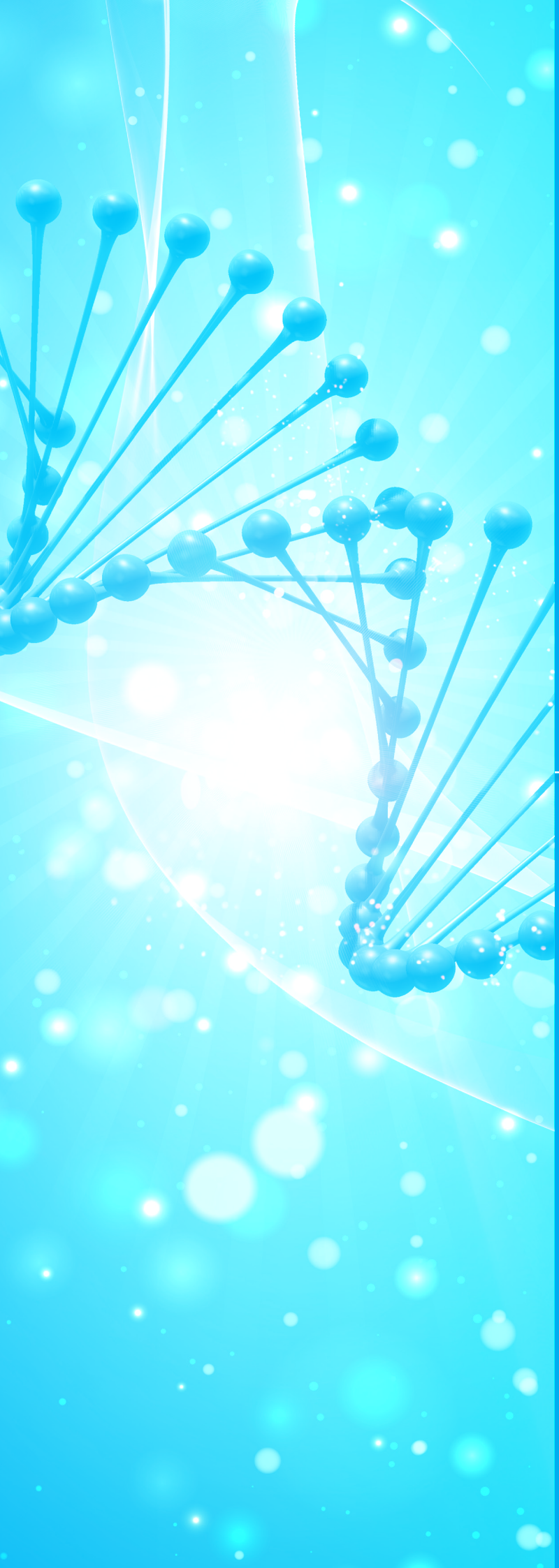

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OBOLEVANJE I UMIRANJE OD RAKA DOJKE U MUŠKOJ I ŽENSKOJ POPULACIJI CENTRALNE SRBIJE U PERIODU 2009-2020.GODINE

Aleksandra Nikolić[1], Danilo Mićanović[2], Petar Mitrašinović[2], Zafir Murtezani[3], Marijana Banašević[4], Sandra Šipetić Grujičić[1*]

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SAŽETAK

Uvod/Cilj: U 2020. godini, rak dojke je vodeći uzrok obolevanja na globalnom nivou kada se posmatraju oba pola zajedno, a zatim slede rak prostate i rak pluća. Međutim, rak dojke je veoma redak kod muškaraca. U okviru ove deskriptivne studije analizirano je obolevanje i umiranje od raka dojke u populaciji muškaraca i žena Centralne Srbije za period od 2009. do 2020. godine.
Metode: Podaci o obolelima i umrlima od raka dojke, kao i o broju stanovnika, po polu i uzrastu, preuzeti su iz publikovanog i nepublikovanog materijala Instituta za javno zdravlje Srbije „Dr Milan Jovanović Batut”. U okviru analize korišćene su opšte, specifične i standardizovane stope incidencije i mortaliteta. *Joinpoint* regresiona analiza je korišćena za analizu trenda kretanja obolevanja i umiranja.
Rezultati: U periodu 2009-2020. godine, prosečna standardizovana stopa incidencije (na 100.000) za rak dojke iznosila je 1,3 za muškarce i 65,3 za žene, a prosečna stopa mortaliteta (na 100.000) 0,4 za muškarce i 19,8 za žene. Tokom posmatranog perioda kod muškaraca dolazi do porasta standardizovane stope incidencije za 1,9% godišnje i stope mortaliteta za 2,4%, ali bez značajnosti. Kod žena značajno raste standardizovana stopa incidencije za 3,5% godišnje u periodu 2013-2020, a standardizovana stopa mortaliteta značajno opada za -0,5% godišnje u periodu 2009-2020. godine. Kod oba pola, stopa mortaliteta i incidencije raste sa godinama starosti, izuzev što je kod žena stopa incidencije za uzrast 70 i više godina bila niža u odnosu na stopu incidencije za uzrast 60-69 godina.
Zaključak: Neophodno je dalje unaprediti sprovođenje organizovanog skrininga za rak dojke kod žena na teritoriji Centralne Srbije, raditi na redukciji i/ili eliminaciji faktora rzika, kao i na podizanju svesti muškaraca da postoji mogućnost da mogu da obolele i od raka dojke.

Ključne reči: deskriptivna studija, rak dojke, muškarci, žene, incidencija, mortalitet, joinpoint regresiona analiza.

Uvod

Prvi put u svetu rak dojke je, 2020. godine, postao vodeći uzrok obolevanja među svim malignim tumorima i to kada se posmatraju oba pola zajedno, a peti je vodeći uzrok umiranja, iza raka pluća, raka kolorektuma, raka jetre i raka želuca (1). Posmatrajući oba pola zajedno, u 2020. godini, u svetu je registrovano 2.261.419 novih slučajeva raka dojke žena, što je 11,7% svih novoobolelih od malignih tumora, a umrlo je 685.000 što je 6,9% svih umrlih od malignoma (1).

Kada se globalno posmatra populacija žena, onda je rak dojke prvi vodeći uzrok obolevanja (čini 24,5% svih obolelih od malignih tumora) i umiranja (čini 15,4% svih umrlih od malignih tumota) (1). Ova bolest se često smatra bolešću žena, iako se javlja kod oko 1% muškaraca (2). To govori da je ovaj maligni tumor veoma redak u muškoj populaciji.

U mnogim studijama ukazano je da postoje velike razlike u stopama incidencije i mortaliteta za

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INCIDENCE AND MORTALITY FROM BREAST CANCER IN THE MALE AND FEMALE POPULATION OF CENTRAL SERBIA IN THE PERIOD 2009-2020

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SUMMARY

Introduction/Aim: In 2020, breast cancer is the leading cause of morbidity globally when considering both sexes together, followed by prostate cancer and lung cancer. However, breast cancer is very rare in men. In this descriptive study, incidence and mortality from breast cancer was analyzed in the population of men and women in Central Serbia for the period from 2009 to 2020.
Methods: Data on patients and deaths from breast cancer, as well as the number of inhabitants, by gender and age, were taken from published and unpublished material of the Institute for Public Health of Serbia "Dr. Milan Jovanović Batut". General, specific and standardized incidence and mortality rates were used in the analysis. Joinpoint regression analysis was used to analyze trends in morbidity and mortality.
Results: In the period 2009-2020. In 2010, the average standardized incidence rate (per 100,000) for breast cancer was 1.3 for men and 65.3 for women, and the average mortality rate (per 100,000) was 0.4 for men and 19.8 for women. During the observed period, the standardized incidence rate for men increased by 1.9% per year and the mortality rate by 2.4%, but without significance. In women, the standardized incidence rate increases significantly by 3.5% per year in the period 2013-2020, and the standardized mortality rate significantly decreases by -0.5% per year in the period 2009-2020. years. In both sexes, mortality and incidence rates increased with age, except that in women the incidence rate for the age of 70 and over was lower compared to the incidence rate for the age of 60-69.
Conclusion: It is necessary to further improve the implementation of organized screening for breast cancer in women in the territory of Central Serbia, to work on the reduction and/or elimination of risk factors, as well as on raising the awareness of men that there is a possibility that they can also get breast cancer.

Key words: descriptive study, breast cancer, men, women, incidence, mortality, joinpoint regression analysis.

Introduction

In 2020, for the first time in the world, breast cancer became the leading cause of morbidity among all malignant tumors when both sexes are observed together and it is the fifth leading cause of death behind lung cancer, colorectal cancer, liver cancer and stomach cancer (1). Looking at both sexes together, 2,261,419 cases of female breast cancer were registered worldwide in 2020, which is 11.7% of all new cases of malignant tumors, while 685,000 died, which is 6.9% of all deaths caused by malignant tumors (1).

When the female population is observed globally, breast cancer is the first leading cause of morbidity (accounting for 24.5% of all patients with malignant tumors) and death (accounting for 15.4% of all deaths from malignant tumors) (1). This disease is often considered as a disease of women, although it occurs in about 1% of men (2).

rak dojke kako unutar jedne zemlje, tako i između različitih zemalja i regiona (3). Najveće stope incidencije za rak dojke su u zemljama koje su prošle ekonomsku tranziciju, a izuzetno visoke stope mortaliteta i rastuća stopa incidencije su u zemljama u tranziciji (1). Procenjuje se da će doći do povećanaja broj novoobolelih (za oko 40%) i broja umrlih (za oko 50%) od raka dojke do 2040. godine (3). Ovo je posledica daljeg porasta broja stanovnika i starenja populacije (3).

Neki od faktora rizika koji se dovode u vezu sa rakom dojke su pozitivna porodična anamneza za rak dojke, stariji uzrast (više od 40 godina), menstruacija u mlađoj dobi, menopauza u starijoj dobi, trudnoća u kasnijim godinama, korišćenje hormona (dugotrajna upotreba kontraceptiva ili hormonska terapija u postmenopauzi), gojaznost, prekomerno konzumiranje alkohola, pušenje, itd. (4). Jako se malo zna o epidemiologiji i etiologiji raka dojke kod muškaraca, u poređenju sa ženama (4,5).

Cilj ove studije je da se analizira kretanje obolevanja i umiranja od raka dojke kod muškaraca i žena u Centralnoj Srbiji za period od 2009. do 2020. godine.

Metode

Za ovu deskriptivnu studiju dobijeni su podaci o novoobolelima i umrlima od raka dojke (šifra C50 prema Međunarodnoj klasifikaciji bolesti, X revizija), kao i o broju stanovnika, po polu i uzrastu, iz publikovanih i nepublikovanih materijala Instituta za javno zdravlje Srbije „Dr Milan Jovanović Batut". Za period od 1999. do 2015. godine podaci su preuzeti iz registara za rak u Centralnoj Srbiji Instituta za javno zdravlje Srbije „Dr Milan Jovanović Batut", a za period 2016-2020. godine korišćeni su nepublikovani podaci Instituta za javno zdravlje Srbije „Dr Milan Jovanović Batut".

U cilju analize podataka korišćene su sirove, specifične i standardizovane stope incidencije i mortaliteta za rak dojke. Direktnom metodom standardizacije izračunate su standardizovane stope incidencije i mortaliteta i to tako što je za standardnu populaciju korišćena standardna populacija sveta prema Segi-ju (1960) (6). U cilju analize kretanja stopa obolevanja i umiranja od raka dojke za period od 1999-2020. godine korišćena je *joinpoint* regresiona analiza (engl. *Joinpoint Regression Program, Version 4.9.0.1. February, 2022; Statistical Methodology and Applications Branch, Surveillance Research Program, National Cancer Institute*), prema metodu Kim i saradnika (7).

Rezultati

U Centralnoj Srbiji, u periodu od 2009. do 2020. godine, prosečno učešće obolelih od raka

Tabela 1. Procentualno učešće novoobolelih i umrlih od raka dojke među novoobolelima i umrlima od svih malignih tumora u muškoj i ženskoj populaciji, Centralna Srbija, 2009-2020. godine

Godine	Procentualno učešće novoobolelih od raka dojke među novoobolelima od svih malignih tumora		Procentualno učešće umrlih od raka dojke među umrlima od svih malignih tumora	
	Muškarci	Žene	Muškarci	Žene
2009	0,4	26,1	0,3	17,5
2010	0,5	25,2	0,4	18,6
2011	0,4	25,7	0,3	18,5
2012	0,4	25,8	0,2	18,0
2013	0,5	20,2	0,2	18,2
2014	0,3	21,3	0,3	17,9
2015	0,5	22,3	0,3	18,9
2016	0,3	23,3	0,4	18,9
2017	0,4	23,1	0,3	19,0
2018	0,4	24,2	0,2	17,5
2019	0,4	24,3	0,4	18,4
2020	0,6	23,0	0,4	19,5
2009-2020	0,4	23,7	0,3	18,4

This means that this malignant tumor is very rare in the male population.

Many studies have shown that there are large differences in the incidence and mortality rates for breast cancer both within one country and between different countries and regions (3). The highest incidence rates for breast cancer are in countries that have undergone economic transition, while extremely high mortality rates and increasing incidence rates are in transition countries (1). It is estimated that the number of new cases of breast cancer (by about 40%) and the number of deaths (by about 50%) will increase until 2040 (3). This is a consequence of the further growth of the population and aging (3).

Some of the risk factors associated with breast cancer are a positive family anamnesis of breast cancer, older age (more than 40 years), menstruation at a younger age, menopause at an older age, pregnancy at a later age, use of hormones (long-term use of contraceptive or hormone therapy in postmenopause), obesity, excessive alcohol consumption, smoking, etc. (4). Very little is known about the epidemiology and etiology of breast cancer in men compared to women (4,5).

The aim of this study to analyze trends in morbidity and mortality of breast cancer in men and women in Central Serbia from 2009 to 2020.

Methods

As part of this descriptive study, data on new cases and deaths caused by breast cancer (code C50 according to the International Classification of Diseases, X revision), as well as on the population number, sex and age, were obtained from published and unpublished materials of the Institute for Public Health of Serbia "Dr. Milan Jovanović Batut". For the period 1999 to 2005, data were taken from the registers for cancer in Central Serbia of the Public Health Institute “Dr Milan Jovanovic Batut”, and for the period 2016-2020 were obtained from the unpublished data of the Institute of Public Health of Serbia “Dr Milan Jovanovic Batut”.

In order to analyze the data, raw, specific and standardized incidence and mortality rates for breast cancer were used. Standardized incidence and mortality rates were calculated with the help of the direct standardization method, by using the standard world population according to Segi (1960) (6). In order to analyze trends in incidence and mortality rates for breast cancer for the period 1999-2020, the joinpoint regression analysis was used (Joinpoint Regression Program, Version 4.9.0.1. February, 2022; Statistical Methodology and Applications Branch, Surveillance Research Program, National Cancer Institute), according to the method of Kim and associates (7).

Table 1. Percent share of new cases and deaths from breast cancer among new cases and deaths from all malignant tumors in male and female population, Central Serbia, 2009-2020

	Percent share of new cases of breast cancer among new cases of all malignant tumors		Percent share of deaths from breast cancer among deaths from all malignant diseases tumors	
Years	Men	Women	Men	Women
2009	0.4	26.1	0.3	17.5
2010	0.5	25.2	0.4	18.6
2011	0.4	25.7	0.3	18.5
2012	0.4	25.8	0.2	18.0
2013	0.5	20.2	0.2	18.2
2014	0.3	21.3	0.3	17.9
2015	0.5	22.3	0.3	18.9
2016	0.3	23.3	0.4	18.9
2017	0.4	23.1	0.3	19.0
2018	0.4	24.2	0.2	17.5
2019	0.4	24.3	0.4	18.4
2020	0.6	23.0	0.4	19.5
2009-2020	0.4	23.7	0.3	18.4

Tabela 2. Broj novoobolelih i umrlih, standardizovane stope incidencije i mortaliteta (na 100.000 stanovnika) za rak dojke po polu, Centralna Srbija, 2009-2020. godine

	Muškarci				Žene			
Godine	Broj novoobolelih	Inc*	Broj umrlih	Mt**	Broj novoobolelih	Inc*	Broj umrlih	Mt**
2009	54	1,1	24	0,4	3307	71,5	1145	20,3
2010	71	1,5	32	0,6	3146	67,8	1197	21,4
2011	59	1,3	23	0,4	3293	69,7	1171	19,9
2012	61	1,3	19	0,3	3186	68,3	1175	20,2
2013	63	1,4	18	0,3	2515	50,5	1169	19,2
2014	37	0,8	22	0,4	2675	53,6	1180	19,3
2015	72	1,4	26	0,5	2966	60,9	1215	19,8
2016	50	0,9	35	0,6	3145	64,7	1238	20,1
2017	69	1,4	23	0,4	3211	65,6	1279	20,3
2018	57	1,2	22	0,4	3359	74,2	1181	18,9
2019	63	1,4	35	0,5	3377	73,4	1221	19,3
2020	102	2,2	33	0,6	3122	63,3	1256	19,5
2009-2020	63	1,3	26	0,4	3109	65,3	1202	19,8

Inc- stopa incidencije;*standardizovana stopa incidencije/100.000 prema populaciji sveta; Mt- stopa mortaliteta; **standardizovana stopa mortaliteta/100.000 prema populaciji sveta.

dojke među svim obolelima od malignih tumora je iznosilo 0,4% za muškarce i 23,7% za žene,aprosečno učešće umrlih od raka dojke među svim umrlima od malignih tumora je bilo 0,3% za muškarce i 18,4% za žene (Tabela 1).

Broj novoobolelih od raka dojke u populaciji muškaraca Centralne Srbije je bio najveći 2020. godine i iznosio je 102, a najmanji 2014. godine i iznosio je 37 (Tabela 2). Broj umrlih muškaraca od raka dojke se kretao od 18 u 2013. godini do 33 u 2020. godini. Prosečna standardizovana stopa incidencije (na 100.000) za rak dojke za muškarce, u periodu 2009-2020. godine, je iznosila 1,3, a mortaliteta 0,4. U ženskoj populaciji Centralne Srbije najveći broj novoobolelih je zabeležen 2019. godine i iznosio je 3377, a najniži u 2013. godini 2515. Broj umrlih od raka dojke se kretao od 1145 u 2009. godini do 1238 u 2016. godini. Prosečna standardizovana stopa incidencije (na 100.000) za

Tabela 3. Prosečne uzrasno-specifične i standardizovane stope incidencije (na 100.000)**, *joinpoint* analiza kretanja stopa incidencije rakadojke popolu, CentralnaSrbija, period2009- 2020. godine

Uzrasne grupe (godine)	Muškarci			Žene		
	Inc	Period	APC (95%IP)	Inc	Period	APC (95%IP)
<30	0,03	-	-	1,9	2009-2020	-6,6 (-13,1–0,4)
30-39	0,5	2009-2020	2,2 (-19,4– 29,6)	41,6	2009-2020	1,9 (-1,4 –5,3)
40-49	1,5	2009-2020	6,7 (-6,2 –21,4)	137,3	2009-2020	0,5 (-3,0 –4,1)
50-59	3,7	2009-2020	-1,3 (-6,9– 4,6)	192,7	2009-2020	-1,2(-4,0– 1,7)
60-69	6,0	2009-2020	1,2 (-3,5 –6,2)	250,9	2009-2013 2013-2020	-7,2*(-12,4–-1,6) 4,7*(2,2–7,3)
70+	8,2	2009-2020	2,7(-2,8 –8,4)	200,1	2009-2020	-0,4(-2,2– 1,5)
Ukupno	1,3**	2009-2020	1,9(-2,9-7,0)	65,3**	2009-2013 2013-2020	-6,8 (-13,9–0,9) 3,5*(0,1–7,1)

Inc – stopa incidencije; APC (engl. *Annual Percent Change*) – prosečnaprocentualna godišnja promena; 95%IP – 95% interval poverenja; * – APC je značajno različit od 0 za alfa=0,05.

Table 2. The number of new cases and deaths, standardized incidence and mortality rates (per 100,000) for breast cancer by sex, Central Serbia, 2009-2020

	Men				Women			
Years	Number of new cases	Inc*	Number of deaths	Mt**	Number of new cases	Inc*	Number of deaths	Mt**
2009	54	1.1	24	0.4	3307	71.5	1145	20.3
2010	71	1.5	32	0.6	3146	67.8	1197	21.4
2011	59	1.3	23	0.4	3293	69.7	1171	19.9
2012	61	1.3	19	0.3	3186	68.3	1175	20.2
2013	63	1.4	18	0.3	2515	50.5	1169	19.2
2014	37	0.8	22	0.4	2675	53.6	1180	19.3
2015	72	1.4	26	0.5	2966	60.9	1215	19.8
2016	50	0.9	35	0.6	3145	64.7	1238	20.1
2017	69	1.4	23	0.4	3211	65.6	1279	20.3
2018	57	1.2	22	0.4	3359	74.2	1181	18.9
2019	63	1.4	35	0.5	3377	73.4	1221	19.3
2020	102	2.2	33	0.6	3122	63.3	1256	19.5
2009-2020	63	1.3	26	0.4	3109	65.3	1202	19.8

Inc- incidence rate;*standardized incidence rate/100,000 according to the world population; Mt- mortality rate; **standardized mortality rate/100,000 according to the world population.

Results

In Central Serbia, from 2009 to 2020, of all cancer cases, the average share of breast cancer was 0.4% for men and 23.7% for women, while the average share of deaths from breast cancer among all deaths from malignant tumors was 0.3% for men and 18.4% for women (Table 1).

The highest number of new cases of breast cancer in the male population of Central Serbia was registered in 2020, and it amounted to 102, while the lowest number was registered in 2014, when it amounted to 37 (Table 2). The number of men who died from bre. The average standardized incidence rates (per 100,000) of breast cancer in men was 1.3 in the period 2009-2020, while average standardized mortality rate was 0.4. In the female population of Central Serbia, the highest number of new cases was registered in 2019, when it amounted to 3377, while the lowest number was in 2013, 2515. The number of deaths

Table 3. Average age-specific and standardized incidence rates (per 100,000)**, joinpoint analysis of trends in incidence rates of breast cancer by sex, Central Serbia, for the period 2009-2020.

Age groups (years)	Men			Women		
	Inc	Period	APC (95%IP)	Inc	Period	APC (95%IP)
<30	0.03	-	-	1.9	2009-2020	-6.6 (-13.1–0.4)
30-39	0.5	2009-2020	2.2 (-19.4– 29.6)	41.6	2009-2020	1.9 (-1.4 –5.3)
40-49	1.5	2009-2020	6.7 (-6.2 –21.4)	137.3	2009-2020	0.5 (-3.0 –4.1)
50-59	3.7	2009-2020	-1.3 (-6.9– 4.6)	192.7	2009-2020	-1.2(-4.0– 1.7)
60-69	6.0	2009-2020	1.2 (-3.5 –6.2)	250.9	2009-2013 2013-2020	-7.2*(-12.4–-1.6) 4.7*(2.2–7.3)
70+	8.2	2009-2020	2.7(-2.8 –8.4)	200.1	2009-2020	-0.4(-2.2– 1.5)
Total	1.3**	2009-2020	1.9(-2.9-7.0)	65.3**	2009-2013 2013-2020	-6.8 (-13.9–0.9) 3.5*(0.1–7.1)

Inc- incidence rate; APC - Annual Percent Change; 95%CI - 95% confidence interval; * - APC is significantly different from 0 for alpha=0.05.

rak dojke za žene, u periodu 2009-2020. godine, je iznosila 65,3, a mortaliteta 19,8.

U okviru posmatranog dvanaestogodišnjeg perioda dolazi do porasta standardizovane stope incidencije u muškoj populaciji za1,9% godišnje, ali trend porasta nije bio značajan (Tabela 3, Grafikon 1a). Međutim kod žena je u periodu od 2009. do 2013. godine bio prisutan trend pada standardizovanih stopa incidencije raka dojke za -6,8% godišnje, a u periodu od 2013. do 2020. godine zabeležen je značajan porast stope incidencije za 3,5% godišnje (Tabela 3, Grafikon 1b). Kod muškaraca i žena raste stopa incidencije sa starenjem, izuzev što je kod žena stopa incidencije za uzrast 70 i više godina bila niža u odnosu na stopu incidencije za uzrast 60-69 godina. Kod muškaraca nije uočen značajan trend porasta ili opadanja stopa incidencije za rak dojke po uzrasnim grupama u posmatranom periodu, a kod žena je u uzrastu 60-69 godina zabeležen jedino statistički značajan pad stopa incidencije u periodu 2009-2013. godine za -7,2% godišnje, a potom u periodu 2013-2020. godine značajan trend porasta za 4,7% godišnje.

U okviru posmatranog dvanaestogodišnjeg perioda dolazi do porastastandardizovane stope mortaliteta u muškoj populaciji za 2,4% godišnje, ali trend porastanije bio značajan (Tabela 4, Grafikon 2a). Međutim kod žena je u periodu od 2009. do 2020. godine bio prisutan značajan trend pada standardizovanih stopa mortaliteta raka dojke za - 0,5% godišnje (Tabela 4, Grafikon 2b). Kod muškaraca i žena raste stopa mortaliteta sa starenjem. Kod muškaraca nije uočen značajan trend porasta ili opadanja stopa mortaliteta za rak dojke po uzrasnim grupama za posmatrani period, a kod žena uzrasta 40-49 i 50-59 godina zabeležen je statistički značajan pad stopamortaliteta za -2,5% i -2,0%, kao i značajan porast stopa mortaliteta u uzrastu 70 i više godina za 2% godišnje.

