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## EVALUATION OF KNOWLEDGE ON DOPING IN SPORTS AMONG SERBIAN GENERAL PRACTITIONERS

*PROCENA NIVOVA INFORMISANOSTI SRPSKIH LEKARA OPŠTE MEDICINE O DOPINGU U SPORTU*

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### Summary

**Introduction.** In the case of illness or injury, athletes, like other patients, seek medical care from general practitioners. Athletes, however, need to be aware of anti-doping regulations. The aim of this study was to evaluate the knowledge and attitudes to doping in sports among general practitioners in Vojvodina. **Material and Methods.** This cross-sectional study included 276 participants of both sexes and different ages. The data collection was performed using a questionnaire, as a non-standard research technique. The statistical analysis correlated the gathered data in regard sex and age of examinees. **Results.** Only a small number of respondents is well informed about both the *List of Prohibited Doping Substances and Methods* and the *Law on Prevention of Doping in Sports* (10.5% and 8%, respectively). Also, only 2.5% of examinees thought they were qualified to treat athletes. Correct answers that furosemide, pseudoephedrine and tamoxifen are prohibited in sports were given by a small number of respondents (36.6%, 56.9% and 29%, respectively). On the other hand, the fact that inhaled salmeterol, inhaled corticosteroids, enalapril and diclofenac are allowed in sports, was known by 42%, 40.6%, 60.9% and 52.9% of respondents, respectively. Doctors had different attitudes towards doping in sports. **Conclusion.** The results of this study showed that general practitioners have insufficient knowledge on different aspects of doping in sports. Since they treat all patients, including athletes, their knowledge should be on a higher level in order to avoid accidental doping. The obtained results point to the need for further education of general practitioners on doping in sports.

**Key words:** Doping in Sports; Athletes; General Practitioners; Surveys and Questionnaires; Health Knowledge, Attitudes, Practice

### Introduction

Doping in sports is as old as sports, but it grew remarkably during the 20<sup>th</sup> century, especially during the 1990s with development of amphetamines (1950s) and anabolic steroids (1960s) [1], as well as peptide hormones such as human growth hormone (HGH) (1980s) and erythropoietin (1990s) [2]. Recently, gene doping has been identified as a major problem in sports, and the extent of its long-term

### Sažetak

**Uvod.** Sportisti, kao i svi drugi pacijenti, u slučaju bolesti ili povrede, javljaju se lekaru radi lečenja i ordiniranja terapije. S druge strane, sportisti podležu antidoping pravilima. Cilj ovog istraživanja je da se proceni nivo informisanja, znanje i stavovi o doping u lekara opšte medicine sa teritorije Vojvodine. **Materijal i metode.** Istraživanje je realizovano kao transverzalna studija empirijskog karaktera i uključivalo je 276 ispitanika različitog pola i godina starosti. Za prikupljanje podataka korišćen je anketni list kao nestandardna istraživačka tehnika. Statističkom analizom rezultata poređeni su rezultati u odnosu na pol i godine ispitanika. **Rezultati.** Mali broj ispitanika je informisan o *Listi zabranjenih supstanci i metoda u sportu*, kao i o *Zakonu o sprečavanju dopinga u sportu* (10,5% i 8%). Samo 2,5% njih smatra da su dobro pripremljeni da leče pacijente koji su sportisti. Tačan odgovor da su furosemid, pseudoefedrin i tamoksifen zabranjeni u sportu dalo je 36,6%, 56,9% i 29% ispitanih lekara. Sa druge strane, da su salmeterol unet inhalacijom, inhalatorni kortikosteroidi, enalapril i diklofenak dozvoljeni u sportu tačno je odgovorilo 42%, 40,6%, 60,9% i 52,9% ispitanika. Učesnici su imali polivalentne stavove po pitanju dopinga u sportu. **Zaključak.** Rezultati ovog istraživanja pokazali su da su lekari opšte medicine nedovoljno informisani o različitim aspektima dopinga u sportu. Budući da su uključeni u lečenje pacijenata koji mogu biti sportisti, njihovo znanje o doping u bi trebalo da je na višem nivou. Rezultati ovog istraživanja bi mogli da budu dobra smernica za planiranje aktivnosti koje bi mogle da poboljšaju edukaciju lekara opšte medicine o doping u sportu.

