterized as severe in 28.7% of the cases. Almost one third of the patients did not visit their GPs (28.6%), while 71.4% visited their GPs, most of them once or twice (47.8%), followed by 3 to 6 times (27.6%), while 15.2% of the patients visited their doctor seven or more times. When asked "Are you satisfied with the present situation and control of your lung disease?" most of the patients responded "Neither satisfied nor dissatisfied" (23.6%) and "Do not know the answer" (24.7%), whereas 23.8% of the patients were dissatisfied. Asthma was diagnosed in 272 (13.1%), and COPD in 394 (20%) patients in primary care practice. Among the primary care physicians, almost half (47.8%) of them were not satisfied with the achieved level of control in asthma and COPD patients.

During the exam in a specialized institution, the airway obstruction (Forced expiratory volume in once second (FEV₁)/Forced vital capacity (FVC)<70%) was present in 35% of the patients. COPD was diagnosed in 454 (21.9%), and asthma in 455 (21.9%) of the patients, while in 14 patients both COPD and asthma were diagnosed (**Graph 1**). COPD was newly diagnosed in 226 (10.9%), and asthma in 269 (13%) patients. There was a moderate agreement between the pulmonologists and GPs on the diagnosis of COPD (kappa 0.41, 95%CI 0.36-0.46) and asthma (kappa 0.42, 95% CI 0.37-0.465). A pulmonary specialist did not confirm the disease in a significant number of patients who had been diagnosed to have asthma or COPD by a GP (**Table 2a and 2b**).

The baseline characteristics of patients with chronic obstructive pulmonary disease and asthma are presented in **Table 3**. Most of the patients with COPD were in stage I (n=141, 31.4%) and II (n=220, 49.0%), followed by stage III (n=77, 17.1%) and IV (n=11, 0.02%) according to Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease (GOLD) [11]. COPD patients were mostly current or ex-smokers (n=384, 79.4%). There was no statistically significant difference in the number of current or ex-smokers in relation to the GOLD stage (stage I 88.2%, stage II 88.7%, stage III 86.3% and stage IV 90.9%, p=0.94).

The diagnosis of asthma was associated with allergic rhinitis in 10% of the cases. Most patients with asthma had partially controlled (n=216, 52.5%) or uncontrolled disease (n=133, 32.4%). Asthma was completely controlled more frequently among non-smokers; the difference, however, was not statistically significant (n=26, 18.3% versus n=29, 13.8%, p=0.26).

Discussion

The study results showed a significant frequency of asthma and chronic obstructive pulmonary diseases among primary care patients. Many of them were not satisfied with their current health condition, and almost half of them represented new cases.

The majority of the patients included in this study belonged to the productive, actively working age group; both sexes were evenly affected. In the European Union, chronic obstructive pulmonary diseases (62.4%) and asthma (21.4%) are

Table 2b. Differences in the diagnosis of COPD among general practitioners and specialist physicians
Tabela 2b. Razlike u dijagnozi hronične opstruktivne bolesti pluća između lekara opšte prakse i lekara specijaliste

		Specialist physician's diagnosis/ <i>Dijagnoza lekara specijaliste</i>					
		COPD/ <i>HOBP</i>					
General practitioner's diagnosis <i>Dijagnoza lekara opšte prakse</i>	COPD <i>HOBP</i>			Yes/ <i>Da</i>	No/ <i>Ne</i>	Total/ <i>Ukupno</i>	p
		Yes	n	228	166	394	0.01
		<i>Da</i>	%	11.6	8.4	20.0	
		No	n	226	1349	1575	
		<i>Ne</i>	%	11.5	68.5	80.0	
		Total	n	454	1515	1969	
		<i>Ukupno</i>	%	23.1	76.9	100.0	

Table 3. Characteristics of patients with chronic obstructive pulmonary disease and asthma
Tabela 3. Osnovne karakteristike pacijenata sa hroničnom opstruktivnom bolesti pluća i astmom

	COPD/HOBP		Asthma/Astma	
Age, years/Godine $\bar{x} \pm SD$	62.96 $\pm$ 10.4		49.5 $\pm$ 16.8	
	n	%	n	%
Male/Muški pol	211	47.9	170	40.0
Smoking history/Pušački status				
Non-smokers/Nepušači	54	12.3	169	40.0
Ex-smokers/Bivši pušači	162	37.0	127	30.0
Smokers/Pušači	222	50.1	127	30.0
Symptoms/Simptomatologija				
Shortness of breath/Nedostatak daha	397	94.3	363	87.3
Cough/Kašalj	343	82.6	321	77.8
Wheezing/Sviranje u grudima	320	79.0	307	75.6
Symptoms affect daily life/Problemi sa disanjem utiču na životnu aktivnost	283	69.2	346	84.4
Newly diagnosed/Novootkriveni	226	49.8	269	59.1
FEV ₁ (%), $\bar{x} \pm SD$	69.20 $\pm$ 21.82		86.07 $\pm$ 21.30	