Diskusija

U Centralnoj Srbiji, za period 2009-2020, prosečna standardizovana stopa incidencije (na 100.000) za rak dojke je iznosila 1,3 za muškarce i 65,3 za žene, a prosečna standardizovana stopa mortaliteta 0,4 za muškarce i 19,8 za žene. Prema podacima GLOBOCAN-a za 2020. godinu, regioni sa najvišim stopama incidencije za rak dojke žena su Australija/Novi Zeland (95,5/100.000), Zapadna Evropa (90,7/100.000), Severna Amerika (89,4/100.000) i Severna Evropa (79,6/100.000), a sa najnižim Centralna Amerika (39,5/100.000), Istočna (33,0/100.000) i Srednja Afrika (32,7/1000.000) i Južna i Centralna Azija (26,2/100.000) (1). Najviše stope mortaliteta za rak dojke žena su zabeležene u Melaneziji (27,5/100.000), Zapadnoj Africi (22,3/100.000), Mikroneziji/Polineziji (19,6/100.000) i na Karibima (18,9/100.000), a najniže u Istočnoj Aziji (9,8/100.000), Centralnoj Americi (10,4/100.000), Australiji/Novom Zelandu (12,1/100.000) i Severnoj Americi (12,5/100.000) (1). Prema ovim podacima Centralna Srbija pripada zemljama sa srednje visokim stopama incidencije i visokim stopama mortaliteta za rak dojke kod žena. Zemlja sa najvišom stopom incidencije je Belgija, a sa najvišom stopom mortaliteta je Barbados. U visoko razvijenim zemljama visoke stope incidencije za rak dojke dovode se u vezu

Tabela 4. Prosečne uzrasno-specifične i standardizovane stope mortaliteta (na 100.000)**, *joinpoint* analiza kretanja stopa mortaliteta raka dojke po polu, Centralna Srbija, period 2009-2020. godine

Uzrasne grupe (godine)	Muškarci			Žene		
	Mt	Period	APC (95%IP)	Mt	Period	APC (95%IP)
<30	0,01	-	-	0,2	2009-2020	-6,7(-27,4– 20,1)
30-39	0,05	-	-	6,2	2009-2020	-0.0(-2,5–2,5)
40-49	0,4	2009-2020	12,2 (-24,9-67,7)	21,5	2009-2020	-2,5*(-4,1 – 2,8)
50-59	1,0	2009-2020	-8,0 (-18,6– 4,1)	56,2	2009-2020	-2,0*(-2,6 – 1,3)
60-69	2,0	2009-2020	4,6 (-7,7 –18,4)	87,7	2009-2020	0,4 (-1,6 –0,7)
70+	5,1	2009-2020	2,4 (-2,4 –7,6)	142,6	2009-2020	2,0*(1,1–2,8)
Ukupno	0,5**	2009-2020	2,4 (-2,6 –7,5)	19,9**	2009-2020	-0,5*(-1,1 – 0,0)

Mt–stopa mortaliteta; APC (engl. *Annual Percent Change*) – prosečnaprocentualna godišnja promena; 95%IP – 95% interval poverenja; * - APC je značajno različit od 0 za alfa=0,05.

from breast cancer ranged from 1145 in 2009 to 1238 in 2016. The average standardized incidence rate (per 100,000) for women, in the period 2009-2020, was 65.3, while the average standardized mortality rate was 19.8.

Within the twelve-year period, there came to the increase in the standardized incidence rate in the male population by 1.9% per year, but the trend of increase was not significant (Table 3, Graph 1a). However, in the period 2009 to 2013, in women, there was a downward trend in standardized breast cancer incidence rates by -6.8% per year, and in the period from 2013 to 2020, a significant increase in the incidence rate by 3.5% per year was registered (Table 3, Graph 1b). In men and women, the incidence rate increases with age, except that in women the incidence rate was lower at the age of 70 and older compared to the incidence rate at the age of 60-69. In men, no significant trend of increase or decrease in the incidence rate of breast cancer was noticed in the observed period, while in women aged 60-69, a statistically significant decrease in the incidence rate was registered in the period 2009-2013, by -7.2% per year, and then in the period 2013-2020, a significant trend of increase of 4.7% a year was registered.

Within the observed twelve-year period, there came to the increase in the standardized mortality rate in the male population by 2.4% per year, but the trend of increase was not significant (Table 4, Graph 2a). However, from 2009 to 2020, in women there was a significant downward trend in standardized breast cancer mortality rates by -0.5% per year (Table 4, Graph 2b). IFor men and women, the mortality rate increases with age. In men, a significant trend of increase or decrease in the mortality rate by age groups was not noticed in the observed period, while in women aged 40-49 and 50-59 a statistically significant decrease in the mortality rate of -2.5% and -2.0% was registered, as well as a significant increase of 2% per year in the mortality rate was registered in the age group 70 and over.

Discussion

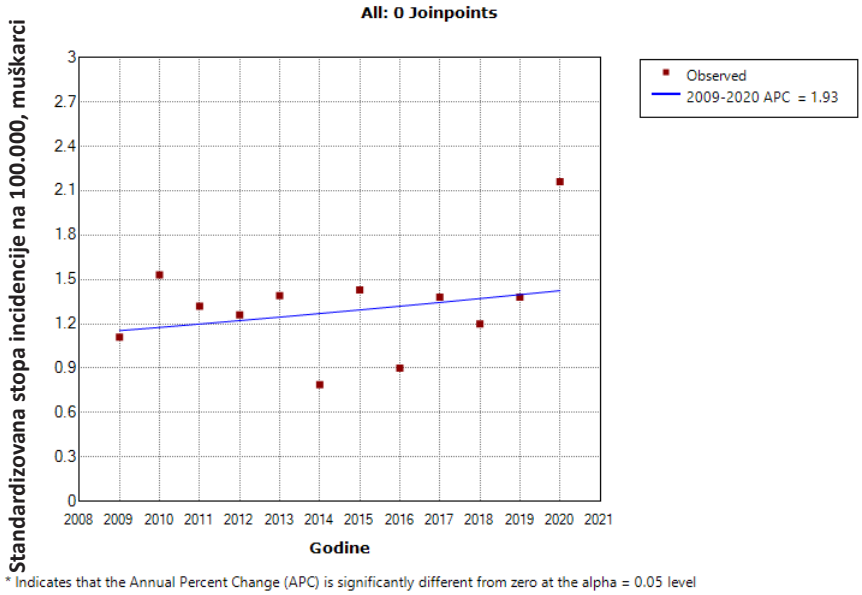
In Central Serbia, the average standardized incidence rate (per 100,000) for breast cancer amounted to 1.3 for men and 65.3 for women in the period 2009-2020, while the standardized mortality rate was 0.4 for men and 19.8 for women. According to GLOBOCAN data for 2020, regions with the highest incidence rates for breast cancer were Australia/ New Zealand (95.5/100,000), Western Europe (90.7/100,000), North America (89.4/100,000), North Europe (79.6/100,000), while the lowest rates were in Central America (39.5/100,000), Eastern (33.0/100,000) and Middle Africa (32.7/100,000) and South and Central Asia (26.2/100,000) (1). The highest mortality rates for breast cancer were registered in Melanesia (27.5/100,000), Western Africa (22.3/100,000), Micronesia/Polynesia (19.6/100,000), and Caribbean (18.9/100,000), while the lowest rates were in East Asia (9.8/100,000), Central America (10.4/100,000), Australia/Zealand (12.1/100,000) and North America (12.5/100,000) (1). According to these data, Central Serbia belongs to the countries with moderately high incidence rates and high mortality rates for breast cancer in women. Belgium is the country with the highest incidence

Table 4. Average age-specific and standardized mortality rates (per 100,000)**, joinpoint analysis of trends in mortality breast cancer rates by sex, Central Serbia, period 2009-2020

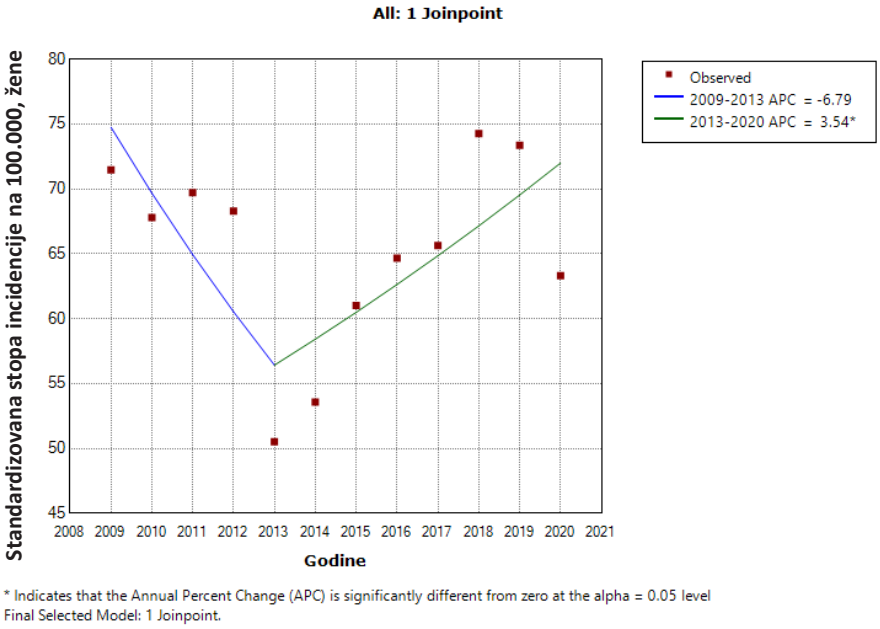
Age groups (years)	Men			Women		
	Mt	Period	APC (95%IP)	Mt	Period	APC (95%IP)
<30	0.01	-	-	0.2	2009-2020	-6.7 (-27.4– 20.1)
30-39	0.05	-	-	6.2	2009-2020	-0.0(-2.5–2.5)
40-49	0.4	2009-2020	12.2 (-24.9-67.7)	21.5	2009-2020	-2.5*(-4.1 – 2.8)
50-59	1.0	2009-2020	-8.0 (-18.6– 4.1)	56.2	2009-2020	-2.0*(-2.6 – 1.3)
60-69	2.0	2009-2020	4.6 (-7.7 –18.4)	87.7	2009-2020	0.4 (-1.6 –0.7)
70+	5.1	2009-2020	2.4 (-2.4 –7.6)	142.6	2009-2020	2.0*(1.1–2.8)
Total	0.5**	2009-2020	2.4 (-2.6 –7.5)	19.9**	2009-2020	-0.5*(-1.1 – 0.0)

Mt – mortality rates; APC - Annual Percent Change; 95%CI - 95% confidence interval; * - APC is significantly different from 0 for alpha=0,05.

a) muškarci

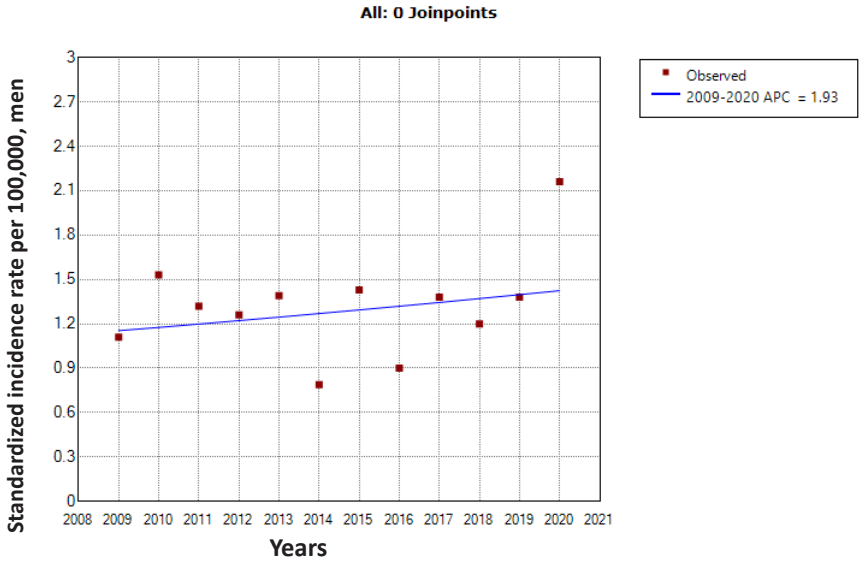


b) žene

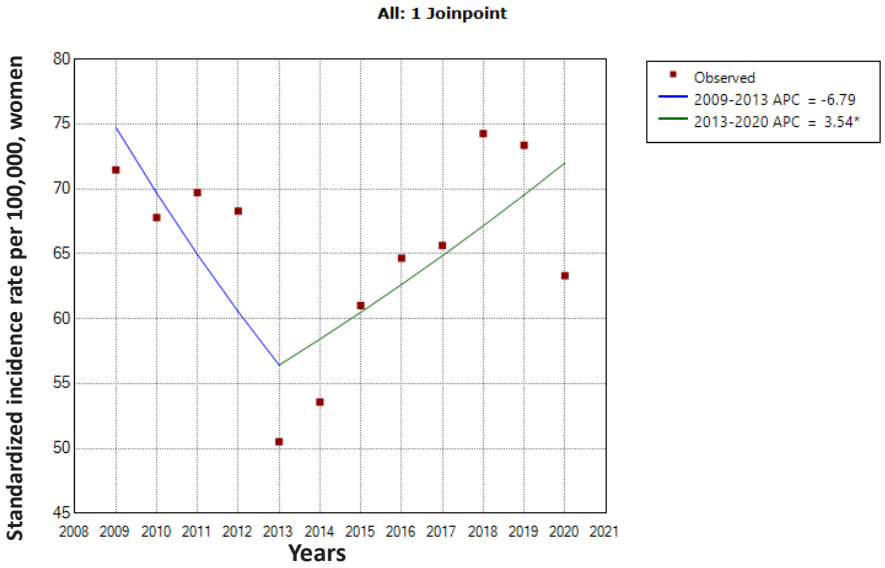


Grafikon 1. *Joinpoint* analiza kretanja standardizovanih stopa incidencije raka dojke po polu, Centralna Srbija, period 2009-2020. godina

sa organizovanim sprovođenjem skrininga za rak dojke koji doprinosi ranijoj detekciji malignoma, životnim navikama (gojaznost, fizička neaktivnost i prekomerno konzumiranje alkohola), kao i sa faktorima vezanim za reproduktivno zdravlje: upotreba oralnih kontraceptiva, hormonska supstituciona terapija u menopauzi, kasna menopauza, ređe dojenje, manji broj živorođene dece i drugo) (8). U2020. godini standardizovane stope incidencije u razvijenim zemljama bile su skoro dva puta veće u odnosu na one u zemljama u razvoju (3). Smatra se da su visoke stope incidencije ovog tumora u ekonomski razvijenim zemljama posledica velike zastupljenosti faktora rizika u tim populacijama (3). Nasuprot ovome žene slabije razvijenih zemalja imale su za 17% veću smrtnost od raka dojke, za razliku od žena u razvijenim državama (3). Veća smrtnost je rezultat nepravovremenog postavljanja dijagnoze bolesti, ali na prvom mestu nesprovođenja organizovanog skrininga - mamografije. Takođe, kod žena jevrejskog porekla (Aškenazi) visoka je učestalost BRCA1 i BRCA2 antigena što vodi većoj učestalosti raka dojke u Izraelu i nekim delovima Evrope (9).



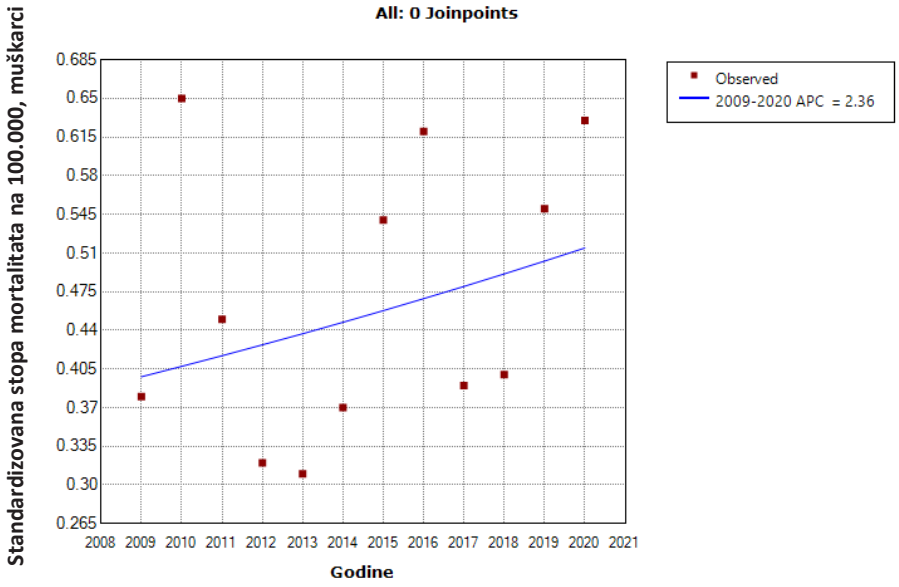
a) males



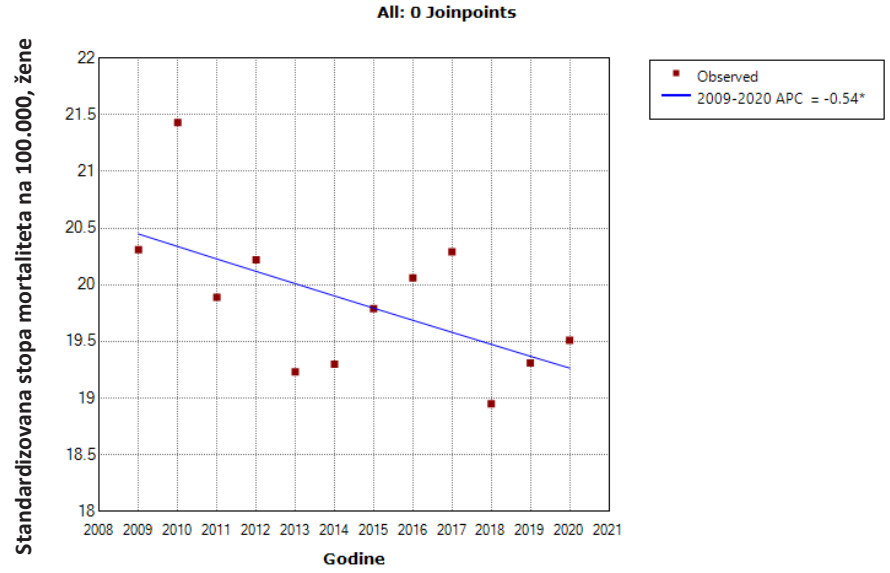
b) females

Graph 1. Joinpoint analysis of trends in standardized mortality rates for breast cancer by sex, Central Serbia, period 2009-2020

rate, while Barbados has the highest mortality rate. In highly developed countries, high incidence rates for breast cancer are associated with the organized screening for breast cancer which contributes to the early detection of cancer, habits (obesity, physical inactivity and excessive alcohol consumption), as well as with factors related to reproductive health: use of oral contraceptives, hormone replacement therapy in menopause, late menopause, rarer breastfeeding, smaller number of live born children), etc. (8). In 2020, standardized incidence rates in developed countries were almost two times higher in comparison to developing countries (3). High incidence rates for this tumor in economically developed countries are considered to be the consequence of presence of risk factors in these populations (3). In contrast, mortality rates were higher for 17% in women from less developed countries, in comparison to women in developed countries (3). Higher mortality is the result of untimely diagnosis of this disease, but in the first place not conducting organized screening – mammography. Also, women of Jewish origin (Ashkenazi) have a high frequency of BRCA1 and BRCA2 antigens, which leads to a higher frequency of



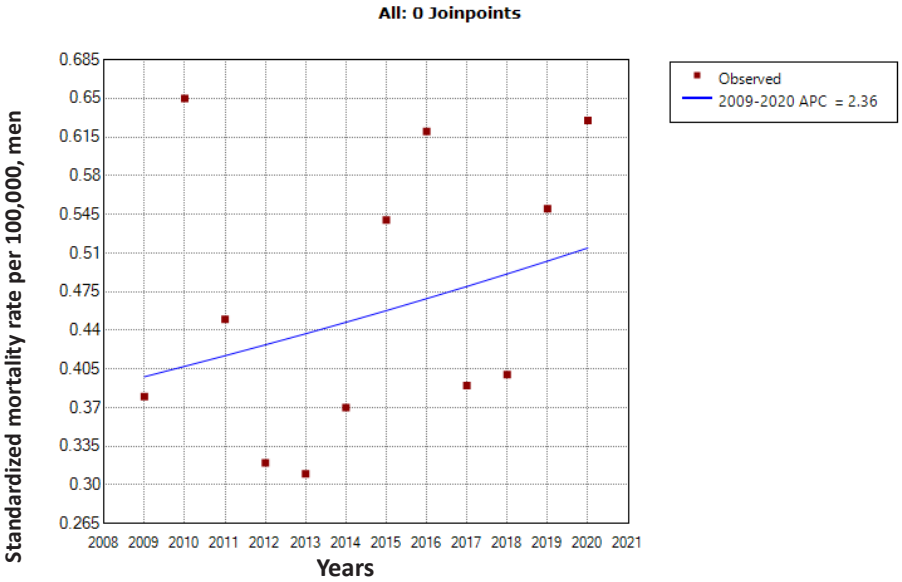
a) muškarci



b) žene

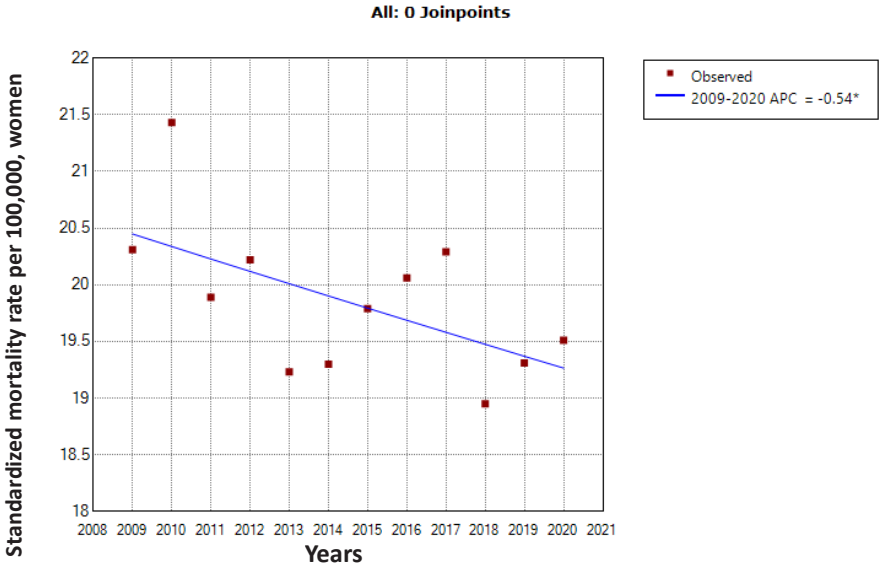
Grafikon 2. *Joinpoint* analiza kretanja standardizovanih stopa mortaliteta raka dojke po polu, Centralna Srbija, period 2009-2020. godina

U Centralnoj Srbiji prosečna standardizovana stopa incidencije za rak dojke muškaraca je bila 50,2 puta manja od stope incidencije za žene, a prosečna standardizovana stopa mortaliteta 49,5 puta manja od stope mortliteta za žene. U 2017. godini, u Sjedinjenim Američkim Državama (SAD) standardizovana stopa incidencije za rak dojke kod muškaraca je iznosila 1,3/100.000, što je oko 97 puta manje u odnosu na standardizovanu stopu incidencije kod žena (125,1/100.000), a stopa mortaliteta je bila 68,6 puta manja (muškarci – 0,3/100.000, a žene – 19,9/100.000)(10). Kod muškaraca rak dojke čini manje od 1% svih malignih tumora i manje od 1% svih malignih tumora dojke (11). Neki od faktora rizika za nastanak raka dojke kod muškaraca su starenje, neravnoteža androgena/estrogena, izloženost zračenju i porodična istorija raka dojke (11,12). Od mutacija u genima najčešće se javlja mutacija gena BRCA2 (11,12). Najveći problem predstavlja činjenica da nije razvijena svest o mogućnosti nastanka ovog malignog tumora kod muškaraca. Iz navedenog razloga obično se lekaru javljaju kada je maligni tumor uznapredovao, što vodi većoj smrtnosti.



a) males

* Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05 level
Final Selected Model: 0 Joinpoints.



b) females

* Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05 level
Final Selected Model: 0 Joinpoints.

Graph 2. Joinpoint analysis of trends in standardized mortality rates for breast cancer by sex a) men and b) women, Central Serbia, period 2009-2020

breast cancer in Israel and some parts of Europe (9).

In Central Serbia, the average standardized incidence rate for breast cancer in men was 50.2 times lower than the incidence rate in women, while the standardized mortality rate was for 49.5 times lower than the mortality rate in women. In 2017, in the United States of America (USA), the standardized incidence rate for breast cancer in men amounted to 1.3/100,000, which is almost 97 times less in comparison to the standardized incidence rate in women (125.1/100,000), while the mortality rate was for 68.6 times lower (men – 0.3/100,000, women – 19.9/100,000) (10). In men, breast cancer accounts for less than 1% of all malignant tumors and less than 1% of all malignant breast tumors (11). Some of the risk factors for breast cancer in men are aging, androgen/estrogen imbalance, exposure to radiation, and family history of breast cancer (11,12). The BRCA gene mutation occurs most frequently of all gene mutations (11,12). The biggest problem is the fact that awareness about the possibility of this malignant tumor in men has not been developed. For the above-mentioned reason, they usually

Neke studije ukazuju da muškarci sa rakom dojke imaju veći rizik od nekih drugi malignih tumora.