**Glavne reči:** dopingovanje u sportu; sportisti; lekari opšte prakse; ankete i upitnici; znanje o zdravlju, stavovi, praksa

health consequences is difficult to predict, but likely to be substantial [3]. The international fight against doping took a giant step forward in 1999, with the foundation of the World Anti-Doping Agency (WADA), and after that with publishing of the World Anti-Doping Code (first edition) in 2003. The *List of Prohibited Doping Substances and Methods* is published every year, outlining substances and methods prohibited in competition and out of competition.

**Abbreviations**

HGH	– human growth hormone
WADA	– World Anti-Doping Agency
GP	– general practitioners
TUE	– Therapeutic Use Exemption

General practitioners (GPs) are a vital part of the sport chain. In their everyday practice they prescribe medicines, and they have to be very careful when the patient is an athlete. Athletes are liable to anti-doping rules and procedures, prohibited in sports. GPs may negligently prescribe prohibited drugs to the athletes, which results in positive doping tests and penalties for the athletes [4, 5]. According to the WADA Code [6], an athlete is always held responsible for violating anti-doping rules, regardless of whether he was familiar with them or he did it out of ignorance.

Moreover, GPs can be involved in sports by [7]:

- Looking after athletes (i.e. in a sporting club)
- Informing athletes about prohibited substances (i.e. for self-medication)
- Being asked to be stakeholders in prevention actions
- Etc.

All around the world, GPs are more or less involved in sports. Doctors do not appear to have much knowledge on the subject of doping, as underlined by a study conducted in the Netherlands, including 1000 GPs, according to which 85% of respondents admitted that they were not familiar with banned substances or their side effects [8]. Another study included 400 GPs in West Sussex, Great Britain; 12% of the respondents answered that physicians can prescribe anabolic steroids for non-medical reasons, and only 35% of them knew that the Prohibited List appears in the British National Formulary [9]. Many physicians are faced with doping in their everyday work. More than 30% of French GPs [10, 11], 28% of Irish GPs [12], 18% of

Senegalese doctors [13], 12% of Austrian GPs [14], as well as Dutch GPs [8], were asked to prescribe banned substances to athletes over the last 12 months, and 18% of British GPs [9] were asked to prescribe particularly anabolic steroids during the same period. Physicians were aware of their role in doping prevention [8, 11, 12, 14, 15], even though most of them considered themselves poorly trained in this domain [11].

According to information from 2008, 12% of Serbian doctors who worked in sports associations were GPs [16].

Based on everything stated above, it can be concluded how significant it is, not only for athletes, coaches, and sport physicians as well, but also for GPs, to have basic knowledge and current information resources on doping.

The aim of this research was to establish the level of knowledge and attitudes towards doping among general practitioners in Vojvodina. Moreover, the aim was also to correlate respondents' answers with respect to sex and age.

**Material nad Methods**

This survey was a cross-sectional study with empirical characteristics. According to power analysis (sample size of  $n=975$ , confidence level 95%, confidence interval 5%), the study included 276 participants of both sexes and different age.

The participants in this survey were primary care physicians - general practitioners (GPs). The author decided to conduct the survey among GPs from Vojvodina, province of Serbia, with its established healthcare system functioning within the healthcare system of Serbia. GPs who took part in the survey were randomly selected from the list of GPs from Vojvodina, provided by the Ministry of Health of the Republic of Serbia (276 out of 975).

**Table 1.** Knowledge on doping among GPs  
**Tabela 1.** Informisanost lekara opšte medicine o dopingu

Questions Pitanja	Answers/Odgovori						$\chi^2$ -test p	ANOVA p
	Yes Da		No Ne		I don't know Ne znam			
	n	%	n	%	n	%		
Are you informed about the <i>Prohibited List of Substances and Methods</i> for 2014?/Da li ste upoznati sa Listom zabranjenih supstancija i metoda u sportu za 2014. godinu?	29	10.5	237	85.9	10	3.6	0.045	0,281
Are you informed about the <i>Law on Prevention of Doping in Sports</i> ?/Da li ste upoznati sa Zakonom o sprečavanju dopinga u sportu?	22	8.0	231	83.7	23	8.3	0.925	0,729
Do you think that your knowledge on doping, gained during your previous education or otherwise, is sufficient to treat athletes?/Da li mislite da imate dovoljno znanja iz oblasti dopinga, stečenog školovanjem, usavršavanjem ili na neki drugi način, koje bi moglo biti korisno prilikom lečenja pacijenata koji su sportisti?	7	2.5	216	78.3	53	19.2	0.001	0,031