FEV₁ -Forced expiratory volume in one second/Forsirani ekspiratorni volumen u sekundi

the most common cause of absence from work of all respiratory diseases [2]. In our study, the diagnosis of the COPD was established in 454 (21.2%) cases. In Europe, 4-10% of the adults suffer from COPD. A slightly higher percentage of COPD in our study was due to the fact that the patients already suspected for COPD by a general practitioner were included, unlike other prevalence studies which selected their subjects from the general population. Furthermore, some data suggest a higher COPD incidence in East than in West Europe. Milenkovic et al. reported a similar prevalence of chronic bronchitis in Belgrade area (21.6%) [15]. In a Swedish study of the patients with an acute respiratory infection, treated in the primary care, COPD was diagnosed in 27% of the cases [16]. Of particular importance is the fact that most COPD cases are diagnosed in stages III and IV of the disease, when the respiratory reserve is already reduced by over 50%, while the greatest reduction of lung function parameters occurs in the disease stages I and II [17]. Most patients included in our study are new cases with the early disease stage, which points to the importance of a timely referral of the patients at risk (smokers and the subjects with respiratory symptoms) by a general practitioner, thus enabling the early treatment and adequate life style amendment. The most common symptoms for referring a patient to a pulmonary specialist were shortness of breath and cough. As most patients were newly diagnosed due to a careful screening by a general practitioner, it may be concluded the patients themselves and the people in their surroundings have not paid enough attention to the symptoms often qualified as "a normal smoking cough" or aging-induced reduction of their physical performance, although over one half of newly diagnosed patients reported that their symptoms affected their routine activi-

ties. For these reasons, the patients usually see a doctor when the disease has already advanced and the lung impairment has become irreversible, thus limiting the therapeutic options. The issue of inadequate diagnosis and treatment of COPD is present in other countries as well. In the United States, 50% of COPD patients remain undiagnosed [18]. Rudolf et al. report that almost 75% of COPD patients in West Europe do not have the adequate diagnosis and treatment [10], most of them in the GOLD stages I and II [16]. Sandelowsky et al. have reported that middle- and old-aged smokers with acute respiratory infection, treated in the primary care, often have an undiagnosed COPD; therefore, the authors suggest to control spirometry parameters in these patients four weeks after the treatment is discontinued [16]. COPD and asthma often fail to be recognized and diagnosed in the patients over 50 with a chronic cough [19]. In our study, over one half of the examined patients with asthma and COPD were new cases. On the other hand, a significant number of the patients (8%) had a former COPD diagnosis that was not confirmed by a specialist. Buffels et al. [20] reported that the disease was not confirmed by a specialist in 25% of the patients who had received bronchodilators in the primary care. In their recent study, Melbay et al reported that the former primary care diagnosis of COPD was not confirmed by spirometry parameters in 32% of the patients [21]. Zwar et al. registered a substantial number of the patients treated for COPD in the primary care whose disease did not meet spirometry criteria (42%). Most frequently, those were the patients with co-morbidities [22]. The reported data emphasize the need for continuous education in the field of asthma and COPD, so that the diagnosis may be established in compliance with current diagnostic criteria, based on spirometry tests because

many other cardiovascular and respiratory diseases may have similar symptoms. Regular controls by a specialist are also very important since a number of those patients once diagnosed to have the disease were lost in the long-term follow-up.

In our study, one third of the patients with asthma and one half of COPD patients were active smokers. Milenkovic et al. reported similar findings [15]. Tobacco smoke is the most frequent, preventable risk factor for pulmonary diseases [23]. Smokers have the risk for COPD and lung cancer six and ten times higher, respectively than the general population [2]. The patients with stage IV COPD who smoke have a worse long-term survival than non-smokers with the same disease stage [24]. Smoking cessation improves the general health condition, slowing down further lung function deterioration in COPD patients [25]. However, many patients continue smoking even after a respiratory disease is diagnosed. Although a reducing tendency in the number of smokers has been observed in Serbia, the statistical data for 2006 showed that 33.6% of the adult population of Serbia were active smokers, over three fifths were exposed to tobacco smoke in their homes, and almost one half at work [8]. Bearing in mind that the smoking habit is rather widely spread, which is also the case in our examined group, adequate measures have to be taken at the national level in order to reduce the number of both active and passive smokers, and educational programs should be implemented to explain the harmful effects of smoking on the occurrence and progression of respiratory diseases.