U Centralnoj Srbiji, kod oba pola, prosečne uzrasno-specifične stope incidencije (na 100.000) su niske pre 30. godine života, a najviše su kod muškaraca u uzrastu 70 i više godina (8,2) i kod žena 60-69 godina (250,9), u periodu od 2009. do 2020. godine. Prosečno uzrasno specifična stopa mortaliteta za žene i muškarce raste sa godinama starosti i najvećaje kod osoba uzrasta ≥70 godina (142,6/100.000 - žene i 5,1/100.000 - muškarci) (10). Najveće stope incidencije i mortaliteta (na 100.000) kod muškaraca u Americi su u uzrastu 80 i više godina (8,30 i 2,68). Takođe, uočava se da je najveći procenat muškaraca sa smrtnim ishodom usled raka dojke u uzrastu 60-69 godina (10). Upravo zbog toga što je ovaj tumor redak i zbog nepostojanja skrining programa većina muškaraca bude dijagnostikovana u starijem životnom dobu i sa uznapredovalom bolešću, što značajno pogoršava prognozu (13).

U populaciji žena Centralne Srbije dolašlo je do značajnog porasta standardizovane stope incidencije u periodu 2013-2020. godine za 3,5% godišnje, a u muškoj polulaciji za 1,3% godišnje, ali porast nije bio značajan. Nije uočena značajna promena kretanja trendova incidencije raka dojke po uzrasnim grupama kod oba pola, sem kod žena u uzrastu 60-69 godina gde je prisutan značajan pad stope incidencije za 7,2% godišnje u periodu 2009-2013, da bi potom došlo do značajnog porasta od 4,7% godišnje u periodu 2013-2020. Međutim, kod žena dolazi do značajnog pada stope mortaliteta tokom posmatranog dvanaestogodišnjeg perioda i to za -0,5% godišnje i za 2,4% godišnje kod muškaraca, ali trend porasta nije bio značajan.

Mnoge epidemiološke studije pokazuju da je trend incidencije karcinoma muške dojke u porastu (14), a stope mortaliteta su u zemljama centralno-istočne Evrope i Latinske Amerike u porastu za razliku od pada u severozapadnoj Evropi, Rusiji i SAD-a (za čak 10-40%) (15). Kod žena, dolazi do brzog porasta incidencije raka dojke u Severnoj Americi, Evropi i Okeaniji, tokom osamdesetih i devedesetih godina XX veka (16), a što se dovodi u vezu sa porastom obuhvata ženske populacije mamografijom i sve većom prevalencijom faktora rizika u populaciji (17).Međutim, u ranim 2000. godinama dolazi do pada incidencije raka dojke žena što se može objasniti manjim korišćenjem hormonske supstitucione terapije u postmenopauzii padom obuhvata skriningom - mamografijom (18,19). Od 2007. godine, ponovo dolazi do porasta incidencije raka dojke žena (20,21) usled primene sve boljih skrining metoda. Takođe se u ovom vremenskom periodu uočava da su među obolelima od raka dojke sve češće prisutni tumori sa pozitivnim receptorima na estrogen (22). Češća pojava pozitivnih receptora na estrogen kod raka dojke dovodi se u vezu sa sve većom prevalencijom gojaznosti u populaciji, kao i sa činjenicom da se mamografijom prvenstveno otkriva baš ova vrsta sporo rastućeg malignoma (23). Obrnuta situacije je zabeležena u nerazvijenim zemljama (Afrika, Južna Amerika i Azija), gde je uočen trend porasta obolevanja od raka dojke zbog prihvatanja zapadnih stilova života (brza hrana, fizička neaktivnost, itd.), veće zaposlenosti žena što je dovelo do rađanja manjeg broja dece i odlaganja rađanja u kasnijim godinama života (3).

Nasuprot trenda incidencije,trend mortaliteta-od raka dojke kod žena u razvijenim zemljama opada od 1980. godine (23). Ovo je posledica stalnog razvoja novih vidova lečenja i skrining programa. Upravo zbog toga došlo je do povećanja broja žena koje žive sa rakom dojke i u 2020. godini iznosio je oko 7,8 miliona (3). Sa druge strane stope mortaliteta pokazuju porast u subsaharskoj Africi i među najvišima su na globalnom nivou (24).

Petogodišnje preživljavanje obolelih od ovog tumora varira od 85-90% u razvijenim zemljama do 66% u 12 zemalja subsaharske Afrike (25,26). Najniže petogodišnje preživljavanje je zabeleženo u Ugandi i iznosi samo 12%. Visoke stope mortaliteta u subsaharskoj Africi i drugim nerazvijenim zemljama su pre svega posledica kasnog otkrivanja oboljenja, nedostupnosti adekvatnog načina lečenja i nepristupačnost zdravstvene zaštite (27). U razvijenim zemljama sveta stope mortaliteta od raka dojke kod muškaraca su konstantno veoma niske i variraju između 0,3-0,4/100.000 u periodu od 1970. do 1990, a potom sledi njihov blag pad (28).

Neophodno je dalje sprovođenje analitičkih studija sa ciljem otkrivanja faktora rizika za nastanak ovog malignog tumora i sprovođenja adekvatnih preventivnih programa.

Zaključak

Trend porasta standardizovanih stopa incidencije i mortaliteta kod muškaraca, u periodu

come to the doctor when the malignant tumor has advanced, which leads to higher mortality. Some studies have indicated that men with breast cancer have a higher risk of some other malignant tumors.

In Central Serbia, in both sexes, the average age-specific incidence rates (per 100,000) are low before the age of 30, while the highest rates are in men aged 70 and older (8.2) and in women aged 60-69 (250.9) in the period 2009 to 2020. The average age-specific mortality rate for women and men increases with age and it is highest in persons aged ≥70 (142.6/100,000 – women and 5.1/100,000 – men) (10). The highest incidence and mortality rates (per 100,000) in men in America are at the age of 80 and over (8.30 and 2.68). Also, it has been observed that the highest percentage of men with deathly outcome caused by breast cancer is between the ages 60-69 (10). Due to the fact that this tumor is rare and due to the lack of screening programs, most men are diagnosed with advanced disease at an older age, which significantly worsens the prognosis (13).

In the female population of Central Serbia, there came to the significant increase in the standardized incidence rate in the period 2013-2020 for 3.5% per year, while in the male population for 1.3% per year, but the increase was not significant. There was no significant change of trends in incidence rates for breast cancer according to age groups in both sexes, except in women aged 60-69, where a significant decrease in incidence for -7.2% was observed in the period 2009-2013. However, a significant decrease in mortality rate in women was observed during the twelve-year period, that is, for -0.5% per year and for 2.4% per year in men, but the trend of increase was not significant.

Many epidemiological studies have indicated that the trend in the incidence of breast cancer in men is on the rise, while the mortality rates increased in countries of Central-Eastern Europe and Latin America in contrast to the decrease in Western and North Europe, Russia and the USA (for even 10-40%) (15). In women, there came to the rapid increase in the incidence of breast cancer in North America, Europe and Oceania, during the 1980s and 1990s (16), which is associated with the increase in the proportion of women who have undergone mammography and the increasing prevalence of risk factors in the population (17). However, in the early 2000s, there was a decline in the incidence of breast cancer in women, which can be explained by the lower use of hormone replacement therapy in postmenopause and the decline in the proportion of women covered by screening – mammography (18,19). Since 2007, there has been an increase in the incidence of breast cancer in women (20,21) due to the application of more efficient screening methods. Also, in this period, it was observed that tumors with positive estrogen receptors were increasingly present among breast cancer patients (22). The more frequent occurrence of positive estrogen receptors in breast cancer is related to the increasing prevalence of obesity in the population, as well as to the fact that mammography primarily detects this type of slow-growing malignancy (23). The reverse situation was observed in underdeveloped countries (Africa, South America and Asia), where the increase in the incidence of breast cancer was observed due to the acceptance of Western lifestyle (fast food, physical inactivity, etc.), higher employment of women, which led to fewer births and delayed childbearing (3).

Contrary to the trend of incidence, the trend of mortality from breast cancer in women in developed countries has decreased since 1980 (23). This is the consequence of the constant development of new types of treatment and screening programs. This is precisely why the number of women living with breast cancer has increased, and in 2020 it was around 7.8 million (3). On the other hand, mortality rates show the increase in sub-Saharan Africa and are among the highest at the global level (24).

Five-year survival from this tumor varies between 85-90% in developed countries to 66% in 12 countries of sub-Saharan Africa (25,26). The lowest five-year survival was registered in Uganda and it was only 12%. High mortality rates in sub-Saharan Africa and other underdeveloped countries are primarily the result of late detection of disease, unavailability of adequate treatment and inaccessibility of health care (27). In developed countries, mortality rates of breast cancer in men are constantly very low and vary between 0.3-0.4/100,000 in the period from 1970 to 1990, followed by the slight decline (28).

It is necessary to carry out further analytical studies with the aim of revealing risk factors for the occurrence of this malignant tumor and implementing adequate preventive programs.

2009-2020.godine, zahteva uvođenje edukativnih programa ucilju upoznavanja muške populacije sa mogućnošću obolevanja i umiranja od ovog malignoma, kao i sa faktorima rizika i mogućim preventivnim merama. U populaciji žena porast trenda incidencije za rak dojke od 2013. godine ukazuje na neophodnost redukcije ili eliminacije faktora rizika (gojaznosti, fizičke neaktivnosti), kao i unapređenje sprovođenja organizovanog skrininga, odnosno mamografije, a trend pada umiranja na pravovremeno otkrivanje i adekvatno lečenje.

Konflikt interesa

Autori su izjavili da nema konflikta interesa.

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Conclusion

The trend of the increase in standardized incidence and mortality rates in men, in the period 2009-2020 requires the introduction of educational programs aimed at informing the male population about the possibility of this disease and death caused by this malignancy, as well as about risk factors and possible preventive measures. Since 2013, in the female population, the increase in the incidence of breast cancer has indicated the necessity to reduce or eliminate risk factors (obesity, physical inactivity), as well as to improve the implementation of organized screening, that is, mammography, while the trend of the decrease in mortality has indicated the timely detection and adequate treatment.

Competing interests

The authors declared no competing interests.

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KVALITET SPAVANJA, ZAMOR I POSPANOST KOD STUDENATA MEDICINSKOG FAKULTETA

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SAŽETAK

Uvod/Cilj: Studenti medicine su izloženi značajnom nivou pritiska zbog akademskih zahteva, usled čega dolazi do smanjenja kvaliteta spavanja, zamora i povećane dnevne pospanosti, što sve može uticati na efikasnost učenja, akademski uspeh, i motivaciju. Istraživanje je imalo za cilj da ispita prevalencije zamora, kvaliteta spavanja i dnevne pospanosti među studentima medicine, kao i njihovu međusobnu povezanost.
Metode: Studija je sprovedena u vidu studije preseka u toku decembra 2022. godine među 316 studenata treće godine Medicinskog fakulteta Univerziteta u Beogradu. Podaci su prikupljeni anketnim upitnikom, koji su studenti popunjavali na početku praktične nastave iz nastavnog predmeta Epidemiologija. Osim demografskih podataka, studenti su popunili upitnik o kvalitetu spavanja (*Pittsbourgh Sleep Quality Index*-PSQI), upitnik o zamoru (*Fatigue Severity Scale*-FSS), i skalu pospanosti (*Epworth Sleepiness Scale*-ESS). U statističkoj analizi podataka korišćene su metode deskriptivne statistike, χ^2 test i Studentov t-test. Kao statistički značajna vrednost je korišćeno $p < 0,05$.
Rezultati: U studiju je bilo uključeno 312 studenata treće godine Medicinskog fakulteta Univerziteta u Beogradu, 86 muškaraca (27,5%) i 226 žena (72,2%). Prosečan uzrast studenata bio je 21,37 godina. Više od polovine studenata (54,7%) imalo je loš kvalitet spavanja, svaki četvrti student imao je povišen zamor (27,6%), a skoro polovina studenata imala je povišene nivoe pospanosti (45,8%). Između muškaraca i žena nije bilo značajne razlike u kvalitetu sna i nivou zamora, ali su žene značajno češće imale više nivoe dnevne pospanosti (p=0,008). Studenti muškog pola koji su imali povišen zamor značajno češće su imali lošiji kvalitet sna u odnosu na studente normalnog nivoa zamora. Dok su studentkinje sa povišenim nivoom zamora značajno češće imale lošiji kvalitet sna i povišenu dnevnu pospanost.
Zaključak: Loš kvalitet sna, zamor i pospanost bili su učestali u populaciji studenata medicine. Više od polovine studenata (54,7%) imalo je loš kvalitet spavanja, svaki četvrti student imao je povišen zamor (27,6%), a skoro polovina studenata imala je povišene nivoe pospanosti (45,8%). Stoga je potrebno podsticati studente medicine na zdraviji način života i adekvatne obrasce spavanja još u ranijim godinama studija.

Ključne reči: zamor, pospanost, kvalitet sna, studenti medicine, akademski uspeh

Uvod

Studenti predstavljaju važan resurs za budućnost društva i nacionalni kapitali svake zemlje. Ulaganje u obrazovanje i zdravlje studenata je ključno kako bi se u potpunosti osposobili da doprinesu društvu. Zbog toga neki smatraju da univerziteti treba da rade na kreiranju zdravog okruženja i da promovišu aktivnosti koje imaju za cilj podršku i podizanje svesti o mentalnom zdravlju (1). Studenti se tokom studija suočavaju sa brojnim izazovima i brigama, kao i sa opterećenjima koja se razlikuju od drugih starosnih grupa i ljudi drugih zanimanja. Akademsko opterećenje, stalni pritisak za uspehom, zabrinutost za budućnost, finansijski problemi, kao i nedostatak slobodnog vremena i manje vremena provedenog sa porodicom česti su stresori, koji mogu do vesti do potencijalnih mentalnih problema (1,2). Rezultati studija širom sveta pokazuju da su sudenti medicine podležniji pogoršanju mentalnog i fizičkog zdravlja od prosečnog studenta (3–5). Iako zvuči

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SLEEP QUALITY, FATIGUE AND SLEEPINESS IN MEDICAL STUDENTS

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SUMMARY

Introduction/Aim: Medical students are exposed to a significant level of pressure due to academic demands, resulting in decreased sleep quality, fatigue, and increased daytime sleepiness, all of which can affect learning efficiency, academic success, and motivation. The research aimed to examine the prevalence of fatigue, sleep quality and daytime sleepiness among medical students and their interrelationship.
Methods: The study was conducted as a cross-sectional study in December 2022 among 316 third-year students of the Faculty of Medicine, University of Belgrade. The data were collected by a survey questionnaire, which students filled out at the beginning of practical classes in the subject of Epidemiology. In addition to demographic data, students filled out a questionnaire on sleep quality (Pittsburgh Sleep Quality Index-PSQI), a questionnaire on fatigue (Fatigue Severity Scale-FSS), and a sleepiness scale (Epworth Sleepiness Scale-ESS). Descriptive statistics, χ^2 test, and Student's t-test were used in the statistical analysis of the data. $p < 0.05$ was used as a statistically significant value.
Results: The study included 312 third-year students of the Faculty of Medicine of the University of Belgrade, 86 men (27.5%) and 226 women (72.2%). The average age of the students was 21.37 years. More than half of the students (54.7%) had poor sleep quality, every fourth student had increased fatigue (27.6%), and almost half of the students had increased levels of sleepiness (45.8%). There was no significant difference between men and women in sleep quality and level of fatigue, but women significantly more often had higher levels of daytime sleepiness (p=0.008). Male students who had increased fatigue significantly more often had poorer sleep quality than students with normal fatigue levels. While female students with an elevated level of fatigue significantly more often had poorer sleep quality and increased daytime sleepiness.
Conclusion: Poor sleep quality, fatigue, and sleepiness were common in the population of medical students. More than half of the students (54.7%) had poor sleep quality, every fourth student had increased fatigue (27.6%), and almost half of the students had increased levels of sleepiness (45.8%). Therefore, it is necessary to encourage medical students to have a healthier lifestyle and adequate sleep patterns even in the earlier years of their studies.

Keywords: fatigue, sleepiness, sleep quality, medical students, academic success

Introduction

Students represent an important resource for the future of society and the national capital of each country. Investing in the education and health of students is crucial in order to fully equip them to contribute to society. Therefore, some believe that universities should work to create a healthy environment and promote activities aimed at supporting and raising awareness of mental health (1). During their studies, students face numerous challenges and worries, as well as workloads that differ from other age groups and people of other professions. Academic load, constant pressure to succeed, worries about the future, financial problems, lack of free time, and less time spent with family are common stressors, which can lead to potential mental problems (1,2). The results of studies around the world show that medical students are more susceptible to deterioration in mental and physical health than the average student (3–5). Although it sounds paradoxical, the

paradoksalno, školovanje budućih lekara koji će brinuti o bolesnima značajno utiče na njihove mentalne i fizičke resurse (4,6).

Poznato je da je medicina suštinski zahtevna profesija, i da se studenti medicine suočavaju sa mnogim poteškoćama tokom studija koje izazivaju visok nivo stresa (7–9). Neke specifične karakteristike studiranja medicine kao što su organizacija nastave (praktična nastava, seminari, predavanja), akademsko preopterećenje, sadržaj i trajanje studija medicine, dodatno otežavaju taj perioda njihovog života. Zbog intenzivnog teorijskog i praktičnog nastavnog programa, savladavanja lekcija i spremanja ispita, studenti ulažu dosta vremena u svoje studije, a takav način života i rada može dovesti do zamora.

Zamor je psihofiziološko stanje smanjene sposobnosti i efikasnosti i može imati veliki uticaj na zdravlje i dobrobit pojedinca (10). Zamor je često praćen smanjenom mentalnom i fizičkom snagom, padom motivacije, kao i narušenim kvaliteom spavanja. Spavanje je biološki proces koji je neophodan za optimalno neurološko funkcionisanje, kao i sistemske fiziolške funkcije, uključujući imunitet, metabolizam, hormonsku ravnotežu i kardiovaskularni sistem (11). Zamor narušava pažnju mladih, što dovodi do loše percepcije i usporenog razmišljanja, dok nedostatak spavanja narušava svakodnevno funkcionisanje, efikasnost učenja i akademska postignuća studenata (10).

Poremećaj noćnog sna, kasni odlazak u krevet i rano ustajanje, posledično imaju pad kvaliteta spavanja, što izaziva pojavu pospanosti tokom dana, stresa, glavobolje, lošije pamćenje i učenje, zamor, povećanje napetosti i anksioznosti, kao i smanjenje sposobnosti suočavanja sa svakodnevnim rutinskim pritiskom (12). U nekim studijama je dokazana veza između stresa za vreme ispitnih rokova i smanjenog kvaliteta spavanja kod studenata (13).

Cilj rada je bio da se ispita kvalitet spavanja, stepen zamora i dnevne pospanosti među studentima treće godine Medicinskog fakulteta Univerziteta u Beogradu, kao i njihova međusobna povezanost.

Metode

Studija je sprovedena u vidu studije preseka u toku decembra 2022. godine među 316 studenata treće godine Medicinskog fakulteta Univerziteta u Beogradu. Podaci su prikupljeni anketnim upitnikom, koji su studenti popunjavali na početku praktične nastave iz nastavnog predmeta Epidemiologija. Osim demografskih podataka, studenti su popunili upitnik o kvalitetu spavanja (*Pittspourgh Sleep Quality Index*-PSQI), skalu o zamoru (*Fatigue Severity Scale*-FSS) i skalu pospanosti (*Epworth Sleepiness Scale*-ESS). Iz studije su isključeni studenti koji su naveli prisustvo psihičkih bolest (4 studenta).

Pitsburški indeks kvaliteta spavanja (*Pittsburgh Sleep Quality Index*-PSQI) (14) je upitnik kojim ispitanici ocenjuju kvalitet spavanja tokom prethodnih mesec dana. Upitnik sadrži 19 stavki i 5 dodatnih pitanja. Na poslednjih pet pitanja odgovara druga osoba, kao što je partner ili cimer/ka; ova pitanja obično se koriste za kliničke informacije i nisu uključena u bodovanje. Sa 19 stavki obuhvaćeno je sedam komponenti kvaliteta spavanja, pod nazivima: 1. subjektivni kvalitet spavanja, 2. latentnost u spavanju, 3. trajanje sna, 4. efikasnost spavanja, 5. poremećaj spavanja, 6. upotreba lekova za spavanje i 7. disfunkcije u toku dana. Svaka komponenta se skoruje od 0 (ne predstavlja problem) do 3 (predstavlja veliki problem). Ukupan rezultat se računa kao zbir skorova sedam komponenti, u rasponu od 0 do 21. Granična vrednost skora je 5. Odnosno, ispitanici sa skorom ≥ 5 imaju loš kvalitet sna. Svojstva PSQI ukazuju na njegovu korist u psihijatrijskoj kliničkoj praksi i istraživanjima. PSQI upitnik je preveden na srpski jezik i validiran (15).

Krupova skala zamora (*Fatigue Severity Scale*-FSS) koristi za procenu efekata zamora na fizičko, psihičko i socijalno funkcionisanje, kao što su fizička kondicija, motivisanost za rad, ili porodične obaveze. Ona je prvobitno dizajnirana kao instrument za merenje zamora kod osoba koje boluju od teških hroničnih bolesti, međutim danas ima mnogo šru upotrebu. Prvenstveno se primenjuje u istraživačke svrhe, ali takođe i u kliničkoj medicini i zdravstvenoj ekonomiji kada su u pitanju teme koje se odnose na kvalitet života, efekte različitih terapija, a u poslednje vreme i za procenu spavanja i sna. Skala se sastoji od 9 tvrdnji koje se boduju na osnovu sedmostepene Likertove skale, od snažnog neslaganja do potpune saglasnosti sa ponuđenom tvrdnjom. Ukupan skor može imati vrednosti od 9 do 63. Zbirna vrednost Krupove skale zamora se dalje deli sa 9 i tako se dobija prosečni skor zamora, koji može imati vrednosti od 1 (potpuno odsustvo zamora) do 7 (najizraženije prisustvo

education of future doctors who will care for the sick significantly affects their mental and physical resources (4,6).

It is known that medicine is an inherently demanding profession and that medical students face many difficulties during their studies that cause high levels of stress (7–9). Some specific characteristics of studying medicine, such as the organization of classes (practical classes, seminars, lectures), academic overload, content, and duration of medical studies, further complicate that period of their lives. Due to the intensive theoretical and practical curriculum, mastering lessons, and preparing for exams, students invest a lot of time in their studies, and such a way of life and work can lead to fatigue.

Fatigue is a psychophysiological state of reduced ability and efficiency and can majorly impact an individual's health and well-being (10). Fatigue is often accompanied by reduced mental and physical strength, a drop in motivation, and impaired sleep quality. Sleep is a biological process that is essential for optimal neurological functioning as well as systemic physiological functions, including immunity, metabolism, hormonal balance, and the cardiovascular system (11). Fatigue impairs young people's attention, leading to poor perception and slowed thinking, while lack of sleep impairs students' daily functioning, learning efficiency, and academic achievement (10).

Disruption of night sleep, late going to bed and early rising, consequently a decrease in sleep quality, which causes daytime sleepiness, stress, headaches, poorer memory and learning, fatigue, increased tension, and anxiety, as well as a decrease in the ability to cope with daily routine pressure. (12). Some studies have shown a link between stress during exam periods and reduced sleep quality in students (13).

The aim of the work was to examine the quality of sleep, degree of fatigue, and daytime sleepiness among third-year students of the Faculty of Medicine of the University of Belgrade, as well as their interrelationships.

Methods

The study was conducted as a cross-sectional study in December, 2022 among 316 third-year students of the Faculty of Medicine at the University of Belgrade. The data were collected by means of a survey questionnaire, which students filled out at the beginning of practical classes in the subject Epidemiology.In addition to demographic data, the students completed the questionnaire about sleep quality (Pittsburgh Sleep Quality Index-PSQI) and questionnaire about fatigue (Fatigue Severity Scale-FSS), visual-analog fatigue scale and sleepiness scale (Epworth Sleepiness Scale-ESS). Students who indicated the presence of mental disorders (4 students) were excluded from the study.

The Pittsburgh Sleep Quality Index (PSQI) (14) is a questionnaire that assesses sleep quality during the previous month. The questionnaire contains 19 items and 5 additional questions. The last five questions are answered by another person, such as a partner or roommate; these items are usually used for clinical information and are not included into scoring. Nineteen questions include seven components of sleep quality under the following names: 1. subjective sleep quality, 2. sleep latency, 3. sleep duration, 4. sleep efficiency, 5. sleep disturbances, 6. use of sleeping medications and 7. daytime dysfunction. Each component is scored from 0 (no difficulty) to 3 (high difficulty). The total score is calculated as the sum of the scores of seven components, ranging from 0 to 21. The threshold value of the score is 5. That is, respondents with the score ≥ 5 have poor sleep quality. The characteristics of the PSQI indicate its usefulness in psychiatric clinical practice and research. The PSQI questionnaire was translated into Serbian and validated (15).