**Table 2.** Knowledge of respondents about specific substances  
**Tabela 2.** Znanje ispitanika o ponuđenim supstancijama

Is this substance allowed in sports?/Da li je dozvoljena upotreba u sportu sledećih supstancija:	Answers/Odgovori					$\chi^2$ -test ANOVA		
	Yes/Da		No/Ne		I don't know/Ne znam		p	p
	n	%	n	%	n	%		
Furosemide/Furosemid	79	28.6	101	36.6	96	34.8	0.415	0,110
Salmeterol (inhaled)/Salmeterol unet inhalacijom	116	42.0	77	27.9	83	30.1	0.930	0,167
Pseudoephedrine/Pseudoefedrin	52	18.8	157	56.9	67	24.3	0.503	0,995
Corticosteroids (inhaled)/Inhalacioni kortikosteroidi	112	40.6	85	30.8	79	28.6	0.578	0,038
Diclofenac/Diklofenak	168	60.9	26	9.4	82	29.7	0.927	0,201
Enalapril/Enalapril	146	52.9	29	10.5	101	36.6	0.465	0,833
Tamoxifen/Tamoksifen	32	11.6	80	29.0	164	59.4	0.881	0,145

The data collection was done through a questionnaire, a non-standard research technique. The questionnaire included 15 items. The closed-ended questions covered general information about doping, pharmaceutical agents GPs may be in contact with on everyday basis (drugs in the questionnaire were from the group of most prescribed medicines in Serbia), and doctors' attitudes to doping. The author supervised the completion of the questionnaires, and assurance of anonymity and confidentiality were given to all participants. The study was conducted in the period December 2014 - May 2015.

The gathered data were processed and analyzed using a computer program SPSS for Windows - version 16.0 (SPSS Inc. USA). Chi-square test was used for comparisons between groups with respect to sex, and analysis of variance (ANOVA) with respect to age (LSD Post Hoc multiple comparisons). The  $p < 0.05$  was considered as statistically significant.

## Results

The study included 276 participants. The mean age was  $38.22 \pm 7.79$  years (range 26 – 60 years). The female to male ratio was 71.4% and 28.6%, respectively.

Our participants' general knowledge about doping is presented in **Table 1**. A great number of participants was not informed about the *Prohibited List* (85.9%) and *Law on Prevention of Doping in Sports* (83.7%). There was a statistically significant difference between the given answers of male and female physicians to the question about the List (positive answers – 15.2% and 8.6%, respectively) ( $p=0.045$ ). When asked if they thought that previous knowledge about doping (from school, faculty, specialization, or some other way) was helpful in work with athletes, only 2.5% of them answered positively, whereas 19.2% answered *I don't know* (difference between the mean age of the participants answering this question showed a statistical significance in all groups – positive answer - 42.86 years, neutral answer - 36.09, and negative answer - 38.60,  $p=0.031$ ); 3.8% of male and 2% of female physicians ( $p=0.001$ ) gave positive answers.

When it comes to questions related to the knowledge about specific substances which are regularly used in the treatment of different diseases, but also as doping (**Table 2**), almost one third of all answers were *I don't know*. Only a small number of examinees gave correct answers that furosemide, pseudoephedrine and tamoxifen were prohibited in sports (36.6%, 56.9% and 29%, respectively). On the other hand, examinees knew that inhaled salmeterol, inhaled corticosteroids, enalapril and diclofenac were allowed in sports: 42%, 40.6%, 60.9% and 52.9%, respectively. Elder participants gave more positive answers about inhaled corticosteroids than neutral answers (39.26 vs. 36.39,  $p=0.012$ ).

The attitudes of GPs to doping are shown in **Table 3**. A large number of GPs who participated in the survey (84.1%) thought that doping was the greatest evil in sports worldwide. Half of respondents agreed that most professional athletes used a prohibited substance at least once in their career (63.3% of male and 44.7% of female physicians, respectively,  $p=0.039$ ). In regard to the impact of doping on athletes' health, not less than 92.4% of respondents thought that doping has negative effects on health, whereas 71.4% of them found that athletes often do not know about the consequences doping may have. The majority (94.8%) agreed that GPs need more education in the field of doping (95.9% of female and 86.1% of male physicians, respectively,  $p=0.006$ ).