In the territory of Belgrade, the prevalence of asthmatic symptoms in the adult population amounts to 12.5% [15]. In our study, the diagnosis of asthma was confirmed in 455 (22%) subjects. Although our study sample included the primary care patients in whom a respiratory disease had been suspected in a screening procedure, the frequency of asthma in our study, as correlated to the examined population, was probably underestimated because the spirometry findings may have been normal during the symptom-free period. International studies have pointed out the fact that asthma remains undiagnosed and inadequately treated in many parts of the world [26]. Irregular controls and late diagnosis of asthma result in suboptimal administration of drugs, particularly corticosteroids, which often causes recurrent exacerbations. Fatal outcomes are also due to inadequate

treatment or not taking the recommended treatment [27]. The majority of patients in our study had either an undiagnosed or poorly controlled disease. Furthermore, the disease was not confirmed by a specialist in 4% of the patients with the diagnosis of asthma. In their study of the Canadian population, Aaron et al found that almost one third of the patients diagnosed to have asthma failed to meet the diagnostic criteria defined in the current guidelines [28], which may result in non-rational administration of drugs.

With respect to the frequency of asthma and COPD, as well as the importance of early diagnosis and therapeutic intervention, the European Respiratory Society proclaimed the year 2010 for the year of the lungs, and the 14th October the day of spirometry. The priorities of this campaign are to improve our awareness of these diseases and to emphasize the importance of their early diagnosis as well as to improve the treatment and care of the affected patients. The early detection is primarily focused onto the primary care because this is where the patient has the first contact with the health system. Carefully selected patients should undergo spirometry tests on time. The spirometry examination is a non-invasive procedure, which is easy to be done and is exceptionally cost-effective for the diagnosis of obstructive pulmonary diseases [29].

Conclusions

The results of our study demonstrate a significant number of asthma and chronic obstructive pulmonary disease patients in the examined population. The high number of newly diagnosed cases suggests that both asthma and chronic obstructive pulmonary disease are still unrecognized and undertreated. On the other hand, a significant number of patients have been misdiagnosed as having asthma or chronic obstructive pulmonary disease. Bearing in mind a wide spread and substantial health and economic impact of asthma and chronic obstructive pulmonary disease on both an individual and a social community, there is a need for a strategic action aimed at early detection and therapy of both diseases according to current recommendations. There is also a need for continuous education of both physicians and patients and follow up of long term effects of the program.

References

1. Masoli M, Fabian D, Holt S, Beasley R. The global burden of asthma: executive summary of the GINA Dissemination Committee report. *Allergy* 2004;59(5):469-78.
2. European lung white book. Brussels, Belgium: European Respiratory Society and the European Lung Foundation; 2003.
3. Janson C, Anto J, Burney P, Chinn S, de Marco R, Heinrich J, et al. The European Community Respiratory Health Survey: what are the main results so far? *Eur Respir J* 2001;18(3):598-611.
4. Sembajwe G, Cifuentes M, Tak SW, Kriebel D, Gore R, Punnett L. National income, self-reported wheezing and asthma diagnosis from the World Health Survey. *Eur Respir J* 2010;35(2):279-86.
5. The global asthma report 2011. Available from: <http://www.globalasthmareport.org/>. Accessed Nov 20, 2011.
6. Ministarstvo zdravlja Republike Srbije. Istraživanje zdravlja stanovnika Republike Srbije, 2006. godina: osnovni

rezultati. Beograd: Ministarstvo zdravlja Republike Srbije; 2007.

7. Global Initiative for asthma. Global strategy for asthma management and prevention. Available from: <http://www.ginasthma.com>. Accessed March 20, 2011.

8. Zdravlje stanovnika Srbije: analitička studija 1997-2007. Available from: <http://www.batut.org.rs/download/publikacije/Zdravlje%20stanovnika%201997-2007.pdf>. Accessed March 10, 2011.

9. World Health Organization. Chronic obstructive pulmonary disease (COPD). Available from: <http://www.who.int/respiratory/copd/en/index.html>. Accessed March 20, 2011.