The Krupp Fatigue Severity Scale (FSS) is used to assess the effects of fatigue on physical, psychological and social functioning, such as work motivation, physical fitness or family obligations. It was originally designed as an instrument to measure fatigue in severe chronic diseases, but today it is used much more widely. It is primarily used for research, but also in clinical medicine and health economics when it comes to topics related to the quality of life, the effects of various therapies, and recently also for the evaluation of sleep. The scale consists of nine statements that are scored according to the seven-point Likert scale, ranging from strong disagreement to complete agreement with the offered statement. The total score can have values from 9 to 63. The total value of the Krupp Fatigue Scale is further divided by nine and

zamora). Prosečnu vrednost Krupove skale zamora veću od 4 autor je označio kao patološku. Krajnji rezultat je samoprocena stepena zamora, koji se može pratiti i porediti tokom vremena, a takođe se može porediti sa drugim stanjima i oboljenjima kod kojih se javlja zamor. Od svih poznatih instrumenata za merenje stepena zamora, Krupova skala zamora je najčešće korišćena. Validirana je i potvrđena je njena interna konzistentnost. Skala je prevođena na mnoge jezike za potrebe istraživanja među obolelima i u opštoj populaciji. Ona dobro korelira sa vizuelno–analognim merama i jasno razdvaja zdravu od patološke populacije (16) .

Epvortova skala pospanosti (*Epworth Sleepiness Scale*-ESS) je skala namenjena za merenje dnevne pospanosti. Sastoji se od 8 pitanja. Od ispitanika se traži da oceni verovatnoću da će zaspati u određenim situacijama na skali od 0 do 3, gde 0 znači nikad, a 3 veliku verovatnoću da će zaspati. Bodovi za osam pitanja se sabiraju da bi se dobio konačan skor. Skor u opsegu 0-9 smatra se normalnim, dok skor u opsegu 10-24 ukazuje na povišenu pospanost (10-15 povišena pospanost, 16-24 ozbiljna pospanost) (17). Skala je prevedena na srpski jezik i validirana (18).

U statističkoj analizi podataka korišćene su metode deskriptivne statistike, χ^2 test i Studentov t-test. Kao statistički značajna vrednost je korišćeno $p < 0,05$. Za statističku obradu podataka korišćen je program IBM SPSS verzija 23.

Rezultati

U studiju je bilo uključeno 312 studenata 27,5% studenata muškog pola i 72,5% studenata ženskog pola. Prosečan uzrast studenata bio je 21,37 ± 1,29 godina (tabela 1). Najveći broj studenata bio je iz Beograda (55,8%), oko jedne trećine iz Centralne Srbije, dok je iz Vojvodine bilo oko 6% studenata. Oko 40% studenata stanovalo je kod roditelja, u iznajmljenom stanu nešto manje od 30%, dok je oko 15% živelo u domu. Prosečna ocena studenata tokom studiranja je bila 8,53 ± 0,85. Između studenata i studentkinja nije bilo značajne razlike u odnosu na uzrast, mesto stanovanja, socio-ekonomski status, mesto stanovanja tokom studiranja i prosečnoj oceni tokom studiranja.

Prosečna vrednost PSQI skora iznosila je 6,49 ± 3,36 (minimum 0-maksimum 20) tokom prethodnih mesec dana (tabela 2). Više od polovine studenata (54,5%) imalo je loš kvalitet spavanja Prosečna vrednost skale zamora iznosila je 3,35 ± 1,33 (minimum 1, maksimum 7), a nešto više od četvrtine studenata (27,6%), imalo je povišen stepen zamora. Prosečna vrednost ESS skale pospanosti iznosila je 9,22 ± 4,46 (minimum 0 - maksimum 24), a skoro polovina studenata imala je povišene nivoe dnevne pospanosti (45,8%). Između muškaraca i žena nije bilo značajne razlike u kvalitetu spavanja i nivou zamora, ali su žene značajno češće imale više nivoe dnevne pospanosti (p=0,008).

Tabela 1. Demografske karakteristike ispitanika

Demografske karakteristike	Muškarci N=86	Žene N=226	p vrednost	Ukupno N=312
Uzrast, ($\bar{x}$ ± SD)	21,55 ± 1,89	21,30 ± 0,96	0,235*	21,37 ± 1,29
Mesto stanovanja, N (%)				
Beograd	51 (59,3)	123 (54,4)	0,362	174 (55,8)
Centralna Srbija	25 (29,1)	84 (37,2)		109 (34,9)
Vojvodina	5 (5,8)	13 (5,8)		18 (5,8)
Drugo	5 (5,8)	6 (2,7)		11 (3,5)
Socio-ekonomski status, N (%)				
Dobar	62 (72,1)	153 (67,7)	0,454	215 (68,9)
Srednji	24 (27,9)	74 (32,3)		97 (31,1)
Loš	0,0	0,0		0,0
Stanovanje tokom studija, N (%)				
Sa roditeljima	29 (33,7)	93 (41,2)	0,144	122 (39,1)
U domu	10 (11,6)	39 (17,3)		49 (15,7)
U iznajmljenom stanu	27 (31,4)	62 (27,4)		89 (28,5)
Ostalo	20 (23,3)	32 (14,2)		52 (16,7)
Prosečna ocena tokom studiranja, ($\bar{x}$ ± SD)	8,49 ± 0,78	8,53 ± 0,88	0,670*	8,53 ± 0,85

$\bar{x}$ - srednja vrednost, SD – standardna devijacija, p vrednost za χ^2 test, * p vrednost za t test

thus the average fatigue score is obtained, which can range from 1 (complete absence of fatigue) to 7 (the most pronounced presence of fatigue). The average value of Krupp Fatigue Scale greater than 4 was marked as pathological by the author. The final result is the self-assessment of the degree of fatigue, which can be monitored and compared over time, and it can also be compared to other conditions and diseases in which fatigue occurs. Of all known instruments used for measuring fatigue, the Krupp Fatigue Scale is most frequently used. It was validated and its internal consistency was confirmed. The scale was translated into many languages for the purposes of research among patients and in the general population. It correlates well with the visual-analog measures and clearly separates the healthy from the pathological population (16).

The Epworth Sleepiness Scale (ESS) is a scale designed to measure daytime sleepiness. It consists of 8 questions. The respondents are asked to assess the likelihood of falling asleep in certain situations on a scale from 0 to 3, where 0 means never and 3 means high probability of falling asleep. Scores for the eight questions are added to give the final score. The score ranging from 0-9 is considered normal, while the score from 10 to 24 indicates increased sleepiness (10-15 is increased sleepiness, 16-24 is severe sleepiness) (17). The scale was translated into Serbian and validated (18).

The methods of descriptive statistics, χ^2 square test and Student's t test were used for the analysis of data. $p < 0.05$ was used as a statistically significant value. The IBM SPSS version 23 program was used for statistical data processing.

Results

The study included 312 third-year students of the Faculty of Medicine of the University of Belgrade, 86 men (27.5%) and 226 women (72.2%) (table 1). The average age of students was 21.37 years. The largest number of students was from Belgrade (55.8%), about one third from Central Serbia, while about 6% were from Vojvodina. About 40% of students lived with their parents, slightly less than 30% of them lived in rented apartments, while about 15% lived in student dormitories. The average grade was 8.53 ± 0.85. There was no significant difference between male and female students regarding age, place of residence, socio-economic status, residence during studies and average grade on studies.

The average score of the Pittsburgh Sleep Quality Index was 6.49 ± 3.36 (minimum 0, maximum 20), more than half of the students (54.5%) had poor sleep quality during the previous month (table 2). The average value of the Fatigue Severity Scale was 3.35 ± 1.33 (minimum 0, maximum 7), and every fourth student had increased fatigue (27.6%). The average value of

Table 1. Demographic characteristics of the respondents

Demographic characteristics	Males N=86	Females N=226	p value	Total N = 312
Uzrast, ($\bar{x}$ ± SD)	21.55 ± 1.89	21.30 ± 0.96	0.235*	21.37 ± 1.29
Place of residence, N (%)				
Belgrade	51 (59.3)	123 (54.4)	0.362	174 (55.8)
Centrala Serbia	25 (29.1)	84 (37.2)		109 (34.9)
Vojvodina	5 (5.8)	13 (5.8)		18 (5.8)
Other	5 (5.8)	6 (2.7)		11 (3.5)
Socio-economic status, N (%)				
Good	62 (72.1)	153 (67.7)	0.454	215 (68.9)
Middle	24 (27.9)	74 (32.3)		97 (31.1)
Poor	0.0	0.0		0.0
Place of residence during studies, N (%)				
With parents	29 (33.7)	93 (41.2)	0.144	122 (39.1)
In student dormitories	10 (11.6)	39 (17.3)		49 (15.7)
In rented apartments	27 (31.4)	62 (27.4)		89 (28.5)
Other	20 (23.3)	32 (14.2)		52 (16.7)
Gradepoint average, ($\bar{x}$ ± SD)	8.49 ± 0.78	8.53 ± 0.88	0.670*	8.53 ± 0.85

$\bar{x}$ - mean, SD – standard deviation, p value for $\chi 2$ test, * p value for t test

Tabela 2. Distribucija muškaraca i žena u odnosu na kvalitet spavanja, zamor i stepen dnevne pospanosti

	Muškarci N=86	Žene N=226	p vrednost	Ukupno N=312
Kvalitet spavanja				
x̄ ± SD	6,35 ± 3,37	6,54 ± 3,37	0,647*	6,49 ± 3,36
med (min – max)	6 (0-20)	6 (0-17)		6 (0-20)
Dobar (PSQI < 5)	41 (47,7)	101 (44,7)	0,636	142 (45,5)
Loš (PSQI ≥ 5)	45 (52,3)	125 (55,3)		170 (54,5)
Zamor				
x̄ ± SD	3,21 ± 1,26	3,41 ± 1,36	0,242*	3,35 ± 1,33
med (min–max)	3 (1,11-6,56)	3,22 (1-7)		3,11 (1-7)
Normalan (FSS ≤ 4)	67 (77,9)	159 (70,4)	0,182	226 (72,4)
Povišen (FSS > 4)	19 (22,1)	67 (29,6)		86 (27,6)
Dnevna pospanost				
x̄ ± SD	8,03 ± 4,15	9,67 ± 4,50	0,004*	9,22 ± 4,46
med (min–max)	7 (0-18)	10 (0-24)		9 (0-24)
Normalna (ESS 0-9)	57 (66,3)	112 (49,6)	0,008	169 (54,2)
Povišena (ESS 10-24)	29 (33,7)	114 (50,4)		143 (45,8)

x̄ - srednja vrednost, SD – standardna devijacija, p vrednost za χ^2 test, * p vrednost za t test, PSQI – *Pittsbourgh Sleep Quality Index*, FSS – F*atigue Severity Scale*, ESS – *Epworth Sleepiness Scale*

Tabela 3. Demografske karakteristike, kvalitet spavanja i dnevna pospanost u odnosu na stepen zamora kod muškaraca

	Normalan stepen zamora N = 67	Povišen stepen zamora N = 19	p vrednost	Ukupno N=86
Mesto stanovanja, N (%)				
Beograd	39 (58,2)	12 (63,2)	0,984	51 (59,3)
Druga mesta	28 (41,8)	7 (36,8)		35 (40,7)
Socio-ekonomski status, N (%)				
Dobar	51 (76,1)	11 (57,9)	0,118	62 (72,1)
Srednji	16 (23,9)	8 (42,1)		24 (27,9)
Stanovanje tokom studija, N (%)				
Sa roditeljima	22 (32,8)	7 (36,8)	0,941	29 (33,7)
U domu	8 (11,9)	2 (10,5)		10 (11,6)
U iznajmljenom stanu	22 (32,8)	5 (26,3)		27 (31,4)
Ostalo	15 (22,4)	5 (26,3)		20 (23,2)
Kvalitet spavanja, N (%)				
Dobar (PSQI < 5)	38 (56,7)	3 (15,8)	0,002*	41 (47,7)
Loš (PSQI ≥ 5)	29 (43,3)	16 (84,2)		45 (52,3)
Dnevna pospanost, N (%)				
Normalna (ESS 0-9)	47 (70,1)	10 (52,6)	0,154	57 (66,3)
Povišena (ESS 10-24)	20 (29,9)	9 (47,4)		29 (33,7)
Prosečna ocena tokom studiranja, (x̄ ± SD)	8,49 ± 0,78	8,53 ± 0,88	0,670*	8,53 ± 0,85

x̄ - srednja vrednost, SD – standardna devijacija, p vrednost za χ^2 test, * p vrednost za t test, PSQI – *Pittsbourgh Sleep Quality Index*, FSS – F*atigue Severity Scale*, ESS – *Epworth Sleepiness Scale*

Table 2. Distribution of male and female students regarding sleep quality, fatigue and sleepiness

	Males N=86	Females N=226	p value	Total N = 312
Sleep quality				
x̄ ± SD	6.35 ± 3.37	6.54 ± 3.37	0.647*	6.49 ± 3.36
med (min – max)	6 (0-20)	6 (0-17)		6 (0-20)
Good (PSQI < 5)	41 (47.7)	101 (44.7)	0.636	142 (45.5)
Poor (PSQI ≥ 5)	45 (52.3)	125 (55.3)		170 (54.5)
Fatigue				
x̄ ± SD	3.21 ± 1.26	3.41 ± 1.36	0.242*	3.35 ± 1.33
med (min–max)	3 (1.11-6.56)	3.22 (1-7)		3.11 (1-7)
Normal (FSS ≤ 4)	67 (77.9)	159 (70.4)	0.182	226 (72.4)
Increased (FSS > 4)	19 (22.1)	67 (29.6)		86 (27.6)
Daily sleepiness				
x̄ ± SD	8.03 ± 4.15	9.67 ± 4.50	0.004*	9.22 ± 4.46
med (min–max)	7 (0-18)	10 (0-24)		9 (0-24)
Normal (ESS 0-9)	57 (66.3)	112 (49.6)	0.008	169 (54.2)
Increased (ESS 10-24)	29 (33.7)	114 (50.4)		143 (45.8)

x̄ - mean, SD – standard deviation, p value for χ^2 test, * p value for t test, PSQI – Pittsbourgh Sleep Quality Index, FSS – Fatigue Severity Scale, ESS – Epworth Sleepiness Scale

Table 3. Demographic characteristics, sleep quality and fatigue in relation to the level of fatigue in men

	Normal fatigue N = 67	Increased fatigue N = 19	p value	Total N=86
Place of residence, N (%)				
Beograd	39 (58.2)	12 (63.2)	0.984	51 (59.3)
Druga mesta	28 (41.8)	7 (36.8)		35 (40.7)
Socio-ekonomski status, N (%)				
Dobar	51 (76.1)	11 (57.9)	0.118	62 (72.1)
Srednji	16 (23.9)	8 (42.1)		24 (27.9)
Place of residence during studies, N (%)				
With parents	22 (32.8)	7 (36.8)	0.941	29 (33.7)
In student dormitories	8 (11.9)	2 (10.5)		10 (11.6)
In rented apartments	22 (32.8)	5 (26.3)		27 (31.4)
Other	15 (22.4)	5 (26.3)		20 (23.2)
Sleep quality, N (%)				
Good (PSQI< 5)	38 (56.7)	3 (15.8)	0.002*	41 (47.7)
Poor (PSQI≥ 5)	29 (43.3)	16 (84.2)		45 (52.3)
Sleepiness, N (%)				
Normal (ESS 0-9)	47 (70.1)	10 (52.6)	0.154	57 (66.3)
Increased (ESS 10-24)	20 (29.9)	9 (47.4)		29 (33.7)
Grade point average, (x̄ ± SD)	8.49 ± 0.78	8.53 ± 0.88	0.670*	8.53 ± 0.85

x̄ - mean, SD – standard deviation, p value for χ^2 test, *p value for t test, PSQI – Pittsbourgh Sleep Quality Index, FSS – Fatigue Severity Scale, ESS – Epworth Sleepiness Scale

Tabela 4. Demografske karakteristike, kvalitet spavanja i dnevna pospanost u odnosu na stepen zamora kod žena

	Normalan stepen zamora N = 159	Povišen stepen zamora N = 67	p vrednost	Ukupno N=226
Mesto stanovanja, N (%)				
Beograd	90 (56,6)	33 (49,3)	0,984	123 (54,4)
Druga mesta	69 (43,4)	34 (50,7)		103 (45,6)
Socio-ekonomski status, N (%)				
Dobar	113 (71,1)	40 (59,7)	0,095	153 (67.7)
Srednji	46 (28,9)	27 (40,3)		73 (32.3)
Stanovanje tokom studija, N (%)				
Sa roditeljima	65 (40,9)	28 (41,8)	0,661	93 (41,2)
U domu	29 (18,2)	10 (14,9)		39 (17,3)
U iznajmljenom stanu	44 (27,7)	18 (26,9)		62 (27,4)
Ostalo	21 (13,2)	11 (16,4)		32 (14,2)
Kvalitet spavanja, N (%)				
Dobar (PSQI < 5)	79 (49,7)	22 (32,8)	0,020	101 (44,7)
Loš (PSQI ≥ 5)	80 (50,3)	45 (67,2)		125 (55,3)
Dnevna pospanost, N (%)				
Normalna (ESS 0-9)	86 (54,1)	26 (38,8)	0,036	112 (49,6)
Povišena (ESS 10-24)	73 (45,9)	41 (61,2)		114 (50,4)
Prosečna ocena tokom studiranja, ($\bar{x}$ ± SD)	8,52 ± 0,94	8,57 ± 0,74	0,735*	8,49 ± 0,78

$\bar{x}$ - srednja vrednost, SD – standardna devijacija, p vrednost za χ^2 test, * p vrednost za t test, PSQI – *Pittsbourgh Sleep Quality Index*, FSS – F*atigue Severity Scale*, ESS – *Epworth Sleepiness Scale*

Između muškaraca sa povišenim stepenom zamora i onih sa normalnim vrednostima stepena zamora nije bilo značajne razlike u odnosu na mesto stanovanja, socio-ekonomski status, mesto stanovanja tokom studija i prosečnu ocenu tokom studija (tabela 3). Studenti sa povišenim stepenom zamora značajno češće su imali loš kvalitet spavanja tokom prethodnih mesec dana (84,2%) u odnosu na studente sa normalnim vrednostima stepena zamora (43,3%), dok u stepenu dnevne pospanosti između njih nije bilo razlike.

Između studentkinja sa povišenim stepenom zamora i onih sa normalnim vrednostima stepena zamora nije bilo značajne razlike u odnosu na mesto stanovanja, socio-ekonomski status, mesto stanovanja tokom studija i prosečnu ocenu tokom studija (tabela 4). Studentkinje sa povišenim stepenom zamora značajno češće su imale loš kvalitet spavanja spavanja tokom prethodnih mesec dana (67,2%) u odnosu na studentkinje sa normalnim vrednostima stepena zamora (50,3%), kao i povišene nivoe dnevne pospanosti (61,2% vs. 45,9%).

Diskusija

Loš kvalitet spavanja je uobičajen kod studenata medicine i povezan je sa brojnim negativnim zdravstvenim ishodima. Međutim, procenjena učestalost lošeg kvaliteta spavanja kod studenata medicine varira u različitim studijama (19). Prema rezultatima naše studije loš kvalitet spavanja imalo je više od polovine studenata, i to 52,3% muškaraca i 55,6% žena.

U populacionim studijama procenjena prevalencija poremećaja spavanja kreće se od 15 do 42%, a kod starijih osoba može biti i do 72% (20). Meta-analiza iz 2020. godine, koja je obuhvatila studije u kojima je kvalitet spavanja procenjivan PSQI skorom, pokazala je da je prevalencija lošeg kvaliteta spavanja kod studenata medicine 52,7% (19). To je značajno više nego među drugim univerzitetskim studentima (23%) (21) i starijoj populaciji (38,3%) (22). Ovakav rezultat verovatno je povezan sa visokim akademskim pritiskom na medicinskim fakultetima, jer se često akademske obaveze studenata završavaju na račun kvaliteta njihovog spavanja. Pored toga, određeni psihološki faktori, kao što su anksioznost i depresivni simp-

Table 4. Demographic characteristics, sleep quality and sleepiness in relation to the level of fatigue in women

	Normal fatigue N = 159	Increased fatigue N = 67	p value	Total N=226
Place of residence, N (%)				
Beograd	90 (56.6)	33 (49.3)	0.984	123 (54.4)
Druga mesta	69 (43.4)	34 (50.7)		103 (45.6)
Socio-ekonomski status, N (%)				
Dobar	113 (71.1)	40 (59.7)	0.095	153 (67.7)
Srednji	46 (28.9)	27 (40.3)		73 (32.3)
Place of residence during studies, N (%)				
With parents	65 (40.9)	28 (41.8)	0.661	93 (41.2)
In student dormitories	29 (18.2)	10 (14.9)		39 (17.3)
In rented apartments	44 (27.7)	18 (26.9)		62 (27.4)
Other	21 (13.2)	11 (16.4)		32 (14.2)
Sleep quality, N (%)				
Good (PSQI< 5)	79 (49.7)	22 (32.8)	0.020	101 (44.7)
Poor (PSQI≥ 5)	80 (50.3)	45 (67.2)		125 (55.3)
Sleepiness, N (%)				
Normal (ESS 0-9)	86 (54.1)	26 (38.8)	0.036	112 (49.6)
Increased (ESS 10-24)	73 (45.9)	41 (61.2)		114 (50.4)
Grade point average, ($\bar{x}$ ± SD)	8.52 ± 0.94	8.57 ± 0.74	0.735*	8.49 ± 0.78

$\bar{x}$ - mean, SD – standard deviation, p value for χ^2 test, *p value for t test, PSQI – Pittsbourgh Sleep Quality Index, FSS – Fatigue Severity Scale, ESS – Epworth Sleepiness Scale

ESS sleepiness scale was 9.22 ± 4.46 (minimum 0, maximum 24), and almost half of the students had elevated levels of sleepiness (45.8%). There was no significant difference between men and women regarding sleep quality and level of fatigue, but women significantly more often had higher levels of daytime sleepiness (p=0.008)

There was no significant difference between men with increased fatigue and those with normal values of fatigue in relation to their place of residence, socio-economic status, place of residence during studies and average grade on studies (tabela 3). Students with increased fatigue had poor sleep quality during previous month significantly more often (84.2%) in comparison to students with normal fatigue scores (43.3%), while there was no difference between them in relation to sleepiness.

Between female students with an elevated level of fatigue and those with normal values of the level of fatigue, there was no significant difference in relation to the place of residence, socio-economic status, place of residence during studies and average grade during studies (table 4). Female students with an increased degree of fatigue significantly more often had poor sleep quality during the previous month (67.2%) compared to female students with normal values of the degree of fatigue (50.3%), as well as increased levels of daytime sleepiness (61.2% vs. 45.9%).

Discussion

Poor sleep quality is common among students of medicine and it is connected with a number of negative health outcomes. However, estimates of the prevalence of poor sleep quality in medical students vary in different studies (19). According to the results of our study, more than half of the students had poor sleep quality, namely 52.3% of men and 55.3% of women.

In population studies, the estimated prevalence of sleep disorders ranges from 15 to 42%, while in the elderly it can be up to 72% (20). One meta-analysis from 2020, which included studies in which sleep quality was assessed by the PSQI score, showed that the prevalence of poor sleep in medical students was 52.7% (19). This is significantly higher in comparison to other

tomi relativno su česti kod studenata medicine (14), što je povezano sa većim rizikom nastanka problema sa spavanjem (3).

Rezultati dobijeni ovim istraživanjem ukazuju da je svaki četvrti student imao povišen stepen zamora, a skoro polovina studenata povišen nivo dnevne pospanosti. Učestalost povišene dnevne pospanosti je značajno veća među ženama, nego među muškarcima. Osim toga, veća je učestalost lošeg kvaliteta spavanja među muškarcima i ženama sa povećanim vrednostima stepena zamora. U našoj studiji nije otkrivena povezanost akademskog uspeha studenata sa zamorom, pospanošću i, kvalitetom spavanja. Prosečna ocena studenata tokom studiranja je bila visoka, i iznosila je 8,53, ali nije uočana značajna razlika u uspehu na studijama u odnosu na pol, a ni među studentima sa povišenim i onih sa normalnim vrednostima stepena zamora. Međutim, rezultati drugih studija ukazuju da i zamor i loš kvalitet spavanja mogu značajno da utiču na akademski uspeh, kao i da povećaju rizik nastajanja sindroma sagorevanja, anksioznosti, depresije i poremećaja pažnje kod studenata (23).

Zamor i pospanost značajni su za studente medicine i sa aspekta što su oni budući zdravstveni radnici. Studije ukazuju na povećane vrednosti dnevne pospanosti, skraćeno vreme reagovanja, povećanu varijabilnost vremena odgovora, kao i na povećanu učestalost medicinskih grešaka i pogrešnog donošenja odluka kod zdravstvenih radnika (24). Usled nestandardnog radnog vremena, odnosno rada u smenama, noćnih dežurstava, izmenjene dinamike rada, svakodnevnog pritiska i stresa, zamor i dnevna pospanost se u velikom procentu javljaju i kod zdravstvenih radnika u kliničkoj praksi (24). Stoga je potrebno motivisati studente medicine na zdraviji način života već u nižim godinama studija.