## Discussion

The results of this study show how well GPs in Vojvodina are informed on doping in sports. There have been no published papers concerning GPs' knowledge on this subject in Serbia.

The results obtained through this survey carried out among physicians from Vojvodina may reflect the knowledge and attitudes of physicians in the whole Serbia. However, the question of possible regional variations within Serbia (which has not been studied so far) could be the subject of some future research.

General practitioners answered questions about doping and doping substances, but also about their attitudes to doping. The results show that GPs have

**Table 3.** Attitudes of respondents to doping  
**Tabela 3.** Stavovi ispitanika o dopingu

Attitudes/Stavovi	Answers (%) Odgovori (%)			$\chi^2$ -test ANOVA	
	I agree <i>Slazem se</i>	I am not sure <i>Nisam siguran/na</i>	I do not agree <i>Ne slazem se</i>	p	p
Doping is the greatest evil in modern sport. <i>Doping je najveće zlo u savremenom sportu.</i>	84.1	14.1	1.8	0.121	0,168
Most of the high level athletes have used doping at least once in their career. <i>Većina vrhunskih sportista je koristila doping bar jednom tokom svoje karijere.</i>	50.0	35.1	14.9	0.039	0,278
Doping has negative impact on the athletes' health. <i>Doping utiče negativno na zdravlje sportiste.</i>	92.4	7.6	0	0.134	0,983
Athletes are often unaware of the risks which doping may have on their health. <i>Sportisti često ne znaju kakve posledice po zdravlje može imati doping sredstvo.</i>	71.4	16.7	11.9	0.254	0,521
GPs need more education in the field of doping. <i>Lekarima opšte medicine treba više edukacije iz oblasti dopinga.</i>	93.1	6.2	0.7	0.006	0,959

insufficient knowledge about different aspects of doping.

Results presented in **Table 1** indicate that a small number of respondents is well informed about basic documents on doping, such as the Prohibited List and the *Law on Prevention of Doping in Sports*. These results come as no surprise, because Serbian GPs do not have lots of opportunities to read about them. In some countries, GPs know where they can find the List and most of them have it (i.e. BNF, Vidal Dictionary, etc.) [9, 11, 12, 17]. Serbian GPs can only get information about doping through the media or some other source and that is probably why they are not confident if they should be treating sick athletes. Due to the fact that men watch sports more than women [18], it is presumed that they have an opportunity to get more information about doping and prohibited substances than women.

According to the answers related to GPs' knowledge whether certain substances are allowed in sports, it can be concluded that Serbian GPs have insufficient knowledge about that issue. It is connected with the previously mentioned answers showing that many of them have not been informed about the *Prohibited List*. The questionnaire included questions on medicines which are regularly prescribed to patients. For example, furosemide, pseudoephedrine and tamoxifen are on the *Prohibited List* [19] and athletes taking them would be sanctioned for breaking the anti-doping rules if they didn't have a granted TUE (Therapeutic Use Exemption). Furosemide is a diuretic and it is often prescribed by GPs. Diuretics are commonly abused substances in sports [20], and the following example is related to diuretics. In 2010, a Serbian handball player was sanctioned for doping, due to the fact that hydrochlorothiazide (diuretic) was found in his urine [21]. His defense was based on the fact that he used hydrochlorothiazide for regular treatment of high blood pressure (documented by the player) and because

of that his doctor should have informed him whether it was forbidden for athletes. He said that he would have made an application for TUE if he knew that the substance was on the *Prohibited List*. However, the player received a 10 month ineligibility sanction imposed by the Handball Federation of Serbia for breaking the anti-doping rule, although it was done out of ignorance. That was, apparently, aberration of the article 14, paragraph 2, of *Serbian Law on Prevention of Doping in Sports*, which says: "A physician who prescribes prohibited doping substances for the purpose of treatment is obliged to inform the athlete about it, if he/she is advised to continue sports activities" [22]. Pseudoephedrine is a nasal decongestant, also on the *Prohibited List*. It is often used to relieve nasal congestion caused by colds, allergies, and hay fever. There are many medications containing pseudoephedrine on the market, and they are easily obtained by athletes. On the other hand, pseudoephedrine is also a psycho-stimulant, and that is the reason why it is on the *Prohibited List*. Some authors believe that athletes use pseudoephedrine only as a decongestant [23], whereas other authors think that athletes mainly used it as a performance-enhancing drug, not as a decongestant [24, 25]. Nevertheless, as mentioned before, athletes are sanctioned if a doping substance is found in their sample, although it might have been done out of ignorance.