10. Rudolf M. The reality of drug use in COPD: the European perspective. *Chest* 2000;117:29-32.

11. Pauwels RA, Buist AS, Calverley PM, Jenkins CR, Hurd SS. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. NHLBI/WHO Global Initiative for Chronic Obstructive Lung Disease (GOLD) workshop summary. *Am J Respir Crit Care Med* 2001;163(5):1256-76.

12. Jemal A, Ward E, Hao Y, Thun M. Trends in the leading causes of death in the United States, 1970-2002. *JAMA* 2005;294(10):1255-9.

13. The cost of respiratory health in Europe. Available from: <http://www.ers-education.org/pages/default.aspx?id=2320&idBrowse=82299&det=1>. Accessed May 20, 2011.

14. Brusasco V, Crapo R, Viegi G. Coming together: the ATS/ERS consensus on clinical pulmonary function testing. *Eur Respir J* 2005;26(1):1-2.

15. Milenkovic B, Mitic-Milicic M, Rebic P, Vukcevic M, Dudvarski-Ilic A, Nagorni-Obradovic L, et al. Asthma and chronic bronchitis symptoms among adult population of Belgrade. *Srp Arh Celok Lek* 2011;139(3-4):149-54.

16. Sandelowsky H, Stallberg B, Nager A, Hasselstrom J. The prevalence of undiagnosed chronic obstructive pulmonary disease in a primary care population with respiratory tract infections: a case finding study. *BMC Fam Pract* 2011;12:122.

17. Vestbo J, Anderson W, Coxson HO, Crim C, Dawber F, Edwards L, et al. Evaluation of COPD Longitudinally to Identify Predictive Surrogate End-points (ECLIPSE). *Eur Respir J* 2008;31(4):869-73.

Rad je primljen 18. V 2012.

Recenziran 28. IX 2012.

Prihvaćen za štampu 18. X 2012.

BIBLID.0025-8105(2013):LXVI:1-2:46-52.

18. Fromer L. Diagnosing and treating COPD: understanding the challenges and finding solutions. *Int J Gen Med* 2011;4:729-39.

19. Broekhuizen BD, Sachs AP, Hoes AW, Moons KG, van den Berg JW, Dalinghaus WH, et al. Undetected chronic obstructive pulmonary disease and asthma in people over 50 years with persistent cough. *Br J Gen Pract* 2010;60(576):489-94.

20. Buffels J, Degryse J, Liistro G, Decramer M. Differential diagnosis in a primary care population with presumed airway obstruction: a real-life study. *Respiration* 2012;84(1):44-54.

21. Melbye H, Drivenes E, Dalbak LG, Leinan T, Hoegh-Henrichsen S, Ostrem A. Asthma, chronic obstructive pulmonary disease, or both? Diagnostic labeling and spirometry in primary care patients aged 40 years or more. *Int J Chron Obstruct Pulmon Dis* 2011;6:597-603.

22. Zwar NA, Marks GB, Hermiz O, Middleton S, Comino EJ, Hasan I, et al. Predictors of accuracy of diagnosis of chronic obstructive pulmonary disease in general practice. *Med J Aust* 2011;195(4):168-71.

23. Marsh S, Aldington S, Shirlcliffe P, Weatherall M, Beasley R. Smoking and COPD: What really are the risks? *Eur Respir J* 2006;28(4):883-4.

24. Tot Veres K. Hronična opstruktivna bolest pluća i pušačke navike. *Med Pregl* 2012;65(3-4):146-51.

25. Fletcher C, Peto R. The natural history of chronic airflow obstruction. *Br Med J* 1977;1(6077):1645-8.

26. Laloo UG, Walters RD, Adachi M, de Guia T, Emelianov A, Fritscher CC, et al. Asthma programmes in diverse regions of the world: challenges, successes and lessons learnt. *Int J Tuberc Lung Dis* 2011;12:1574-87.

27. Burr ML, Davies BH, Hoare A, Jones A, Williamson IJ, Holgate SK, et al. A confidential inquiry into asthma deaths in Wales. *Thorax* 1999;54(11):985-9.

28. Aaron SD, Vandemheen KL, Boulet LP, McIvor RA, Fitzgerald JM, Hernandez P, et al. Overdiagnosis of asthma in obese and nonobese adults. *CMAJ* 2008;179(11):1121-31.

29. Derom E, van Weel C, Liistro G, Buffels J, Schermer T, Lammers E, et al. Primary care spirometry. *Eur Respir J* 2008;1:197-203.