Ovo istraživanje je sprovedeno na uzorku studenata treće godine studija medicine, pa se rezultai ne mogu generalizovati na studente svih godina studija. Kako se sa godinama studija menja i akademsko opterećenje bilo bi značajno da se istraživanje sprovede među studentima svih godina studija. Osim toga, kako je istraživanje dizajnirano po tipu studije preseka, ima sva ograničenja koja su karakteristična za ovaj tip studija, pre svega nemogućnost utvrđivanja uzročno-posledične veze. Stoga bi bilo značajno sprovesti studije koje bi omogućile detaljniji uvid u navike u dnevnom funkcionisanju i akademskom opterećenju studenata, koje bi zajedno sa podacima o kvalitetu spavanja, stepenu zamora i pospanosti pružile infeormacije o njihovom mentalnom stanju, što bi dalo osnov za primenu odgovarajućih preventivnih mera. Potrebno je podržati studente i omogućiti im da uz profesionalne veštine razviju neophodne kapacitete koji će im omogućiti da održe zdravlje i blagostanje kako tokom studiranja pod visokim pritiskom i tako i tokom zahtevne profesionalne karijere.

Zaključak

Loš kvalitet spavanja, zamor i dnevna pospanost su učestali među studenatima medicine. Više od polovine studenata medicine ima loš kvalitet spavanja, svaki četvrti student medicine ima povišen stepen zamora, a skoro polovina studenata medicine ima povišen nivo dnevne pospanosti. U cilju smanjenja učestalosti neželjenih zdravstvenih posledica lošeg kvaliteta spavanja, neophodno je sprovoditi dodatnu edukaciju studenata medicine o uticaju kvaliteta spavanja i zamora na zdravlje, kao i edukacije o zdravim obrascima spavanja i efikasnoj organizaciji vremena tokom studiranja.

Konflikt interesa

Autori su izjavili da nema konflikta interesa.

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university students (23%) (21) and the elderly population (38.3%) (22). This result is probably related to the high academic pressure at medical faculties, because academic duties are often completed at the expense of good quality sleep. In addition, certain psychological factors, such as anxiety and depressive symptoms are relatively common in medical students, which is associated with a higher risk of sleep problems (3).

The results obtained from this research indicated that the prevalence of increased fatigue is 27.6%, and increased daytime sleepiness even 45.8%. The frequency of increased sleepiness is significantly higher among women (50.4%) than among men (33.7%). In addition, the frequency of increased sleepiness is significantly higher among women (50.4%) than among men (33.7%). In addition, the frequency of poor sleep quality is higher among men and women with increased fatigue. In this study, the correlation between the academic success of students and increased fatigue, sleepiness and poor sleep quality was not found. The average grade of students was high, 8.53, but there was no significant difference between genders in relation to academic success, as well as between students with increased and those with normal fatigue scores. However, the results of other studies indicate that fatigue and poor sleep quality can significantly influence the academic success, as well as increase the risk of burnout, anxiety, depression and attention deficit disorders (23).

Fatigue and sleepiness are important for medical students because they are future healthcare workers. Numerous studies have pointed to increased sleepiness, decreased reaction time, increased variability of response time, as well as increased frequency of medical errors and incorrect decision-making in healthcare workers (24). Due to non-standard working hours, that is, shift work, nightshifts, changed work dynamics, everyday pressure and stress, fatigue and sleepiness occur in healthcare workers in clinical practice in a large percentage (24). Therefore, it is necessary to encourage medical students to adopt a healthier lifestyle in the earlier years of studies.

This research was conducted on a sample of students in the third year of medical studies, so the results cannot be generalized to students of all years of study. As the academic load changes with the years of study, it would be significant if the research was conducted among students of all years of study. In addition, as the research was designed as a cross-sectional study, it has all the limitations characteristic of this type of study, primarily the impossibility of establishing a cause-and-effect relationship. Therefore, it would be essential to conduct studies that would allow more detailed insight into the habits of daily functioning and academic workload of students, which, together with data on the quality of sleep, degree of fatigue, and sleepiness, would provide information about their mental state, which would provide a basis for the application of appropriate preventive measures. It is necessary to support students and enable them to develop, along with professional skills, the necessary capacities that will help them to maintain health and well-being both during high-pressure studies and during a demanding professional career.

Conclusion

Poor sleep quality, fatigue and daytime sleepiness are common among medical students. More than half of medical students have poor sleep quality, every fourth medical student has an increased level of fatigue, and almost half of medical students have an increased level of daytime sleepiness. In order to reduce the frequency of unwanted health consequences of poor sleep quality, it is necessary to conduct additional education of medical students about the impact of sleep quality and fatigue on health, as well as education about healthy sleep patterns and efficient organization of time during studies.

Competing interests

The authors declared no competing interests.

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ARTERIJSKA HIPERTENZIJA KOD RUDARA JAMSKOG KOPA

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SAŽETAK

Uvod/Cilj: Arterijska hipertenzija je česta kako u opštoj populaciji, tako i kod proizvodnih radnika, naročito onih koji rade na poslovima u specijalnim uslovima rada. Cilj ovog rada je da se analizira učestalost javljanja i karakteristike arterijske hipertenzije kod rudara jamskog kopa u odnosu na fizičke radnike.
Metode: U studiju preseka uključeno je 321 rudar Rudnika „Lece“ (Srbija) i 150 fizičkih radnika koji nikada nisu radili u jamskom kopu. Dobijeni rezultati su analizirani u odnosu na vrstu i težinu arterijske hipertenzije i godine starosti ispitanika. U cilju postavljanja dijagnoze hipertenzije urađen je klinički pregled. U statističkoj analizi podataka korišćen je hi kvadrat test.
Rezultati: Arterijska hipertenzija je značajno ($p<0,001$) češće bila prisutna kod rudara (35,2%) nego fizičkih radnika (14,5%). Najmanje 95% ispitanika obe ispitivane grupe je imalo primarnu hipertenziju. Učestalost hipertenzije raste sa godinama starosti kod obe ispitivane grupe i bila je najveća u uzrastu 46-55 godina. Nije bilo značajne razlike između ispitivanih grupa u odnosu na učestalost hipertenzije po uzrasnim grupama, mada su rudari u najstarijem uzrastu češće imali umerenu (31,5%) i tešku hipertenziju (13,0%) nego fizički radnici (28,6% i 7,1%).
Zaključak: Češće javljanje hipertenzije, kao i predominacija umerene i teške hipertenzije, kod rudara u odnosu na fizičke radnike, upućuje na mogućnost da radni uslovi utiču na nastanak ovog oboljenja.

Ključne reči: arterijska hipertenzija, uzrast, rudari, jamski kop, fizički radnici.

Uvod

Arterijska hipertenzija je široko rasprostranjena bolest koja se javlja kod oko 50% svih obolelih od kardiovaskularnih bolesti i najčešći je uzrok smrti kod ¼ do ½ obolelih. Kardiovaskularne bolesti su vodeći uzrok obolevanja i umiranja u svetu (1). Prema podacima Svetske zdravstvene organizacije, procenjuje se da u svetu 46% odraslih uzrasta od 30-79 godina ne zna da ima hipertenziju, a samo je kod 42% dijagnostikovana i lečena (1). Hipertenzija se javlja kod radno aktivnog stanovništva na pojedinim poslovima, sa akcentom na teškim i stresnim poslovima (2).

Cilj ovog rada je da se analizira učestalost javljanja i karakteristike arterijske hipertenzije kod rudara jamskog kopa u odnosu na fizičke radnike.

Metode

Ovom studijom preseka bio je obuhvaćen 321 rudar „Rudnika Lece“ i 150 fizičkih radnika „Rudnika Lece“(Srbija) koji uopšte nisu radili u jami. Svi ispitanici su muškog pola. Ispitanici su pregledani u prostorijama rudnika. Studija je urađena u prvoj polovini 2019. godine. Od svih ispitanika dobijeni su podaci o uzrastu, vrsti posla, postojanju hipertenzije i težini hipertenzije. Nijedan testirani rudar nije bio stariji od 55 godina što je posledica činjenice da rudari odlaze u penziju ranije zbog beneficiranog radnog staža. Upravo iz tog razloga u studiju smo uključili rudare i fizičke radnike uzrasta 26-55 godina.

Svim ispitanicima je izmeren krvni pritisak, prema uslovima preporučenim u Smernicama za tretiranje arterijske hipertenzije Evropskog društ-

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ARTERIAL HYPERTENSION IN MINE PIT MINERS

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SUMMARY

Introduction/Aim: Arterial hypertension is common both in the general population and in production workers, especially those who work in jobs with special working conditions. The aim of this work is to analyze the frequency of occurrence and characteristics of arterial hypertension in pit miners in relation to physical workers.
Methods: The cross-sectional study included 321 miners of the "Lece" Mine (Serbia) and 150 manual workers who had never worked in the pit. The obtained results were analyzed in relation to the type and severity of arterial hypertension and the age of subjects. In order to diagnose hypertension, a clinical examination was performed. The chi-square test was used in the statistical analysis of data.
Results: Arterial hypertension was significantly ($p<0.001$) more often present in miners (35.2%) than manual workers (14.5%). At least 95% of the subjects of both investigated groups had primary hypertension. The frequency of hypertension increased with age in both studied groups and was highest in the age group of 46-55 years. There was no significant difference between the treated groups in relation to the frequency of hypertension by age group, although miners in the oldest age group had moderate (31.5%) and severe hypertension (13.0%) more often than manual workers (28.6% and 7. 1%).
Conclusion: The more frequent occurrence of hypertension, as well as the predominance of moderate and severe hypertension, in miners compared to physical workers, points to the possibility that working conditions influence the onset of this disease.

Key words: arterial hypertension, age, miners, pit, manual workers.

Introduction

Arterial hypertension is a widespread disease that accounts for about 50% of all cardiovascular patients and it is the most common cause of death in ¼ to ½ of patients. Cardiovascular diseases are the leading cause of morbidity and mortality in the world (1). According to the official World Health Organization data, it is estimated that in the world 46% of adults aged 30-79 do not know that they have hypertension, and only 42% have it diagnosed and treated (1). Hypertension occurs in the working population in some jobs, with an accent placed on difficult and stressful jobs (2).

The aim of this work is to analyze the frequency of occurrence and characteristics of arterial hypertension in pit miners in relation to physical workers.

Methods

This cross-sectional study included 321 miners of the "Lece Mine" and 150 manual workers of the "Lece Mine" (Serbia) who did not work in the pit at all. All respondents were male. The respondents were examined on the mine premises. The study was done in the first half of 2019. Data on age, type of work, presence of hypertension, and severity of hypertension were obtained from all respondents. No miner tested was older than 55 years old, which is a consequence of the fact that

va za kardiologiju i Evropskog društva za hipertenziju iz 2018. godine (3). Ispitanici su udobno sedeli u tihom okruženju 5 minuta pre početka merenja krvnog pritiska. Dva puta je meren krvni pritisak, u razmaku od 1-2 minuta, a dodatna merenja su obavljana samo ako su se prva dva očitavanja razlikovala za >10 mmHg. Krvni pritisak je zabeležen kao prosek poslednja dva očitavanja krvnog pritiska. Za klasifikaciju hipertenzije korišćene su iste Smernice za tretiranje arterijske hipertenzije (4).

U statističkoj analizi podataka korišćen je hi kvadrat test.

Rezultati

Kao što je prikazano u Tabeli 1, od 321 rudara, 113 (35,2%) imalo je arterijsku hipertenziju, dok od 138 fizičkih radnika 20 (14,5%). Ova razlika je bila značajna (p<0,001). Prema težini hipertenzije, rudari su značajno češće imali povišeni normalni, blagu, umerenu i tešku hipertenziju u odnosu na fizičke radnike. Između ispitivanih grupa nije bilo značajne razlike u odnosu na vrstu hipertenzije. Primarna hipertenzija konstatovana je kod 96,5% rudara i 95,0% fizičkih radnika. Rudari sa hipertenzijom su bili češće stariji (81,4%) u poređenju sa fizičkim radnicima (70,0%).

Umerena i teška arterijska hipertenzija češće se javljala kod rudara u uzrastu 36-45 i 46-55 godine, a kod fizičkih radnika blaga u uzrastu 36-45 godina i 46-55 godina (tabela 2). U uzrastu 26-35 godina, kod obe ispitivane grupe, bila je prisutna samo blaga hipertenzija.

Diskusija

U našojstudiji prevalencija hipertenzije je bila značajno veća kod rudara jamskog kopa (35,2%) nego fizičkih radnika (14,5%). Takođe, rudari jamskog kopa su češće imali teži oblik hipertenzije (umerenu i tešku) nego fizički radnici. Mnoge studije navode da rad u rudnicima povećava rizik od kardiovaskularnih bolesti zbog uticaja brojnih faktora: silicijum dioksid, vibracije, buka, ugljen monoksid, visoka temperatura i smenski rad (5-8). Pored profesionalnih faktora odgovorni su i brojni drugi počevši od gojaznosti, nasleđa, sagorevanja na poslu, stresa itd. (9). Rudari u jamskim kopovima izloženi su lošijim uslovima rada i većem radnom riziku što može uzrokovati stres i dovesti do hipertenzije (10,11). Istraživanje *Wang*-a i *Shang*-a, kojim je obuhvaćeno 1736 rudara koji su radili u podzemnom kopu i 825 koji su radili u površinskom kopu, je pokazalo da je prevalencija hiperten-

Tabela 1. Distribucija rudara i fizičkih radnika prema demografskim karakteristikama, vrsti i težini arterijske hipertenzije

Karakteristike	Rudari Broj (%)	Fizički radnici Broj (%)	p vrednost*
Arterijska hipertenzija (sistolni ≥140 mmHg i/ ili dijastolni ≥90 mmHg)			
Da	113 (35,2)	20 (14,5)	<0,001
Ne	208 (64,8)	118 (85,5)	
Ukupno	321 (100,0)	138 (100,0)	
Težina arterijske hipertenzije			
Normalna (sistolni 120-129 i/ili dijastolni 80-84 mmHg)	198 (61,7)	115 (83,3)	<0,001
Povišeni normalni (sistolni 130-139 i/ili dijastolni 85-89 mmHg)	10 (3,1)	3 (2,2)	
Blaga hipertenzija (sistolni 140-159 i/ili dijastolni 90-99 mmHg)	63 (19,6)	13 (9,4)	
Umerena hipertenzija (160-179 i/ili 100-109 mmHg)	38 (11,8)	6 (4,3)	
Teška hipertenzija (≥180 i/ili ≥110 mmHg)	12 (3,7)	1 (0,7)	
Ukupno	321 (100,0)	138 (100,0)	
Vrsta hipertenzije			
Primarna (esencijalna)	109 (96,5)	19 (95,0)	0,752
Sekundarna	4 (3,5)	1 (5,0)	
Ukupno	113 (100,0)	20 (100,0)	
Uzrast (godine) lica sa hipertenzijom			
26-35	4 (3,5)	1 (5,0)	0,498
36-45	17 (15,0)	5 (25,0)	
46-55	92 (81,4)	14 (70,0)	
Ukupno	113 (100,0)	20 (100,0)	

p vrednost za χ^2 test

miners retire earlier due to beneficial working years. It is for this reason that we included miners and manual workers aged 26-55 in the study.

Each respondent's blood pressure was measured under the conditions recommended in the 2018 ESC/ESH Guidelines for the management of arterial hypertension (3). Patients were seated comfortably in a quiet environment for 5 min before the beginning of blood pressure (BP) measurements. Two BP measurements were recorded, 1-2 min apart, and additional measurements were recorded only if the first two readings differed by >10 mmHg. BP was recorded as the average of the last two BP readings. The same 2018 ESC/ESH Guidelines for the management of arterial hypertension were used for the hypertension classification (4).

The chi-square test was used in the statistical analysis of data.

Results

As shown in Table 1, out of 321 miners, 113 (35.2%) had arterial hypertension, while out of 138 manual workers 20 (14.5%). This difference was significant ($p<0.001$). According to the severity of hypertension, miners had elevated normal, mild, moderate, and severe hypertension significantly more often than manual workers. There was no significant difference between the examined groups in relation to the type of hypertension. Primary hypertension was found in 96.5% of miners and 95.0% of manual workers. Miners with hypertension were more often older (81.4%) compared to manual workers (70.0%).

Moderate and severe arterial hypertension occurred more often in miners aged 36-45 and 46-55 years, and in manual labourers aged 36-45 and 46-55 years (Table 2). At the age of 26-35, in both investigated groups, only mild hypertension was present.

Discussion

In our study, the prevalence of hypertension was significantly higher in pit miners (35.2%) than in manual workers (14.5%). Also, pit miners had a more severe form of hypertension (moderate and severe) than manual workers. Many studies report that working in mines increases the risk of cardiovascular diseases due to the influence of numerous factors: silica, vibration, noise, carbon monoxide, high temperature, and shift work (5-8).

Table 1. Distribution of miners and manual workers according to demographic characteristics, type and severity of arterial hypertension

Characteristics	Miners Number (%)	Manual workers Number (%)	p value*
Arterial hypertension (systolic ≥140 mmHg and/ or diastolic≥90 mmHg)			
Yes	113 (35.2)	20 (14.5)	<0.001
No	208 (64.8)	118 (85.5)	
Total	321 (100.0)	138 (100.0)	
Severity of arterial hypertension			
Normal (systolic 120-129 and/or diastolic 80-84 mmHg)	198 (61.7)	115 (83.3)	<0.001
Elevated normal (systolic 130-139 and/or diastolic 85-89 mmHg)	10 (3.1)	3 (2.2)	
Mild hypertension (systolic 140-159 and/or diastolic 90-99 mmHg)	63 (19.6)	13 (9.4)	
Moderate hypertension (160-179 and/or 100-109 mmHg)	38 (11.8)	6 (4.3)	
Severe hypertension (≥180 and/or ≥110 mmHg)	12 (3.7)	1 (0.7)	
Total	321 (100.0)	138 (100.0)	
Type of hypertension			
Primary	109 (96.5)	19 (95.0)	0.752
Secondary	4 (3.5)	1 (5.0)	
Total	113 (100.0)	20 (100.0)	
Age (years) of the person with hypertension			
26-35	4 (3.5)	1 (5.0)	0.498
36-45	17 (15.0)	5 (25.0)	
46-55	92 (81.4)	14 (70.0)	
Total	113 (100.0)	20 (100.0)	

p value for χ^2 test

Tabela 2. Distribucija rudara i fizičkih radnika sa hipertenzijom prema uzrastu i težini arterijske hipertenzije

Karakteristike	Rudari							
	Blaga AH		Umerena AH		Teška AH		Ukupno	
	N	(%)	N	(%)	N	(%)	N	(%)
Uzrast (godine) lica sa hipertenzijom								
26-35	4	100	0	0,0	0	0,0	4	100,0
36-45	8	47,0	9	53,0	0	0,0	17	100,0
46-55	51	55,4	19	31,5	12	13,0	92	100,0
	Fizički radnici							
	Blaga AH		Umerena AH		Teška AH		Ukupno	
	N	(%)	N	(%)	N	(%)	N	(%)
Uzrast (godine) lica sa hipertenzijom								
26-35	1	100,0	0	0,0	0	0,0	1	100,0
36-45	3	60,0	2	40,0	0	0,0	5	100,0
46-55	9	64,3	4	28,6	1	7,1	14	100,0

AH- arterijska hipertenzija

zije rudara jamskog kopa 23,9% i da je značajno veća od prevalencije za rudare površinskog kopa 15,5% (12). Dužina rada pod zemljom, takođe, značajno je korelirala sa prevalencijom hipertenzije. Studija sprovedena u Americi je pokazala da je prevalencija hipertenzije među rudarima 31%, kao i da je veća od one zabeležene u odrasloj populaciji, što je zahtevalo intervencije za borbu protiv kardiovaskularnih bolesti (13).

U nacionalnoj studiji Grujić i saradnika, sprovedenoj 2006. godine u R. Srbiji na 14.204 odraslih uzrasta 20 godina i više, uočeno je da 47% odrasle populacije ima hipertenziju (stadijum 1, kada je sistolni krvni pritisak 140-159 mm Hg ili dijastolni krvni pritisak 90-99 mm Hg, - 25,3%; stadijum 2, kada je sistolni krvni pritisak 160 i više mm Hg ili dijastolni krvni pritisak 100 I više mm Hg, - 18,1%) (14). Tek sva druga osoba znala je da ima hipertenziju, a lečilo se samo 60,4% ispitanika (14). Podaci za svet pokazuju da hipertenziju, prema potvrdi ispitanika da im je dijagnostikovana hipertenzija, ima 59% žena i 49% muškaraca u 2019. godini, kao i da se leči tek svaka druga žena i svaki treći muškarac (15).

Kod naših ispitanika, kako rudara jamskog kopa, tako i fizičkih radnika, češće je bila zastupljena primarna hipertenzija (oko 95%) što se može objasniti prethodnim rigoroznim kontrolnim pregledima koji isključuju da osobe sa oboljenjima obavljaju ovaj težak posao.

U našoj studiji, učestalost javljanja atrerijske hipertenzije raste sa godinama starosti, a umerena i teška forma bolesti arterijske hipertenzije su češće kod starijih rudara jamskog kopa nego fizičkih radnika. Rezultati o uticaju starenja na hipertenziju su u skladu sa rezultatima drugih autora (15-19).

Glavni nedostatak ove studije je što nisu analizirani i drugi faktori rizika koji mogu da se dovedu do nastanka hipertenzije kod rudara (npr. dužina radnog staža, stepen uhranjenosti, stres, depresija, sagorevanje na poslu, itd.). S druge strane ogroman je doprinos ove studije, jer ukazuje na često javljanje hipertenzije i otvara mogućnost za preventivni rad (rano otkrivanje hipertenzije, redukcija ili eliminacija faktora rizika – npr. gojaznosti) što bi doprinelo sprečavanju nastanka infarkta miokarda, moždanog udara i drugih kardiovaskularnih događaja. Sve navedeno ukazuje na važnost očuvanja fizičkog i mentalnog zdravlja rudara, odnosno obezbeđivanja adekvatnog kvalitet života osobama ove profesije.

Zaključak

Arterijska hipertenzija se češće registruje kod rudara (35,2%) nego kod fizičkih radnika (14,5%), sa dominantnom umerenom i teškom hipertenzijom, što ukazuje na mogućnost da uslovi rada utiču na pojavu ove bolesti. Prevalencija arterijske hipertenzije raste sa uzrastom ispitanika.

Table 2. Distribution of miners and manual workers with hypertension according to age and severity of arterial hypertension

Mine workers								
Arterial hypertension	**Mild**		**Moderate**		**Severe**		**Total**	
	N	**(%)**	**N**	**(%)**	**N**	**(%)**	**N**	**(%)**
Age (years) of miners with hypertension								
26-35	4	100	0	0.0	0	0.0	4	100.0
36-45	8	47.0	9	53.0	0	0.0	17	100.0
46-55	51	55.4	19	31.5	12	13.0	92	100.0
Manual workers								
Arterial hypertension	**Mild**		**Moderate**		**Severe**		**Total**	
	N	**(%)**	**N**	**(%)**	**N**	**(%)**	**N**	**(%)**
Age (years) of workers with hypertension								
26-35	1	100.0	0	0.0	0	0.0	1	100.0
36-45	3	60.0	2	40.0	0	0.0	5	100.0
46-55	9	64.3	4	28.6	1	7.1	14	100.0

In addition to occupational factors, many other factors are responsible, including obesity, heredity, burnout at work, stress, etc. (9). Pit miners are exposed to poorer working conditions and greater occupational risk, which can cause stress and lead to hypertension (10,11). A study by Wang and Shang, which included 1736 underground miners and 825 open pit miners, showed that the prevalence of hypertension in pit miners was 23.9% and was significantly higher than the prevalence for open pit miners 15.5% (12). The length of work underground also significantly correlated with the prevalence of hypertension. A study conducted in America showed that the prevalence of hypertension among miners was 31% and that it was higher than that recorded in the adult population, which required interventions to combat cardiovascular diseases (13).

In a national study by Grujić and associates, conducted in 2006 in the Republic of Serbia on 14,204 adults aged 20 and over, it was observed that 47% of adult population had hypertension (stage 1, when systolic blood pressure is 140-159 mm Hg or diastolic blood pressure 90-99 mm Hg, - 25.3%; stage 2, when systolic blood pressure is 160 and more mm Hg or diastolic blood pressure 100 and more mm Hg, - 18.1%) (14). Only every second person knew that they had hypertension, and only 60.4% of respondents were treated (14). Data for the world show that 59% of women and 49% of men had hypertension, according to respondents' confirmation that they were diagnosed with hypertension in 2019, and that only every second woman and every third man were treated (15).

In our respondents, both pit miners and manual workers, primary hypertension was more common (about 95%), which can be explained by previous rigorous control examinations that exclude people with diseases from performing this difficult work.

In our study, the incidence of arterial hypertension increases with age, and moderate and severe forms of arterial hypertension are more common in older pit miners than manual workers. The results on the effect of aging on hypertension are consistent with the results of other authors (16-20).

The main shortcoming of this study is that other risk factors that may lead to the development of hypertension in miners were not analyzed (e.g. length of work experience, level of nutrition, stress, depression, burnout at work, etc.). On the other hand, the contribution of this study is huge, because it indicates the frequent occurrence of hypertension and opens the possibility for preventive work (early detection of hypertension, reduction or elimination of risk factors – e.g. obesity) which would contribute to the prevention of myocardial infarction, stroke and other cardiovascular events. All of the above points to the importance of preserving the physical and mental health of miners, that is, ensuring an adequate quality of life for people in this profession.

Neophodna su dalja ispitivanja faktora rizika za nastanak hipertenzije kod rudara koji rade u jamskim i površinskim kopovima.