Other substances included in the questionnaire were diclofenac, enalapril, inhaled corticosteroids and inhaled salmeterol, which are not on the *Prohibited List*. In contrast to the respondents' knowledge about diclofenac and enalapril (more than 50% correct answers), less than half of them gave correct answers that both inhaled corticosteroids and inhaled salmeterol are allowed in sports. Both medicines are used in the treatment of asthma. Bearing in mind the prevalence of asthma in general population [26, 27], but also among athletes [28–30], it is presumed that

## QUESTIONNAIRE/UPITNIK

Sex/Pol:

Age/Godine starosti:

1. Please answer the following questions/Molim Vas da zaokružite odgovor na sledeća pitanja:

Are you informed about the Prohibited List of Substances and Methods for 2014?

*Da li ste upoznati sa Listom zabranjenih supstanci i metoda u sportu za 2014. godinu?*

Yes/Da	No/Ne	I don't know/Ne znam
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Are you informed about the Law on Prevention of Doping in Sports?

*Da li ste upoznati sa Zakonom o sprečavanju dopinga u sportu?*

Yes/Da	No/Ne	I don't know/Ne znam
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Do you think that your knowledge on doping, gained during your previous education or otherwise, is sufficient to treat athletes?/Da li mislite da imate dovoljno znanja iz oblasti dopinga, stečenog školovanjem, usavršavanjem ili na neki drugi način, koje bi moglo biti korisno prilikom lečenja pacijenata koji su sportisti?

Yes/Da	No/Ne	I don't know/Ne znam
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2. Is this substance allowed in sports?/Da li je dozvoljena upotreba u sportu sledećih supstanci?:

Furosemide/Furosemid	Yes/Da	No/Ne	I don't know/Ne znam
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Salmeterol (inhaled)	Yes	No	I don't know
<i>Salmeterol unet inhalacijom</i>	<i>Da</i>	<i>Ne</i>	<i>Ne znam</i>

Pseudoephedrine	Yes	No	I don't know
<i>Pseudoefedrin</i>	<i>Da</i>	<i>Ne</i>	<i>Ne znam</i>

Corticosteroids (inhaled)	Yes	No	I don't know
<i>Inhalacioni kortikosteroidi</i>	<i>Da</i>	<i>Ne</i>	<i>Ne znam</i>

Diclofenac/Diklofenak	Yes/Da	No/Ne	I don't know/Ne znam
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Enalapril/Enalapril	Yes/Da	No/Ne	I don't know/Ne znam
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Tamoxifen/Tamoksifen	Yes/Da	No/Ne	I don't know/Ne znam
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3. What is your attitude to doping in sports?/Molim Vas da iskažete mišljenje o sledećim stavovima (tvrdnjama):

Doping is the greatest evil in modern sport./Doping je najveće zlo u savremenom sportu.

I agree	I am not sure	I do not agree
<i>Slažem se</i>	<i>Nisam siguran/na</i>	<i>Ne slažem se</i>

Most of the high level athletes have used doping at least once in their career.

*Većina vrhunskih sportista je koristila doping barem jedanput tokom svoje karijere.*

I agree	I am not sure	I do not agree
<i>Slažem se</i>	<i>Nisam siguran/na</i>	<i>Ne slažem se</i>

Doping has negative impact on the athlete's health.

*Doping utiče negativno na zdravlje sportiste.*

I agree	I am not sure	I do not agree
<i>Slažem se</i>	<i>Nisam siguran/na</i>	<i>Ne slažem se</i>

Athletes are often unaware of the risks which doping may have on their health.

*Sportisti često ne znaju kakve posledice po zdravlje može imati doping sredstvo.*

I agree	I am not sure	I do not agree
<i>Slažem se</i>	<i>Nisam siguran/na</i>	<i>Ne slažem se</i>

GPs need more education in the field of doping.