Konflikt interesa

Autori su izjavili da nema konflikta interesa.

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Conclusion

Arterial hypertension was more often registered in the miners (35.2%) than in manual workers (14.5%), with dominant moderate and severe hypertension, suggesting the possibility that working conditions affect the occurrence of this disease. The prevalence of arterial hypertension increases with the age of respondents. Further studies of risk factors for the development of hypertension in miners working in pit and surface mines are necessary.

Competing interests

The authors declared no competing interests.

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ZNANJE I STAVOVI RUKOVODILACA O PRIMENI STANDARDIZOVANIH SISTEMIMA MENADŽMENTA U REPUBLIČKOM FONDU ZA ZDRAVSTVENO OSIGURANJE

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SAŽETAK

Uvod/Cilj: Uvođenje i primena standardizovanih sistema menadžmenta u Republički fond za zdravstveno osiguranje (RFZO) je postala neophodnost radi unutrašnje stabilnosti i stabilnosti zdravstvenog sistema Republike Srbije (RS). Cilj ove studije preseka je bio da ispita znanje i stavovi rukovodioca RFZO RS o standardizovanim sistemima menadžmenta i važnosti njihove primene u RFZO, kao i da se daju odgovarajuće preporuke.
Metode: U okviru ove studije preseka, tokom meseca maja 2017. godine, prikupljeni su podaci upitnikom od 157 rukovodilaca iz RFZO RS, jer su oni imali neposredan uvid u primenu standarda ISO 9001 - sistem menadžmenta kvalitetom i ISO 27001 - sistem menadžmenta bezbednošću informacija za koji je RFZO sertifikovan.
Rezultati: Od svih standardizovanih sistema menadžmenta koji su uvedeni u RFZO RS rukovodioci su u najvećem procentu bili upoznati sa ISO 9001 (99,4%) i ISO 27001, a najmanje sa ISO 30400 – sistem menadžmenta ljudskim resursima (6,4%), ISO 30001 – sistem menadžmenta rizicima (5,7%), ISO 45001 – sistem menadžmenta bezbednost i zdravlje na radu (5,1%) i ISO 14001 – sistem menadžmenta životnom sredinom (4,5%). Najvažnija pozitivna iskustva po pitanju primene ISO standardizovanih sistema menadžmenta su bila: bolja organizacija posla (93,6%), povećanje zadovoljstva zaposlenih (89,8%), poboljšan rad filijale (78,8%) i jednoobraznost u radu (72,0%), a negativna obimnija administracija (26,8%) i otpor prema promenama (24,8%). Od ličnih iskazanih pozitivnih doživljaja vezanih za uvođenje ISO standardizovanih sistema menadžmenta su zadovoljstvo unapređenjem poslovanja (84,1%) i povećana odgovornost (42,7%), a od negativnih otpor promenama (31,2%) i dug period uvođenja (23,6%).
Zaključak: Kontinuirano unapređenje poslovnog procesa RFZO vodi ka kvalitetnijem zdravstvenom sistemu RS i boljem opštem zdravstvenom stanju društva.

Ključne reči: znanje, stavovi, rukovodioci, ISO standardizovani sistem menadžmenta

Uvod

Poslovanje Republičkog fonda za zdravstveno osiguranje Republike Srbije je utemenjeno na osnovnim načelima Zakona o zdravstvenom osiguranju (1). Ovim zakonom jasno je definisana svrha, delatnost, nadležnost i odgovornost državnog fonda zdravstvenog osiguranja kao izvora finansiranja zdravstvenog sistema Republike Srbije (1).

Alokacija raspoloživih finansijskih resursa i garantovano ostvarivanje prava osiguranika u matičnoj evidenciji državnog fonda, proisteklih iz Zakona o zdravstvenom osiguranju, a u skladu sa načelima solidarnosti i dostupnosti zdravstvene zaštite, uz održanje kontinuirane finansijske stabilnosti zdravstvenog sistema Republike Srbije i poslovnog procesa Republičkog fonda za zdravstveno osiguranje, u savremenim uslovima je jedino moguće uz standardizaciju poslovnih procesa. Uvođenje i primena standardizovanih sistema menadžmenta u Republički fond za zdravstveno osiguranje je postala neophodnost radi unutrašnje stabilnosti i stabilnosti zdravstvenog sistema Republike Srbije.

Nezavisno od nacionalne politike i opredeljenosti za model zdravstvenog osiguranja, poslovni proces u organizacijama zdravstvenog osiguranja mora biti čvrsta osnova za dalji razvoj sistema zdravstvene

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KNOWLEDGE AND ATTITUDES OF MANAGERS ON THE APPLICATION OF STANDARDIZED MANAGEMENT SYSTEMS IN THE REPUBLIC HEALTH INSURANCE FUND

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SUMMARY

Introduction/Aim: The introduction and implementation of standardized management systems in the Republic Health Insurance Fund (RHIF) has become a necessity for the sake of internal stability, as well as the stability of the health system of the Republic of Serbia (RS). The aim of this cross-sectional study was to examine the knowledge and attitudes of managers of RHIF RS about standardized management systems and the importance of their implementation in RHIF, as well as to give appropriate recommendations.
Methods: As part of this cross-sectional study, during May 2017, data was collected using a questionnaire from 157 managers of RHIF RS, because they had a direct insight into the implementation of ISO 9001 – quality management system and ISO 27001 – information security management system, for which RHIF is certified.
Results: Of all the standardized management systems that were introduced in RHIF RS, the majority of managers were familiar with ISO 9001 (99.4%) and ISO 27001, while they were least familiar with ISO 30400 – human resources management system (6.4%), ISO 30001 – risk management system (5.7%), ISO 45001 – occupational health and safety (5.1%) and ISO 14001 – environmental management system (4.5%). The most important positive experiences regarding the implementation of ISO standardized management system were the following: better work organization (93.6%), increased satisfaction of employees (89.8%), improved work of branch offices (78.8%), and uniformity of work (72.0%), while the negative included: more extensive administration (26.8%) and resistance to changes (24.8%). The personal positive experiences related to the introduction of ISO standardized management systems included satisfaction with the improvement of business (84.1%) and increased responsibility (42.7%), while the negative ones were resistance to changes (31.2%) and a long period of introduction (23.6%).
Conclusion: The continuous improvement of RHIF business process leads to the better quality of the healthcare system in RS and a better general health condition of society.

Key words: knowledge, attitudes, managers, ISO standardized management system

Introduction

The operations of the Republic Health Insurance Fund of the Republic of Serbia are based on the basic principles of the Law on Health Insurance (1). The purpose, activity, jurisdiction and responsibility of the state health insurance as a source of financing of the health system of Serbia are clearly defined by this law (1).

The allocation of available financial resources and guaranteed realization of rights of insured persons in the registry of the state fund, based on the Law on Health Insurance and in accordance with the principles of solidarity and availability of health care, with the maintenance of continuous financial stability of the health system of the Republic of Serbia and the business process of the Republic Fund for Health Insurance under modern conditions, are possible only with the standardization of business processes. The introduction and implementation of standardized management systems in the Republic Health Insurance Fund have become the necessity for the sake of internal stability and stability of the health system of the Republic of Serbia.

Regardless of the national policy and commitment to the health insurance model, the business process in health insurance organizations

zaštite (2,3). Organizacije zdravstvenog osiguranja moraju da imaju standardizovane poslovne procese radi unutrašnje stabilnosti i uređenosti kako same organizacije, tako i radi stabilnosti celokupnog zdravstvenog sistema. Jedna greška u poslovanju Republičkog fonda za zdravstveno osiguranje može da dovede do grešaka u pružanju zdravstvenih usluga, a time da direktno utiče na zdravlje pacijenta što jasno pokazuje sistemski pristup (3).

Uvođenje i primena ISO 9001- standardizovanog sistema menadžmenta kvaliteta kroz politike, procedure, uputstva i obrasce uvodi jasnu hijerarhijsku podelu nadležnosti i odgovornosti, identifikuje aktivnosti u okviru poslovnih procesa, daje mogućnost merenja izvršenja radnih zadataka u zadatom roku, povećava efikasnost i produktivnost u poslovanju, smanjuje mogućnost greške, ubrzava proces komunikacije, dovodi do jednoobraznosti u poslovanju i tumačenju zakonske regulative (4,5). Sve navedeno je izuzetno značajno u organizacijama zdravstvenog osiguranja, a naročito u poslovnim procesima matične evidencije osiguranika, ostvarivanja prava iz zdravstvenog osiguranja, centralizovanih javnih nabavki, finansijske stabilnosti, mogućnosti interne kontrole poslovog procesa radi otklanjanja grešaka u poslovnom procesu i stvaranja baze znanja. U poslovnoj praksi nekih od najuspešnijih zdravstvenih sistema je da organizacije zdravstvenog osiguranja ugovore o pružanju zdravstvenih usluga zaključuju samo sa zdravstvenim ustanovama sertifikovanim, odnosno akreditovanim za vršenje delatnosti u skladu sa standardizovanim sistemima menadžmenta. Podjednak značaj za državni fond zdravstvenog osiguranja i organizacije u sektoru zdravstvenog osiguranja u svetu ima primena sistema menadžmenta bezbednosti informacija i to: ISO/IEC 27001, ISO/IEC 27002, ISO 27799 (6-8).

Cilj ove studije preseka je bio da ispita znanje i stavove rukovodilaca Republičkog fonda za zdravstveno osiguranje Republike Srbije o standardizovanim sistemima menadžmenta i važnosti njihove primene u Republičkom fondu za zdravstveno osiguranje, kao i da se daju odgovarajuće preporuke.

Metode

U Republičkom fondu zdravstvenog osiguranja Republike Srbije izvršena je sertifikaciona provera sistema menadžmenta kvalitetom, prema zahtevima standarda ISO 9001:2008 i ISO 27001:2005, u periodu od 20. do 23. avgusta 2012. godine od strane sertifikacionog tela "SGS Beograd" (9,10). Ova studija preseka o istraživanju primene standardizovanih sistema menadžmenta u Republičkom fondu za zdravstveno osiguranje Republike Srbije, kao i o znanju i stavovima rukovodilaca Republičkog fonda za zdravstveno osiguranje o standardizovanim sistemima menadžmenta, je sprovedena u period 15-30. maja 2017. godine, kada je tema opravdanosti troškova resertifikacije bila aktuelna.

U studiju je uključeno 157 rukovodilaca (direktori, pomoćnici direktora i načelnici) u Direkciji Republičkog fonda za zdravstveno osiguranje i svm filijalama Republičkog fonda na teritoriji Republike Srbije, jer oni imaju neposredan uvid u primenu standarda ISO 9001 - sistem menadžmenta kvalitetom (9) i ISO 27001 - sistem menadžmenta bezbednošću informacija (10) za koji je Republički fond zdravstvenog osiguranja sertifikovan. Lokalni kordinatori nisu bili uključeni u istraživanje, jer su bili direktno uključeni u proces uvođenja, primene i sertifikacije, kao i zbog visokog stepena poznavanja standardizovanih sistema menadžmenta.

Od rukovodilaca zavisi doslednost u primeni, a bez njihovog razumevanja potrebe za sprovođenjem poslovnih procesa u skladu sa definisanim politikama i procedurama nije moguće govoriti o njihovom doslednom sprovođenju. Pošto ne postoje podaci o dobrobiti uvedenih standardizovanih sistema menadžmenta, moguće je da neinformisanost donosilaca odluka i lični subjektivni stav može da utiče na bezbednost podataka kojima Republički fond za zdravstveno osiguranje Republike Srbije raspolaže.

Od svakog ispitanika podaci su dobijeni upitnikom. Pitanja u upitniku osmišljena su na osnovu literaturnih podataka. Da bi istraživanje bilo potpuno i sveobuhvatno, data im je mogućnost opisa prema ličnom zapažanju rukovodilaca. U analizi podataka korišćeni su apsolutni brojevi i procenti.

Rezultati

Od svih standardizovanih sistema menadžmenta koji su uvedeni u Republički fond za zdravstveno osiguranje R. Srbije rukovodioci su u najvećem procentu bili upoznati sa ISO 9001 – sistemom menadžmenta kvalitetom (99,4%) i ISO 27001 – sistemom menadžmenta bezbednošću informacijama

must be a solid basis for the further development of the health care system (2,3). Health insurance organizations must have standardized business processes, aimed at internal stability and order of the organization itself, as well as the stability of the entire health system. One error in the operations of the Republic Health Insurance Fund may lead to mistakes in the provision of health services, thus directly affecting the patient's health, which clearly shows a systemic approach (3).

The introduction and implementation of ISO 9001 - standardized quality management systems through policies, procedures, guidelines and forms introduces a clear hierarchical division of competence and responsibilities, identifies activities within business processes, provides the ability to measure the completion of work tasks within the given deadline, increases the efficiency and productivity of business operations, reduces the possibility of mistakes, accelerates the communication process, leads to uniformity in business and interpretation of legal regulations (4,5). All of the above mentioned is extremely important in health insurance organizations, and particularly in the business processes within registers of insured persons, exercising rights from health insurance, centralized public procurement, financial stability, the possibility of internal control of the business process aimed at eliminating mistakes in the business process and creating the base of knowledge. In the business practice of some of the most successful health systems, health insurance organizations conclude contracts for the provision of health services only with health institutions that are certified, that is, accredited to perform activities in accordance with standardized management systems. Equal significance for the state health insurance fund and organizations in the health insurance sector has the implementation of information security management systems, including the following: ISO/IEC 27001, ISO/IEC 27002, ISO 27799 (6,8).

The aim of this cross-sectional study was to examine the knowledge and attitudes of the managers of the Republic Health Insurance Fund of the Republic of Serbia about standardized management systems and the importance of their implementation in the Republic Health Insurance Fund, as well as to give appropriate recommendations.

Methods

In the Republic Health Insurance Fund of the Republic of Serbia, a certification check of the quality management system was performed, according to the requirements of ISO 9001:2008 and ISO 27001:2005 standards, in the period from August 20th to August 23rd, 2012 by the certification body "SGS Belgrade" (9,10). This cross-sectional study on the research into the implementation of standardized management systems in the Republic Health Insurance Fund of the Republic of Serbia, as well as on the knowledge and attitudes of the managers of the Republic Health Insurance Fund about standardized management systems was conducted in the period from 15th to 30th May, 2017, when the topic of justification of recertification costs was actual.

The study included 157 managers (directors, assistant directors and heads) in the Directorate of the Republic Health Insurance Fund and all branch offices of the Republic Health Insurance Fund in the territory of the Republic of Serbia, because they have a direct insight into the application of ISO 9001 – quality management system (9) and ISO 27001 – information security management system (10), for which the Republic Health Insurance Fund is certified. Local coordinators were not included in the study because they were directly involved in the process of introduction, application and certification, as well as because of their high level of knowledge of standardized management systems.

Consistency of implementation depends on managers, and without their understanding of the need to implement business processes in accordance with defined policies and procedures, it is not possible to talk about their consistent implementation. Due to the fact that there is no data on the benefits of introduced standardized management systems, it is possible that the lack of information of decision makers and personal subjective attitude may affect the security of data that the Republic Health Insurance Fund of the Republic of Serbia has at its disposal.

Data were obtained from each respondent with the help of a questionnaire. The questions in the questionnaire were designed based on literature data. In order for a study to be complete and comprehensive, managers were given the opportunity to describe something according to

Tabela 1. Znanje i stavovi rukovodilaca u Republičkom fondu za zdravstveno osiguranje Republike Srbije, maj 2017. godine

Karakteristike	Broj (%) (N=157)
Koje standardizovane sisteme menadžmenta poznajete?	
ISO 9001 - sistem menadžmenta kvalitetom	156 (99,4)
ISO 27001 - sistem menadžmenta bezbednošću informacijama	147 (93,6)
ISO 30400 - sistem menadžmenta ljudskim resursima	10 (6,4)
ISO 30001 - sistem menadžmenta rizicima	9 (5,7)
ISO 14001 - sistem menadžmenta životnom sredinom	8 (5,1)
ISO 45001 – bezbednost i zdravlje na radu	7 (4,5)
Koji od navedenih standarda može da vam pomogne u radu?	
ISO 9001 – sistem menadžmenta kvalitetom	152 (96,8)
ISO 27001 – sistem menadžmenta bezbednošću informacijama	140 (89,2)
ISO 30400 – sistema menadžmenta ljudskim resursima	48 (30,6)
ISO 30001 – sistem menadžmenta rizicima	29 (18,5)
ISO 45001 - bezbednost i zdravlje na radu	28 (17,8)
Značaj ISO 30400 - sistema menadžmenta ljudskim resursima u sprovođenju već primenjenih standarda	
Bez značaja	2 (1,3)
Mali značaj	3 (1,9)
Značajan	29 (18,5)
Veoma značajan	64 (40,8)
Najvećeg značaja	59 (37,6)
Koji način uvođenja i primene ISO standarda smatrate pogodnijim?	
„Frontalno”	30 (19,1)
„Postepeno”	124 (79,0)
Ne znam	3 (1,9)
Da li smatrate da je ispravno i opravdano uvođenje ISO standarda?	
Da	145 (92,4)
Ne	8 (5,1)
Ne znam	4 (2,6)
Da li smatrate opravdanim troškove sertifikovanja?	
Da	109 (69,4)
Ne	33 (21,0)
Ne znam	15 (9,6)
Da li je uvođenjem ISO standarda i sertifikovanjem došlo do smanjenja troškova poslovanja?	
Da	73 (46,5)
Ne	63 (40,1)
Ne znam	21 (13,4)
Iskustva ispitanika u primeni ISO standarda	
Pozitivna	134 (85,4)
Negativna	23 (14,7)
Lični doživljaj uvođenja ISO standarda i njihove primene	
Pozitivan	146 (93,0)
Negativan	11 (7,0)

(93,6%), a najmanje sa ISO 30400 – sistemom menadžmenta ljudskim resursima (6,4%), ISO 30001 – sistemom menadžmenta rizicima (5,7%), ISO 45001 – sistemom menadžmenta bezbednosti i zdravlja na radu (5,1%) i ISO 14001 – sistemom menadžmenta životnom sredinom (4,5%) (tabela 1). Od svih navedenih šest standardizovanih sistema menadžmenta rukovodioci smatraju da im najviše u radu mogu pomoći dva, i to ISO 9001 – sistem menadžmenta kvalitetom (96,8%) i ISO 27001 – sistem menadžmenta bezbednošću informacijama (89,2%). Takođe, su smatrali da su im najmanje važni za rad ISO 30001 – sistem menadžmenta rizicima (18,5%) i ISO 45001 - bezbednost i

Table 1. Knowledge and attitudes of managers in the Republic Health Insurance Fund of the Republic of Serbia, May 2017

Characteristics	Number (%) (N=157)
Which standardized management systems do you know?	
ISO 9001 – quality management system	156 (99.4)
ISO 27001 – information security management system	147 (93.6)
ISO 30400 – human resources management system	10 (6.4)
ISO 30001 – risk management system	9 (5.7)
ISO 14001 – environmental management system	8 (5.1)
ISO 45001 – occupational health and safety	7 (4.5)
Which of these standards can be helpful for your work?	
ISO 9001 – quality management system	152 (96.8)
ISO 27001 – information security management system	140 (89.2)
ISO 30400 – human resources management system	48 (30.6)
ISO 30001 – risk management system	29 (18.5)
ISO 45001 - occupational health and safety	28 (17.8)
Significance of ISO 30400 – human resources management system in implementing already applied standards	
No significance	2 (1.3)
Little significance	3 (1.9)
Significant	29 (18.5)
Very significant	64 (40.8)
Of greatest significance	59 (37.6)
Which way of introducing ISO standards is more appropriate?	
"Frontal"	30 (19.1)
"Gradual"	124 (79.0)
I do not know	3 (1.9)
Do you think that the introduction of ISO standards is correct and justified?	
Yes	145 (92.4)
No	8 (5.1)
I do not know	4 (2.6)
Do you think that certification costs are justified?	
Yes	109 (69.4)
No	33 (21.0)
I do not know	15 (9.6)
Were costs of operations reduced when ISO standards were introduced?	
Yes	73 (46.5)
No	63 (40.1)
I do not know	21 (13.4)
Experience of respondents related to the implementation of ISO standards	
Positive	134 (85.4)
Negative	23 (14.7)
Personal experience related to the introduction of ISO standards and their implementation	
Positive	146 (93.0)
Negative	11 (7.0)

their personal observations. Absolute numbers and percentages were used in data analysis.

Results

Of all the standardized management systems introduced in the Republic Health Insurance Fund of the Republic of Serbia, the largest percentage of managers were familiar with ISO 9001 – quality management system (99.4%) and ISO 27001 – information security management system (93.6%), while they were least familiar with ISO 30400 – human resources management system (6.4%), ISO 30001 – risk management system (5.7%), ISO 45001 – occupational health and

Tabela 2. Pozitivna i negativna iskustva po pitanju primene ISO standardizovanih sistema menadžmenta iskazana od strane rukovodilaca Republičkog fonda za zdravstveno osiguranje Republike Srbije, maj 2017. godine

POZITIVNO ISKUSTVO	Broj (%) (N=157)	NEGATIVNO ISKUSTVO	Broj (%) (N=157)
Povećanje efikasnosti	104 (66,2)	Opterećujuće	17 (10,8)
Smanjena mogućnost greške	57 (36,3)	Obimnija administracija	42 (26,8)
Olakšan rad	49 (31,2)	Povećana potrošnja papira	9 (5,7)
Jednoobraznost u radu	113 (72,0)	Otpor promenama	39 (24,8)
Jednostavnija međusobna komunikacija	37 (23,6)	Zahteva više vremena za obavljanje radnih zadataka	13 (8,3)
Poboljšan rad filijala	124 (78,8)	Nedovoljan broj izvršilaca	8 (5,1)
Kontinuirano unapređenje poslovanja	73 (46,5)	Nedostatak prostora za arhiviranje obimne dokumentacije	21 (13,4)
Povećana odgovornost zaposlenih	67 (42,7)	Nedoslednost u primeni	19 (12,1)
Jasno utvrđene nadležnosti	52 (33,1)	Obimnost materijala za upoznavanje novozaposlenih sa poslovnim procesima	7 (4,5)
Povećanje kvaliteta rada	15 (9,6)	Teško primenjivo	3 (1,9)
Jasno definisan poslovni proces i aktivnosti	45 (28,7)	Radna dokumentacija nije ažurirana	31 (19,8)
Pomaže u radu	102 (65,0)		
Povećano zadovoljstvo zaposlenih	141 (89,8)		
Povećano zadovoljstvo osiguranika	2 (1,3)		
Povećano zadovoljstvo poslovnih partnera	8 (5,1)		
Povećano zadovoljstvo zdravstvenih ustanova	13 (8,3)		
Timski rad	5 (3,2)		
Povećanje sigurnosti u radu	2 (1,3)		
Povećana bezbednost podataka	97 (61,8)		
Bolja organizacija posla	147 (93,6)		
Lakše uvođenje novozaposlenih u rad	11 (7,0)		
Jasna podela posla	29 (18,5)		

zdravlje na radu (17,8%). U cilju sprovođenja standardizovanih sistema menadžmenta samo jedna trećina rukovodilaca (37,6%) je smatralo da je ISO 30400 – sistem menadžmenta ljudskim resursima od najvećeg značaja, a nešto više od jedne trećine da je veoma značajan. Manje od 4% je smatralo da je bez značaja ili da ima mali značaj. Većina rukovodilaca Republičkog fonda za zdravstsveno osiguranje (79%) je bila za „postepeno" uvođenje i primenu ISO standarda, a 19% za „frontalno". Za „frontalno" pristup uvođenju i primeni ISO standarda u Republičkom fondu zdravstvenog osiguranja u većem broju slučajeva bili su rukovodioci na trećem hijerarhijskom nivou, odnosno načelnici, dok su direktori i pomoćnici direktora iskazivali u većem obimu suprotan stav. Većina rukovodilaca (92,4%) je smatrala da je ispravno i opravdano uvođenje standardizovanih sistema menadžmenta u Republički fond zdravstvenog osiguranja, odnosno smatrali su da se time doprinosi boljem poslovanju. Oko 93% rukovodilaca je imalo stav da je ispravno i opravdano uvođenje standardizovanih sistema menadžmenta u Republički fond zdravstvenog osiguranja, odnosno da se time doprinosi boljem poslovanju. Troškove sertifikovanja je oko dve trećine rukovodilaca smatralo opravdanim, a jedna trećina neopravdanim. Ispitanici najvišeg hijerarhijskog novoa, njih 10% od ukupnog broja ispitanika, nisu bili opredeljeni u smislu opravdanosti troškova sertifikovanja. Skoro svaki drugi rukovodi-

Table 2. Positive and negative experience regarding the implementation of ISO standardized management systems shown by managers of the Republic Health Insurance Fund of the Republic of Serbia, May 2017

POSITIVE EXPERIENCE	Number (%) (N=157)	NEGATIVE EXPERIENCE	Number (%) (N=157)
Increased efficiency	104 (66.2)	Burdensome	17 (10.8)
Reduced possibility of mistake	57 (36.3)	More administration	42 (26.8)
Easier work	49 (31.2)	Increased use of paper	9 (5.7)
Uniformity of work	113 (72.0)	Resistance to changes	39 (24.8)
Easier communication	37 (23.6)	Demands more time for performing work tasks	13 (8.3)
Improved work of branches	124 (78.8)	Insufficient number of employees	8 (5.1)
Continuous improvement of business operations	73 (46.5)	Lack of space for storing extensive documentation	21 (13.4)
Increased responsibility of employees	67 (42.7)	Inconsistency of application	19 (12.1)
Clearly defined responsibilities	52 (33.1)	Extensive material for introducing new employees to business processes	7 (4.5)
Increased quality of work	15 (9.6)	Hard to be applied	3 (1.9)
Clearly defined business process and activities	45 (28.7)	Working documentation not updated	31 (19.8)
Helps at work	102 (65.0)		
Increased satisfaction of employees	141 (89.8)		
Increased satisfaction of the insured	2 (1.3)		
Increased satisfaction of business partners	8 (5.1)		
Increased satisfaction of healthcare institutions	13 (8.3)		
Team work	5 (3.2)		
Increased safety at work	2 (1.3)		
Increased information security	97 (61.8)		
Better work organization	147 (93.6)		
Easier introduction of new employees to work	11 (7.0)		
Clear division of responsibilities	29 (18.5)		

safety management system (5.1%) and ISO 14001 – environmental management system (4.5%) (Table 1). Of all the six mentioned standardized management systems, the managers believed that two can help them most in their work, namely ISO 9001 – quality management system (96.8%) and ISO 27001 – information security management system (89.2%). Also, they considered ISO 30001 – risk management system (18.5%) and ISO 45001 – safety and occupational health (17.8%) to be the least important for their work. In order to implement standardized management systems, only one third of managers (37.6%) considered ISO 30400 – human resources management system to be of greatest importance, and a little more than one-third to be very important. Less than 4% of managers thought that it was of no importance or of little importance. The majority of managers of the Republic Health Insurance Fund (79%) supported the "gradual" introduction and implementation of ISO standards, while 19% supported "frontal". Managers on the third hierarchical level, that is, heads, were in most cases for the "frontal" approach to the introduction and implementation of ISO standards in the Republic Health Insurance Fund, while directors and assistant directors expressed the opposite attitude to a greater extent. The majority of managers (92.4%) considered

Tabela 3. Pregled iskazanih ličnih doživljaja nakon uvođenja i primene ISO standardizovanih Sistema menadžmenta od strane rukovodilaca Republičkog fonda za zdravstveno osiguranje Republike Srbije, maj 2017. godine

POZITIVNO ISKUSTVO	Broj (%) (N=157)	NEGATIVNO ISKUSTVO	Broj (%) (N=157)
Unapređenje kvaliteta	9 (5,7)	Otpor promenama	49 (31,2)
Normalno	28 (17,8)	Dug period uvođenja	37 (23,6)
Pojednostavljen rad	12 (7,6)	Nužnost	13 (8,3)
Povećanu odgovornost	67 (42,7)	Opterećujuće u početku, kasnije korisno	29 (18,5)
Aktivno učešće u promeni	27 (17,2)	Kao ispostavljen zahtev	11 (7,0)
Zadovoljstvo, nakon otpora u početku uvođenja ISO standarda	21 (13,4)	Kao nametnutu obavezu	23 (14,7)
Zadovoljstvo unapređenjem poslovanja	132 (84,1)	Stresno	19 (12,1)
Olakšanje u radu	33 (21,0)	Suvišna obaveza	3 (1,9)
Potreba	7 (4,5)	Razočaravajuće, jer nije postignuto ono što je lično očekivano	2 (1,3)
Unapređenje poslovanja	51 (32,5)	Razočaravjuće, zbog nedoslednosti	2 (1,3)
Dobar metod za unapređenje poslovanja	37 (23,6)	Ustrojavajuće	1 (0,6)
Povećanje ličnih sposobnosti	3 (1,9)		
Pozitivno iskustvo	77 (49,0)		
Kao pomoć u radu	33 (21,0)		
Sve je moguće uraditi efikasnije i preciznije	3 (1,9)		
Neophodnost	5 (3,2)		
Vid ličnog usavršavanja	2 (1,3)		
Značajno olakšanje u radu	32 (20,4)		
Pozitivna promena	22 (14,0)		
Oduševljenje	1 (0,6)		
Entuzijazam zbog unapređenja poslovanja	3 (1,9)		
Afirmativno	31 (19,8)		
Izazov	7 (4,7)		
Delimično primenjivo	5 (3,2)		
Povećan napor, sa kasnijim benefitima	37 (23,6)		
Povećana odgovornost	15 (9,6)		

lac je smatrao da je uvođenjem ISO standarda (ISO 9001:2008 i ISO 27001:2005 standardizovanih sistema menadžmenta) i sertifikovanjem došlo do smanjenja troškova poslovanja u Republičkom fondu za zdravstveno osiguranje. Pozitivna iskustva po pitanju primene ISO standardizovanih sistema menadžmenta je imalo 85,4% rukovodilaca, a lični pozitivan doživljaj uvođenja ISO standarda i njihove primene je imalo 93% rukovodilaca.

Od svih pozitivnih iskustava rukovodilaca po pitanju primene ISO standardizovanih sistema menadžmenta u Republičkom fondu za zdravstveno osiguranje najvažnija su bila: bolja organizacija posla (93,6%), povećanje zadovoljstva zaposlenih (89,8%), poboljšan rad filijale (78,8%) i jednoobraznost u radu (72,0%) (tabela 2). Od negativnih iskustava dominirali su obimnija administracija (26,8%) i otpor prema promenama (24,8%).

Od ličnih iskazanih pozitivnih doživljaja vezanih za uvođenje ISO standardizovanih sistema menadžmenta su zadovoljstvo unapređenjem poslovanja (84,1%) i povećana odgovornost (42,7%), a od negativnih otpor promenama (31,2%) i dug period uvođenja (23,6%) (tabela 3).

Table 3. Review of expressed personal experiences after the introduction and application of ISO standardized management systems by managers of the Republic Health Insurance Fund of the Republic of Serbia, May 2017.

POSITIVE EXPERIENCE	Number (%) (N=157)	NEGATIVE EXPERIENCE	Number (%) (N=157)
Improvement of quality	9 (5.7)	Resistance to changes	49 (31.2)
Normal	28 (17.8)	Long period of introduction	37 (23.6)
Easier work	12 (7.6)	Obligation	13 (8.3)
Increased responsibility	67 (42.7)	Burdensome at the beginning. later useful	29 (18.5)
Active participation in changes	27 (17.2)	As a set demand	11 (7.0)
Satisfaction after resistance at the beginning of introducing ISO standards	21 (13.4)	As imposed responsibility	23 (14.7)
Satisfaction related to improvement of business operations	132 (84.1)	Stressful	19 (12.1)
Ease at work	33 (21.0)	Additional duty	3 (1.9)
Need	7 (4.5)	Disappointing because we did not achieve what we expected	2 (1.3)
Improvement of operations	51 (32.5)	Disappointing due to inconsistency	2 (1.3)
Good method for improving operations	37 (23.6)	Demanding	1 (0.6)
Increase of personal abilities	3 (1.9)		
Positive experience	77 (49.0)		
Help at work	33 (21.0)		
Everything can be done in a more efficient and precise way	3 (1.9)		
Necessity	5 (3.2)		
Kind of personal improvement	2 (1.3)		
Significant ease at work	32 (20.4)		
Positive change	22 (14.0)		
Excitement	1 (0.6)		
Enthusiasm due to improvement of operations	3 (1.9)		
Affirmative	31 (19.8)		
Challenge	7 (4.7)		
Partly applicable	5 (3.2)		
Increased effort with later benefits	37 (23.6)		
Increased responsibility	15 (9.6)		

the introduction of standardized management systems in the Republic Health Insurance Fund to be correct and justified, that is, they believed that it contributed to better business operations. About 93% of managers thought that the introduction of standardized management systems in the Republic Health Insurance Fund was correct and justified, that is, that it contributed to better business operations. About 2/3 of managers thought that the costs of certification were justified, while 1/3 thought they were unjustified. Respondents of the highest hierarchical level, 10% of the total number of respondents, were not determined in terms of the justification of certification costs. Almost every other manager believed that the introduction of ISO standards (ISO 9001:2008 and ISO 27001:2005 standardized management systems) and certification led to a reduction in business costs in the Republic Health Insurance Fund. 85.4% of managers had positive experience regarding the implementation of ISO standardized management systems, while 93% of managers had a personal

Tabela 4. Koristi od primene ISO standardizovanih sistema menadžmenta i sertifikacije od strane rukovodilaca Republičkog fonda za zdravstveno osiguranje Republike Srbije, maj 2017. godine

Koristi od primene ISO standarda i sertifikacije	Broj (%) (N=157)
Povećana efikasnost i produktivnost organizacije	109 (69,4)
Pojednostavljenost poslovnog procesa i olakšanje u svakodnevnom radu	65 (41,4)
Povećana zaštita podataka I informacionog sistema	97 (61,8)
Savesnije postupanje zaposlenih prema raspoloživim resursima	69 (44,0)
Standardizovanje poslova – radni zadaci se izvršavaju u skladu sa procedurama, uputstvima i obrascima, jednoobraznost poslovnih procesa	113 (72,0)
Jasna međusobna komunikacija horizontalno i vertikalno po nadležnostima	37 (23,6)
Definisan poslovni process	76 (48,4)
Lakše otkrivanje rizika I nedoslednosti u radu	9 (5,7)
Povećan stepen lične odgovornosti kroz jasno definisane nadležnosti	122 (77,7)
Ubrzavanje procesa rada – unapred definisane aktivnosti u izvršenju radnih zadataka sa unapred utvrđenim rokovima	17 (10,8)
Interna baza znanja – sistematizovano znanje u okviru Info portala	39 (24,8)
Povećanje zadovoljstva osiguranika, zaposlenih, zdravstvenih ustanova, privrednih subjekata i državnih institucija sa kojima imamo saradnju	151 (96,2)
Povećanje stepena dostupnosti podataka – definisan način komunikacije, upita, forme dostavljanja zahtevanih podataka, poštovanje rokova	2 (1,23)
Transparentnost u radu	14 (8,9)
Povećanje nivoa profesionalizma I kvaliteta rada zaposlenih – upotreba obrazaca i dokumenata po jasno definisanim procedurama, kroz jednoobraznost i poštovanje rokova	124 (79,0)
Stalna nadgradnja poslovnog procesa – uočavanje grešaka i rizika, kao i blagovremeno uvođenje sistemskih promena	73 (46,5)
Povećanje nivoa kvaliteta i njegovo kontinuirano održavanje	143 (91,1)
Smanjenje mogućnosti greške – uočavanje nove greške koje za posledicu ima izmenu procedura, uputstava i obrazaca, direktno dovodi do eliminisanja greške čija je mogućnost minimizirana samim uvođenjem ISO standarda	19 (12,1)
Povećanje mogućnosti kontrole rada i merljivost rezultata rada	30 (19,1)
Otklanjanje dilemma u primeni propisa	11 (7,0)
Pozitivni efekti na upravljanje od strane menadžmenta u ugled organizacije	143 (91,1)
Povećanje discipline zaposlenih, ispravnosti i preglednosti dokumentacije	50 (31,8)
Poboljšanje sistema upravljanja informacionom bezbednošću	109 (69,4)
Povećanje stepena kontrole bezbednosti podataka	97 (61,7)
Jasno utvrđene nadležnosti – horizontalno i vertikalno po hijerarhiji	52 (33,1)
Uspostavljanje kontrolnih mehanizama	19 (12,1)
Smanjenje mogućnosti improvizacije od strane – minimiziranje rizika	5 (9,6)

Rukovodioci su u najvećem broju sagledavali tri sledeće koristi od primene ISO standardizovanih sistema menadžmenta: povećanje zadovoljstva osiguranika, zaposlenih, zdravstvenih ustanova, privrednih subjekata i državnih institucija sa kojima Fond sarađuje (96,2%); povećanje nivoa kvaliteta i njegovo kontinuirano održavanje (91,1%); i pozitivni efekti na upravljanje od strane menadžmenta i ugled organizacije (91,1%) (tabela 4).

Diskusija

Rezultati našeg istraživanje pokazuju da je 99,4% ispitanika Republičkog fonda za zdravstveno osgiranje poznavalo standardizovani sistem menadžmenta ISO 9001 što je očekivano i govori u prilog činjenici da je sistem menadžmenta kvalitetom ISO 9001:2008 u potpunosti primenjivan na najvišim hijerarhijskim nivoima, te je doslednost u primeni visoka (9). Jedino ovakav

Table 4. Advantages of application of ISO standardized management systems and certification by managers of the Republic Health Insurance Fund of the Republic of Serbia, May 2017

Koristi od primene ISO standarda i sertifikacije	Broj (%) (N=157)
Increased efficiency and productivity of organization	109 (69.4)
Simplified business operations and ease at everyday work	65 (41.4)
Increased security of data and information system	97 (61.8)
Employees are more conscientious about available resources	69 (44.0)
Standardization of work – work tasks done in line with procedures, instructions and forms, uniformity of business processes	113 (72.0)
Clear mutual communication horizontally and vertically by responsibilities	37 (23.6)
Defined business process	76 (48.4)
Easier discovery of risks and inconsistency at work	9 (5.7)
Increased level of personal responsibility through clearly defined accountabilities	122 (77.7)
Acceleration of working process – activities defined in advance for performing tasks with deadlines set in advance	17 (10.8)
Internal base of knowledge	39 (24.8)
Increased satisfaction of the insured, employees, health care institutions, enterprises and state institutions that we cooperate with	151 (96.2)
Increased level of data availability – defined way of communication, inquiries, ways of delivering requested data, respecting deadlines	2 (1.23)
Work transparency	14 (8.9)
Increased level of professionalism and quality of work of employees – use of forms and documents according to clearly defined procedures, through uniformity and respecting deadlines	124 (79.0)
Constant improvement of business processes – noticing errors and risks, as well as timely introduction of system changes	73 (46.5)
Increasing the level of quality and its continuous maintenance	143 (91.1)
Reduction of the probability of mistake – noticing a new mistake resulting in the change of procedures, instructions and forms, which leads to the elimination of the mistake whose probability has been minimized by the introduction of ISO standard	19 (12.1)
Increased possibility of work control and measurement of results	30 (19.1)
Removing dilemmas in the application of regulations	11 (7.0)
Positive effects on the management and reputation of organization	143 (91.1)
Increased discipline of employees, correctness and clearness of documentation	50 (31.8)
Improving the system of managing information security	109 (69.4)
Increased level of control of information security	97 (61.7)
Clearly determined authority – horizontally and vertically according to hierarchical positions	52 (33.1)
Establishment of control mechanisms	19 (12.1)
Reduced possibility of improvisation – risk minimization	5 (9.6)

positive experience in relation to the introduction of ISO standards and their implementation.

Of all the positive experiences of managers regarding the implementation of ISO standardized management systems in the Republic Health Insurance Fund, the most important were the following: better organization of work (93.6%), increased employee satisfaction (89.8%), improved work of the branch office (78.8%) and uniformity of work (72.0%) (Table 2). Of the negative experiences, more extensive administration (26.8%) and resistance to changes (24.8%) were dominant. The personal positive experiences related to the introduction of ISO standardized management systems included satisfaction with the improvement of business (84.1%) and increased responsibility (42.7%), while negative were resistance to changes (31.2%) and a long period of introduction (23.6%) (Table 3).

sistem može da obezbedi kontinuirano povećanje stepena zadovoljstva korisnika usluga Republičkog fonda za zdravstveno osiguranje, počevši od osiguranika do zdravstvenih ustanova i pravnih lica sa kojima Republički fond zaključuje ugovore.

Međutim, nešto manji broj, samo 93,6% rukovodilaca Fonda je poznavalo ISO/IEC 27001 - sistem menadžmenta bezbednošću informacija (10), mada su oba sistema menadžmenta paralelno uvedena u poslovanje Fonda. Podaci kojima državni fond zdravstvenog osiguranja raspolaže, počevši od matične evidencije osiguranika do izvršenih zdravstvenih usluga u sistemu zdravstvene zaštite Republike Srbije i u okviru zdravstvenih sistema u inostranstvu, a posebno poverljivosti podataka u vezi dijagnoza, obavezuju svakog rukovodioca na adekvatnu zaštitu informacija i stvaranje uslova za apsolutnu bezbednost informacija. Ova razlika u poznavanju ova dva standardizovana sistema menadžmenta nije u skladu sa očekivanjima. Takođe, postavlja se pitanje da li je problem nastao odmah prilikom uvođenja standardizovanih sistema menadžmenta u Republički fond obzirom da je primenjen frontalni pristup i nemogućnost da se prihvati promena, shvati značaj i podjednako primene oba standardizovana sistema menadžmenta (ISO 9001 i ISO 27001) u istom vremenskom periodu.

Ipak, uzevši u obzir činjenicu da je među 93,6% onih koji poznaju oba sistema bilo uključeno 100% svih hijerarhijski najviših rikovodilaca, može se smatrati da je došlo do značajnog unapređenja poslovanja. Nepoznavanje oba sistema od strane svih rukovodilaca je rezultat otpora zaposlenih na promene i stres koje je izazvalo „frontalno" uvođenje dva standardizovana sistema menadžmenta, kao i definisanje poslovnih procesa zakonskim i podzakonskim aktima Republike Srbije koji određuju nadležnosti i način poslovanja Republičkog fonda.

Međutim, istraživanje je pokazalo da postoje rukovodioci koji poznaju i druge standardizovane sisteme menadžmenta koji takođe mogu biti od značaja za poslovanje (npr. 6,4% zna za ISO 30400 – sistem menadžmenta za upravljanje ljudskim resursima; 5,7% za ISO 30001 – sistem menadžmenta za upravljanje rizikom 5,7%; 5,1% za ISO 14001 - sistem zaštite životne sredine; 4,5% za ISO 45001 - bezbednost i zdravlje na radu).

Uvođenjem informacionog sistema u sistem zdravstvene zaštite, u središte pažnje se više ne postavlja funkcionisanje tog sistema, već sigurnost informacija, odnosno bezbednosti „lične zdravstvene informacije" prema standardu ISO 27001 (10). Sigurnost zdravstvenih informacija o svakom pojedincu bi trebao da bude imperativ poslovanja svih organizacija u sektoru zdravstvenog osiguranja. Posmatrano iz ugla Republičkog fonda za zdravstveno osiguranje, to su lične informacije o svakom pojedinačnom osiguraniku evidentirane u matičnoj evidenciji i zdravstvene informacije počevši od izvršenih usluga, dijagnoza, odobrenih načina lečenja, stručna medicinska mišljenja o opravdanosti ostvarivanja nekog od prava zdravstvenog osiguranja. Značajno je istaći da sistemi najrazvijenijih zemalja u sektoru zdravstvenog osiguranja počivaju na načelu solidarnosti i načelu dostupnosti. Primenom standardizovanih sistema menadžmenta, a posebno ISO 9001 i ISO 27001 standarda, navedena načela dodatno dobijaju na značaju i njihovom poštovanju usled odvijanja standardizovanog poslovnog procesa (3).

Prema poslednjim istraživanjima, kao i podacima Svetske banke i Svetske zdravstvene organizacije (11-14), zemalje koje imaju najveći stepen zadovoljstva korisnika sistemom zdravstvene zaštite, a mogu da posluže kao dobri primeri, su Švajcarska, Kanada, Nemačka, Holandija, Francuska, Engleska i SAD. Pored razlika u izdvojenom novcu, dostupnosti, načinu organizacije nacionalnog sistema zdravstvene zaštite postoji zajednička karakteristika svih, a to je da teže jednoobraznosti poslovanja i u osnovi standardizaciji poslovnih procesa. U sistemu zdravstvene zaštite razvijenih zemalja standardizovani sistem menadžmenta je podrazumevan, a akcenat je stavljen na pružanje usluga. Institucije koje su izvor finansiranja imaju možda manje vidljivu, ali izuzetno odgovornu, ulogu u standardizaciji poslovanja sa akcentom na ISO 9000 i ISO 27000 (13,14). Većinom, nacionalni fondovi zdravstvenog osiguranja imaju politiku da se ugovori o sprovođenju zdravstvenih usluga, za račun osiguranika, sprovode sa pružaocima zdravstvenih usluga koji su sertifikovani, odnosno akreditovani, prema nacionalnim državnim preporukama i politici kvaliteta i sigurnosti (ISO 9001 i ISO 27001). Podaci koji se koriste i razmenjuju u sistemu zdravstvene zaštite u nekim zemljama podležu i nacionalnoj i međunarodnoj zakonskoj regulativi kojom se štiti pravo svakog građanina, kao osiguranika i pacijenta, čuva lični integritet i sprečava zloupotreba „lične zdravstvene infor-

The largest number of managers saw the following three benefits related to the application of ISO standardized management systems: increased satisfaction of policy holders, employees, health institutions, business entities and state institutions with which the Fund cooperates (96.2%); increasing the level of quality and its continuous maintenance (91.1%); and positive effects on management and reputation of the organization (91.1%) (Table 4).

Discussion

The results of our study show that 99.4% of the respondents of the Republic Health Insurance Fund were familiar with the standardized management system ISO 9001, which was expected and which speaks in favor of the fact that ISO 9001:2008 quality management system was fully implemented at the highest hierarchical levels, and that consistency of application was high (9). Only such a system can ensure a continuous increase in the level of satisfaction of users of the Republic Health Insurance Fund, starting from the insured persons to health institutions and legal entities with which the Republic Fund concludes contracts.

However, a slightly smaller number, that is, 93.6% of managers of the Fund (93.6%) were familiar with ISO/IEC 27001 – information security management system (10), although both management systems were introduced in the Fund's operations in parallel. The data available to the state health insurance fund, starting from the register of insured persons to performed health services in the health care system of the Republic of Serbia and within health systems in foreign countries, and especially the confidentiality of data related to diagnoses, obliges every manager to adequately protect information and create conditions for absolute security of information. This difference regarding the knowledge of these standardized management systems is not in line with expectations. Also, the question is whether the problem appeared immediately during the introduction of standardized management systems in the Republic Fund, given that the frontal approach was applied and the inability to accept the change, realize the importance and equally apply both standardized management systems (ISO 9001 and ISO 27001) in the same period of time.

However, considering the fact that 93.6% of those who were familiar with both systems included 100% of all hierarchically highest managers, it can be said that there came to a significant improvement of business operations. The fact that not all the managers were familiar with both systems is the result of employees' resistance to changes and stress caused by the frontal introduction of two standardized management systems, as well as the definition of business processes by laws and by-laws of the Republic of Serbia that determine the competences and business operations of the Republic Fund.

However, the research showed that there were managers who were familiar with other standardized management systems that can also be of importance for business operations (e.g. 6.4% knew about ISO 30400 – management system for human resources; 5.7% about ISO 30001 – risk management system; 5.1% about ISO 14001 – system for the protection of environment; 4.5% about ISO 45001 – occupational health and safety).

By introducing the information system into the health care system, the focus is no longer on the functioning of that system, but on the security of information, that is, the security of "personal health information" according to ISO 27001 (10). The security of health information about each individual should be the business imperative of all organizations in the health insurance sector. Seen from the perspective of the Republic Health Insurance Fund, this relates to personal information about each insured individual in the registry and health information starting from services, diagnoses, approved methods of treatment, expert medical opinion on the justification of exercising some of the health insurance rights. It is important to point out that the systems of the most developed countries in the health sector are based on the principle of solidarity and the principle of availability. By applying standardized management systems, particularly ISO 9001 and ISO 27001 standards, the aforementioned principles gain additional importance and respect due to standardized business operations (3).

According to the latest research, as well as data from the World Bank and World Health Organization (11-14), countries that have the highest level of satisfaction of users of the health care system and that can be good examples are

macije" u vezi sa fizičkim ili mentalnim zdravljem, ili o pružanju zdravstvene usluge pojedincu.