*Lekarima opšte medicine treba više edukacije iz oblasti dopinga.*

I agree	I am not sure	I do not agree
<i>Slažem se</i>	<i>Nisam siguran/na</i>	<i>Ne slažem se</i>

some patients in the doctor's office may be athletes with asthma. However, severe asthma attacks are treated with oral corticosteroids, which are banned in sports. There is some confusion about whether corticosteroids are allowed in sports, but only corticosteroids administered by oral, intravenous, intramuscular and rectal routes are banned in sports [19].

The majority of examined GPs thought that doping is the greatest evil in modern sport, and half of them believed that most high level athletes used doping at least once in their career. These results show the negative feelings of people about doping, regarding the fact that during and after many sporting events media report on doping of some competitors. Besides, speed, strength and endurance performances in different sports are continuously getting better, and physical appearance of certain athletes may sometimes also raise suspicion [31]. That is why some GPs have doubts whether many sports successes and wins were made with the help of doping. According to the results of the study and regarding the fact that men follow sports more than women [18] and get lots of information about this subject (including pieces of information about doping positive cases), it is presumed that men have more doubts about sports results, whereas women seem to idealize athletes and have more belief in the spirit of sport and fair-play [32].

When it comes to the connection between doping and health, many participants are aware that doping is a health risk, but also think that athletes are often not aware of it. It is good that general practitioners are aware that health has no price and that it can be put at risk by doping. It is known that some GPs were faced with requests of athletes to prescribe banned substances, especially anabolic steroids [9–14]. Therefore, GPs have an important role in doping prevention [14, 15, 17]. On the other hand, athletes themselves sometimes have a different point of view. More than 40 years ago, Dr. Gabe Mirkin asked more than 100 competitive runners if they would take a "magic pill" that guaranteed them an Olympic gold medal but would also kill them within a year, and found that more than one-half of athletes responded that they would take the pill [33]. Similarly, in our previous study including Serbian high level athletes, we found that 5.6% of them admitted they would take a doping drug in order to advance their sports career even though it could have negative consequences on their health (7.5% didn't know) [34].

Our results were compared with the results of other authors. Only 34.5% of French GPs were aware of the French Law concerning protection of health of athletes and fight against doping [11], whereas

even less [8%] of our respondents were aware of the *Serbian Law on Prevention of Doping in Sports*. In regard to the *List of Prohibited Substances and Methods in Sport*, one out of ten (10.5%) participants in this study were informed about it, and much more than that, 46% of team doctors in Malawi (almost half of team doctors were GPs) were informed about the same [35]. One third of British GPs [9] knew that the *List of Prohibited Substances and Methods* was available in the British National Formulary (BNF), and 73% of French GPs [11] and 33% of Irish GPs [12] possessed such a list.

A great number (65%) of GPs from West Sussex answered correctly that inhaled salmeterol and inhaled corticosteroids are allowed in sports [9] with respect to our examinees (42% and 40.6%, respectively).

Lots of French GPs [11] stated that most records have been broken due to doping (83.5%) and that most of the great champions resort to doping (73%), whereas half of the Serbian GPs believe that most professional athletes used a doping agent at least once in their career.

In the present study, the majority of respondents agreed that doping has negative impact on athlete's health (92.4%) and, also, that athletes often do not know about the consequences which doping may have on their health (71.4%). Similarly, 87% of French GPs [10], and 80% of Senegalese doctors [13] believe that doping is a public health problem. A large number of French GPs [10] (83%) and Dutch GPs [8] (85%), consider themselves poorly trained in the field of doping, as well as 65% of Austrian GPs [14] and 69% of team doctors from Malawi [35]. A small number (9%) of Irish GPs [12] felt adequately trained to treat athletes, which is more than respondents in our study (2.5%). Furthermore, the Irish GPs [12] (86%) feel they need further training in relation to doping, and 93.1% of our examinees felt the same.

## Conclusion

The results of this study showed that general practitioners in Vojvodina have insufficient knowledge about doping. Since all patients, including athletes, seek for their help, their knowledge should be on a higher level in order to avoid accidental doping. The respondents' answers showed small differences with respect to sex and age.

These results point to the need for further education of general practitioners on doping in sports. This should include organization of seminars and symposia for general practitioners on this and related topics, as well as lectures on doping in sports for medical students.

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