Države sa najvećim godišnjim troškovima zdravstvene zaštite po stanovniku u svetu su SAD, Švajcarska i Norveška (13,15). Postoji korelacija između ukupnog troška država za zadravstvenu zaštitu po stanovniku i prosečnog životnog veka. Švajcarska je zemlja sa najvećim godišnjim troškom po stanovniku ali i najboljim efektima (15,16). Izdvaja se za zdravstvenu zaštitu 6.468 $ godišnje po stanovniku, a prosečan životni vek osoba je 83 godine (15,16). Negde oko 81% osiguranika je ocenilo da je njihovo dobro zdravstveno stanje zasnovano na univerzalnom sistemu zdravstvene zaštite, a 99,5% stanovnika je osigurano (15,16). Sve navedeno je rezultat kontinuiranog unapređenja sistema zdravstvene zaštite, ali i institucije zdravstvenog osiguranja kao osnovnog izvora finansiranja, i pored izuzetno složene unutrašnje državne organizacije. Zakonskom regulativom u oblasti zdravstvene zaštite Švajcarske je predviđeno da na 1000 stanovnika ima 17 medicinskih tehničara i 4 lekara (15-18). Međutim, neuporedivost Švajcarskog modela finansiranja zdravstvene zaštite i modela u Republici Srbiji proizilazi iz toga što ne postoji jedinstveni nacionalni fond Švajcarske, već je osnovni paket univerzalnog osiguranja određen zakonskom regulativom, a izvor finansiranja su privatni fondovi zdravstvenog osiguranja koji imaju mogućnost ostvarenja profita obavljanjem delatnosti, sa izuzetno izraženim stepenom konkurentnosti. Direktno uporediv sa zakonskom regulativom i institucijama Republike Srbije je izvor finansiranja zdravstvene zaštite koji u Švedskoj sprovodi Agencija obaveznog socijalnog osiguranja Švedske „*Försäkringskassan*". Neke od zakonskih obaveza Agencije su finansijsko obezbeđenje procesa lečenja i finansijsko obezbeđenje osiguranika tokom bolesti. Sam proces standardizacije poslovnih procesa u Agenciji obaveznog socijalnog osiguranja Švedske „*Försäkringskassan*" je započet tokom 1998. godine. Kompletan sistem državne uprave Švedske je započeo proces standardizacije, a time i njen zdrvstveni sistem u celini. Prema zvaničnim podacima iz 2010. godine, Agencija je standardizovala poslovne procese prema preporukama Vlade Švedske. Kao i sve organizacije za sprovođenje zdravstvenog osiguranja u Evropi, Švedska je pristupila sistemu „*European Health Insurance Card*" (EHIC card) odnosno Evropskoj karti zdravstvenog osiguranja. Izdaje se besplatno osiguranicima Evropske Unije, Irske, Lihtenštajna, Norveške i Švajcarske, radi mogućnosti neophodnog medicinskog tretmana besplatno ili po povoljnijim cenama, radi nastavka njihovog boravka u navedenim državama i državama članicama Evropske unije (19). Prilikom reforme sektora zdravstvenog osiguranja u Evropi, početni proces je bio standardizacija poslovnih procesa nacionalnih osiguravajućih institucija. Krajnji korak reforme je bilo uvođenje Evropske zdravstvene kartice, koja ne može biti uvedena bez standardizacije poslovnih procesa u skladu sa ISO standardizovanim sistemima menadžmenta ISO 9001 i ISO 27001 (20,21). Agencija obaveznog socijalnog osiguranja je svoj poslovni proces uvođenjem standardizovanih sistema menadžmenta unapredila u tolikoj meri da za rezultat ima da su 99% stanovnika Švedske osiguranici Agencije (21). Privatni sektor zdravstvenog osiguranja ima učešće od 3% od ukupnog broja osiguranika (21). Ugovori sa zdravstvenim ustanovama za pružanje zdravstvenih usluga osiguranicima mogu biti potpisani samo sa sertifikovanim, odnosno akreditovanim zdravstvenim ustanovama. Time se insistira na kvalitetu zdravstvene usluge koja se pruža osiguraniku i garantuje sigurnost i nepovredivost lične zdravstvene informacije (3).

Neposredno poznavanje pozitivne zakonske regulative Republike Srbije kojom je definisan rad državnog fonda zdravstvenog osiguranja, ali i unutrašnjih poslovnih procesa u njemu od strane direktora, pomoćnika direktora i načelnika svih organizacionih jednica omogućavaju precizan odgovor gde standardizovani sistem menadžmenta može da pomogne u radu Republičkog fonda za zdravstveno osiguranje. U našem istraživanju, manji deo rukovodilaca je prepoznao druge standardizovane sisteme menadžmenta kao što su ISO 30400 – sistem menadžmenta rizicima (22) (24,2%), ISO 45001 - bezbednost i zdravlje na radu (23) (4,5%) i ISO 30001 - sistem menadžmenta za upravljanje rizikom (24) (5,7%). Poslednji navedni sistem ima poseban pozitivan uticaj na poslovanje Sektora javnih nabavki i Sektora za finansije Direkcije Republičkog fonda, a time direktno na poslovanje svih organizacionih jednica i celokupan zdravstveni sistem Republike Srbije naročito kroz centralizovane javne nabavke. Centralizovane javne nabavke su izuzetno osetljiv poslovni proces, koji u potpunosti zavisi od raspoloživih finansijskih sredstava, te spoznajom ove činjenice upravljanje

Switzerland, Canada, Germany, the Netherlands, France, England and the USA. In addition to the differences in allocated money, availability, the way of organization of the national health care system, there is a common characteristic of all of them, which means that they strive for business uniformity and, basically, the standardization of business processes. In the health care system of developed countries, a standardized management system is the default, and the emphasis is placed on providing services. Institutions that are the source of funding have perhaps less visible, but extremely responsible role in business standardization, with an emphasis placed on ISO 9000 and ISO 27000 (13,14). For the most part, the policy of national health insurance funds implies that the contracts on providing health services, on behalf of the insured, are concluded with the providers of health services that are certified or accredited according to national government recommendations and quality and safety policies (ISO 9001 and ISO 27001). Data which are used and exchanged in the system of health care of a country are subject to both national and international legislation that protects the right of each citizen as an insured person and a patient, preserves personal integrity and prevents the misuse of "personal health information" related to physical or mental health, or provision of health services to individuals.

Countries with the highest annual healthcare costs per inhabitant in the world are the USA, Switzerland, and Norway (13,15). There is a correlation between the country's total cost of health care per inhabitant and average life expectancy. Switzerland is the country with the highest annual cost per inhabitant, but also the best effects (15,16). 6,468 dollars is allocated for health care per inhabitant annually, and the average life expectancy is 83 years (15,16). About 81% of the insured persons assessed that their good state of health is based on the universal health care system, and 99.5% of the population is insured (15,16). All of the above mentioned is the result of continuous improvement of the health care system, but also of the institutions of health insurance as the main source of financing in addition to the extremely complex internal state organization. According to the legislation in the field of health care in Switzerland, there are 17 medical technicians and 4 doctors per 1000 inhabitants (15-18). However, the incomparability of the Swiss model of financing the health care and the model in the Republic of Serbia stems from the fact that there is no single national fund of Switzerland, but the basic package of universal insurance is determined by legal regulations, while the source of financing includes private health insurance funds that have the possibility of making profit by performing their operations, with an extremely pronounced degree of competitiveness. The source of financing health care implemented in Sweden by the Swedish Agency for mandatory health insurance "Försäkringskassan" is directly comparable to the legislation and institutions of the Republic of Serbia. Some of the legal obligations of the Agency include financial securing of the treatment process and financial securing of insured persons during the illness. The process of standardization of business processes in the Swedish Social Insurance Agency "Försäkringskassan" was started in 1998. The complete system of state administration of Sweden began the process of standardization, including the health system as a whole. According to the official data from 2010, the Agency standardized the business process according to the recommendations of the Government of Sweden. Like all health insurance organizations in Europe, Sweden joined the system of the European Health Insurance Card (EHIC card). It is issued free of charge to insured persons of the European Union, Ireland, Liechtenstein, Norway and Switzerland for the possibility of necessary medical treatment free of charge or at more favorable prices, so that people could continue their stay in the mentioned countries and member states of the European Union (19). During the reform of the health insurance sector in Europe, the initial process included the standardization of business processes of national insurance institutions. The final step of the reform was the introduction of the European health card, which could not be introduced without standardization of business processes in accordance with ISO standardized management systems ISO 9001 and ISO 27001 (20,21). The Agency for mandatory social insurance improved its business process by introducing standardized management systems to such an extent that 99% of the population of Sweden is insured by the Agency (21). The private health insurance sector has a share of 3% of the total number of insured persons (21). Contracts with health institutions for the provision of health

rizikom se postavlja kao ključni standard koji može da pomogne u radu Republičkog fonda zdravstvenog osiguranja.

Naši rezultati pokazuju da je većina (78,4%) rukovodilaca sagledala važnost menadžmenta ljudskim resursima u sprovođenju standardizovanih sistema menadžmenta (ISO 30400). Republički fond je zakonskom regulativom ograničen u smislu broja zaposlenih, a u nekim slučajevima i same strukture zaposlenih. Smanjenje broja zaposlenih za više od 400, u odnosu na period kada su uvođeni standardizovani sistemi menadžmenta ISO 9001:2008 i ISO 27001:2005, predstavlja značajno opterećenje za ostale zaposlene s obzirom da je obim poslova povećan a broj izvršilaca značajno smanjivan.

Pogodnost trenutka za uvođenje standardizovanih sistema menadžmenta je sama po sebi diskutabilna zbog prirodnog otpora zaposlenih na uvođenje promena. Uvek je neophodno izabrati pravi pristup prilikom uvođenja novina i, koliko je to moguće, pogodan trenutak. Sagledavanje raspoloživosti ljudskih resursa u Republičkom fondu kao nosilaca promena koje dolaze uvođenjem standardizovanih sistema menadžmenta je preduslov za uspešno uvođenje i sprovođenje u budućnosti. S tim u vezi, u trenutku procesa uvođenja i sertifikacije za ISO 9001 i ISO 27001 standardizovane sisteme menadžmenta nije bilo naznaka da može doći do faktora koji mogu biti ograničavajući u pogledu rasopoloživosti kadra. Republički fond za zdravstveno osiguranje Republike Srbije je prvi pristupio procesu uvođenja standardizovanih sistema menadžmenta u odnosu na sve zemlje u okruženju. Izabran je „frontalni" pristup kao način uvođenja i primene ISO standarda. U našem istraživanju, veći deo (79%) rukovodilaca Republičkog fonda za zdravstsveno osiguranje smatralo je da je „postepeno" uvođenje i primena ISO standarda pogodnije u odnosu na „frontalno". Međutim, za „frontalni" pristup uvođenju i primeni ISO standarda u Republičkom fondu zdravstvenog osiguranja u većini slučajeva bili su rukovodioci na trećem hijerarhijskom nivou, odnosno načelnici, dok su direktori i pomoćnici direktora iskazivali u većem obimu suprotan stav. Mogući uzrok je njihov bolji uvid u celokupne poslovne procese sa višeg hijerarhijskog nivoa.

Opravdanost uvođenja standardizovanih sistema menadžmenta može biti posmatrana iz više aspekata. Neposredni učesnici poslovnih procesa pre i posle uvođenja ISO standardizovanih modela, koji su ujedno u većini i rukovodioci, mogu dati najbolju ocenu opravdanosti. Rezultati našeg istraživanja pokazuju da oko 92,4% rukovodilaca smatrala da je ispravno i opravdano uvođenje standardizovanih sistema menadžmenta (ISO 9001:2008 i ISO 27001:2005 standarda) u Republički fond zdravstvenog osiguranja, odnosno da se time doprinosi boljem poslovanju.

Odluka o uvođenju standardizovanih sistema menadžmenta i sertifikacije direktno dovodi do angažovanja neophodnih ljudskih, finansijskih i materijalnih resursa za sprovođenje samog procesa. Prilikom sprovođenja istraživanja dobijeni su podaci da nikada nisu utvrđeni tačni troškovi uvođenja i sertifikacije ISO 9001:200849 i ISO 27001:200550 standardizovanih sistema menadžmenta i da nisu izmereni njihovi efekti. Iz tog razloga, rukovodioci Fonda pitani su o opravdanosti troškova sertifikovanja. Tako da je oko dve trećine rukovodilaca smatralo troškove sertifikovanja opravdanim, a ispitanici najvišeg hijerarhijskog novoa, njih 10% od ukupnog broja ispitanika, nisu bili opredeljeni u smislu opravdanosti troškova sertifikovanja.

Važno je uočiti da je mali broj rukovodilca koji jasno razdvajaju proces uvođenja od same sertifikacije standarda. Često se ponovno sertifikovanje istog ISO standarda smatra bespotrebnim finansijskim izdatkom, ali se uočava potreba za revizijom procedura uvedenih standarda i usklađivanje sa izmenama u zakonskim i podzakonskim aktima Republike Srbije koji su direktno doveli do izmena u poslovanju Republičkog fonda za zdravstveno osiguranje. S tim u vezi, samo 69,4% rukovodilaca naše studije je smatralo opravdanim troškove sertifikovanja.

Skoro svaki drugi rukovodilac u našem istraživanju je smatrao da je uvođenjem ISO standarda (ISO 9001:2008 i ISO 27001:2005 standardizovanih sistema menadžmenta) i sertifikovanjem došlo do smanjenja troškova poslovanja u Republičkom fondu. Oni koji su imali suprotno mišljenje su većinom ispitanici koji direktno sprovode propisane procedure, odnosno načelnici, a značajno je da nekolicina njih iznosi i stav da su troškovi povećani zbog obimnije administracije i troškova materijala za sprovođenje procedura.

Iskustva ispitanika u primeni ISO standardizovanih sistema menadžmenta u Republičkom fondu za zdravstveno osiguranje su izuzetno bitna sa stanovišta sagledavanja stepena uspešnosti uvođenja

services to insured persons can only be signed with certified or accredited health institutions. Thus, the quality of health service provided to the insured is insisted on and safety and inviolability of personal health information is guaranteed (3).

When directors, assistant directors and heads of all organizational units know about the positive legislation of the Republic of Serbia, which defines the work of the state health insurance fund, as well as the internal business processes in it, it enables a precise response where the standardized management system can help in the work of the Republic Health Insurance Fund. In our study, a smaller number of managers recognized other standardized management systems such as ISO 30400 – risk management system (22) (24.2%), ISO 45001 – occupational health and safety (23) (4.5%) and ISO 30001 – management system for risk management (24) (5.7%). The last above mentioned system has a particularly positive influence on the business operations of the Public Procurement Sector of the Directorate of the Republic Fund, and thus directly on the operations of all organizational units and the entire healthcare system of the Republic of Serbia, especially through centralized public procurement. Centralized public procurement is an extremely sensitive business process, which is completely dependent on the available financial resources, and by realizing this fact, risk management is set as a key standard that can help the work of the Republic Health Insurance Fund.

Our results show that the majority (78.4%) of managers realized the importance of human resources management in the implementation of standardized management systems (ISO 30400). The Republic Fund is limited by law in terms of the number of employees, and in some cases also the structure of employees. The reduction in the number of employees by more than 400, in comparison to the period when the standardized management systems ISO 9001:2008 and ISO 27001:2005 were introduced, represents a significant burden for other employees, considering that the scope of work increased and the number of employees was significantly reduced.

The opportune moment to introduce standardized management systems is in itself debatable due to employees' natural resistance to change. It is always necessary to choose the right approach when introducing novelties and the most convenient moment. Realizing the availability of human resources in the Republic Fund as the bearers of changes that come with the introduction of standardized management systems is a prerequisite for the successful introduction and implementation in the future. In this regard, at the time of the introduction and certification of ISO 9001 and ISO 27001 standardized management systems, there were no indications that there could be factors that could be limiting in terms of staff availability. The Republic Health Insurance Fund was the first to start the process of introducing standardized management systems in relation to all countries in the surrounding area. A "frontal approach" was chosen as a way of introducing and applying ISO standards. In our study, the majority (79%) of the managers of the Republic Health Insurance Fund considered that the "gradual" introduction and implementation of ISO standards is more suitable than "frontal". However, managers at the third hierarchical level, that is, heads, supported the "frontal" approach to the introduction and implementation of ISO standards in the Republic Health Insurance Fund in most cases, while directors and assistant directors expressed the opposite attitude to a greater extent. A possible cause could be their better insight into the entire business processes from a higher hierarchical level.

The justification for the introduction of standardized management systems can be viewed from different perspectives. Immediate participants in business processes before and after the introduction of ISO standardized models, who are also managers in most cases, can best assess the justification. The results of our study show that about 92.4% of managers believed that the introduction of standardized management systems (ISO 9001:2008 and ISO 27001:2005) in the Republic Health Insurance Fund was correct and justified, that is, that it contributed to better business operations.

The decision to introduce standardized management and certification systems directly leads to the engagement of necessary human, financial and material resources for the implementation of the process itself. During the research, data was obtained that the exact costs of the introduction and certification of ISO 9001:2008 49 and ISO27001:200550 standardized management systems were never determined and

i sertifikacije u smislu unapređenja nivoa poslovanja. Pozitivna iskustva po pitanju primene ISO standardizovanih sistema menadžmenta je imalo 85,4%, a lični pozitivan doživljaj po pitanju uvođenja ISO standarda i njihove primene 93% rukovodilaca. Uzevši u obzir učešće pozitivnog iskustva ispitanika i njihovu jasnu percepciju gde je došlo do povoljšanja u okviru poslovnog procesa državnog fonda za zdravstveno osiguranje, možemo reći da je uvođenje ISO 9001:2008 i ISO 27001:2005 standardizovanih sistema menadžmenta dalo željeni značajan doprinos podizanju nivoa poslovanja. Može se smatrati da je lični doživljaj ključ u realizaciji uvođenja ISO standarda. Lični negativan doživljaj uvođenja ISO standarda je imalo 7% rukovodilaca, što je uobičajen procenat, odnosno to su obično ljudi koji imaju otpor prema bilo kojim promenama. Početni otpor uvođenju i primeni ISO standarda, generisan i nedostatkom vremena i motivacije za dodatne napore, neophodne u cilju implementacije, savladan je u toku procesa primene procedura, uputstava i obrazaca prilikom rešavanja konkretnih poslovnih zadataka po tačno unapred definisanim aktivnostima, te je većina rukovodilaca bila zadovoljna novim načinom rada.

Prema dosadašnjim istraživanjima najveća korist je ujednačavanje prakse i otklanjanje dilema u primeni propisa. Otuda i pozitivni efekti na upravljanje, kvalitet obavljanja poslova i zadataka, efikasnost, kao i na imidž organizacije. Da bi se održao novoostvareni kvalitet i korist, najveći problem je neophodnost ažuriranja, usled promene propisa i drugih okolnosti u radnom okruženju, kao i postizanje visokog stepena preciznosti i ispravnosti prilikom regulisanja konkretnih poslovnih procesa.

Jasno definisanje poslovnih procesa dovodi direktno do podele nadležnosti i ovlašćenja, transparentne međusobne zavisnosti i uslovljenosti, a time i pojedinačne odgovornosti svakog zaposlenog i mogućnosti praćenja poštovanja definisanih pravila poslovanja kroz merenje i praćenje parametara efikasnosti poslovanja. Takođe, unificiranje procesa javnih nabavki i jasnim definisanjem aktivnosti u postupanju organizacionih jednica, uvođenje politika, procedura i uputstava u okviru ISO 27001:200563 standarda, doprinelo je znatnom olakšanju u poslovnom procesu sektora.

Koristi od uvođenja ISO 9001:200867 i ISO 27001:200568 standardizovanih sistema menadžmenta su izuzetno značajne za sistem poslovanja Republičkog fonda za zdravstveno osiguranje R. Srbije kao osnovnog izvora finansiranja sistema zdravstvene zaštite, a preko njega idirektno korist za svakog osiguranika, sistem zdravstvene zaštite Republike Srbije i društvo u celini. Neophodno je pronaći način obezbeđenja adekvatnih ljudskih resursa za ažuriranje procedura, uputstava i obrazaca.

Zaključak

Poslovanje Republičkog fonda zdravstvenog osiguranja je unapređeno uvođenjem standardizovanih sistema menadžmenta ISO 9001 i ISO 27001. Analiza istraživanja koje je sprovedeno u svim organizacionim jedinicama Republičkog fonda za zdravstveno osiguranje, sa ispitanicima rukovodiocima na najvišem hijerarhijskom hivou, jasno pokazuje da primena standardizovanih sistema menadžmenta može značajno da doprinese podizanju nivoa poslovanja Republičkog fonda za zdravstveno osiguranje.

Neophodno je dodatno unaprediti postojeći poslovni proces Republičkog fonda za zdravstveno osiguranje, ali i razmotriti mogućnosti uvođenja i primene ISO 45001- sistem menadžmenta zdravlja i bezbednosti i ISO 14001 - sistema menadžmenta životne sredine. Kontinuirano unapređenje poslovnog procesa Republičkog fonda za zdravstveno osiguranje, usklađeno sa zakonskom regulativom Republike Srbije, Strategijom razvoja sistema zdravstvene zaštite i potrebama osiguranika, zbog prirode svog uticaja na celokupni zdravstveni sistem, vodi ka kvalitetnijem zdravstvenom sistemu Republike Srbije i boljem opštem zdravstvenom stanju društva.

Konflikt interesa

Autor je izjavio da nema konflikta interesa.

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that their effects were not measured. Therefore, the managers of the Fund were asked about the justification of the certification costs. Thus, about two-thirds of managers considered the costs of certification to be justified, and the respondents of the highest hierarchical level, 10% of the total number of respondents, were not determined in terms of the justification of the costs of certification.

It is important to note that there are few managers who clearly separate the process of introduction of standards from the certification itself. Re-certification of the same ISO standard is often considered to be the unnecessary financial expense, but there is a need to revise the procedures of introduced standards and align them with changes in laws and by-laws of the Republic of Serbia, which directly led to changes in the operations of the Republic Health Insurance Fund. In this regard, only 69.4% of managers in our study considered the costs of certification to be justified.

Almost every other manager in our study believed that the introduction of ISO standards (ISO 9001:2008 and ISO 27001:2005 standardized management systems) and certification led to the reduction in operating costs in the Republic Fund. Those who had opposite opinion are mostly respondents who directly implement the prescribed procedures, that is, heads, and it is significant that a few of them think that the costs increased due to more extensive administration and material costs for the implementation of procedures.

The respondents' experience in the application of ISO standardized management systems in the Republic Health Insurance Fund is extremely important from the perspective of evaluation of success of introduction and certification in terms of improving the business operations. 85.4% of managers had positive experiences regarding the application of ISO standardized management systems, while 93% of them had a personal positive experience regarding the introduction of ISO standards and their application. Taking into account the respondents' positive experience and their perception of improvements in business operations of the state health insurance fund, it can be said that the introduction of ISO 9001:2008 and ISO 27001:2005 standardized management systems made the desired significant contribution to raising the level of business operations. It can be claimed that personal experience is essential for the realization of ISO standards introduction. 7% of managers had a personal negative experience regarding the introduction of ISO standards, which is a common percentage, that is, they are usually people who have resistance to any changes. The initial resistance to the introduction and application of ISO standards, which is generated by the lack of time and motivation for additional efforts necessary for the implementation, was overcome during the process of implementation of procedures, instructions and forms when solving specific business tasks according to activities that were previously clearly defined, and therefore, the majority of managers were satisfied with the new way of working.

According to previous studies, the greatest benefit is the standardization of practice and elimination of dilemmas in the application of regulations. It causes positive effects on management, the quality of performance of activities and tasks, efficiency, as well as on the image of the organization. In order to maintain the newly achieved quality and benefits, the biggest problem is the necessity of updating, due to changes in regulations and other circumstances in the working environment, as well as achieving a high degree of precision and correctness when regulating specific business processes.

A clear definition of business processes leads directly to the division of responsibilities and competence, transparent mutual dependence and conditionality, and thus the individual responsibility of each employee and the possibility of monitoring the compliance with defined business rules through measurement and monitoring of business efficiency parameters. Also, the unification of the public procurement process and the clear definition of activities in the operations of organizational units, the introduction of policies, procedures and instructions within ISO 27001:200563 standard, contributed to the significant ease of business processes of the sector.

The advantages of the introduction of ISO 9001:200867 and ISO 27001:200568 standardized management systems are extremely significant for the business system of the Republic Health Insurance Fund of the Republic of Serbia as the main source of funding for the health care system, and through it benefits are provided for each insured

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person, the system of health care of the Republic of Serbia and society as a whole. It is necessary to find a way to provide adequate human resources for updating procedures, instructions and forms.

Conclusion

The operations of the Republic Health Insurance Fund have been improved by the introduction of standardized management systems ISO 9001 and ISO 27001. The analysis of research, which was conducted in all organizational units of the Republic Health Insurance Fund, with respondents who were managers at the highest hierarchical positions, clearly shows that the implementation of standardized management systems can significantly contribute to improving the operations of the Republic Health Insurance Fund.

It is necessary to additionally improve the existing business process of the Republic Health Insurance Fund, and also to consider the possibility of introducing and implementing ISO 45001 – health and safety management system and ISO 14001 – environmental management system. The continuous improvement of the business process of the Republic Health Insurance Fund, aligned with the legislation of the Republic of Serbia, Strategy for the Development of the Health Care System, and the needs of the insured, due to its influence on the entire health care system, leads to the better quality of the health care system of the Republic of Serbia, and to a better general health condition of a society.

Competing interests

The author declared no competing interests.

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TINEA PENIS – RETKA LOKALIZACIJA DERMATOFITNE INFEKCIJE

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SAŽETAK

Uvod/Cilj: Dermatofitne infekcije muških genitalija nisu česte i cilj ovog rada je da prikaže retku lokalizaciju ovog oboljenja na telu penisa zdrave muške osobe.
Prikaz bolesnika: Prikazujemo muškarca starog 34 godine sa anularnim eritemoskvamoznim poljem na telu penisa koje je praćeno svrabom. Na drugim delovima kože nije imao promene. Preparat uzorka promene sa tela penisa napravljen uz dodavanje kalijum hidroksida je pozitivan, a u kulturi je izolovan *Trichophyton mentagrophytes.* Pacijent je tretiran topikalnom antifungalnom terapijom tokom dve nedelje i kožne promene su se povukle.
Zaključak: Iako je genitalna lokalizacija dermatofitne infekcije retka, o ovom oboljenju bi trebalo razmišljati, dijagnostikovati ga i rano lečiti da ne bi postalo fokus za rekurentne gljivične infekcije.

Ključne reči: tinea, muške genitalije, *Trichophyton mentagrophytes*

Uvod

Gljivične superficijalne infekcije penisa i skrotuma najčešće su izazvane kvasnicama koje su deo normalne mikrobiote muških genitalija iz genusa *Candida* ili speciesa *Malassezia,* a znatno ređe dermatofitima, keratofilnim mikroorganizmima koji invadiraju rožaste strukture kože, dlake i nokta (1). Dermatofitna infekcija genitalija je relativno retka u odnosu na infekciju koja zahvata vlažnu ingvino-kruralnu regiju kod muškaraca (2,3), što se objašnjava smanjenom sekrecijom ekrinih znojnica u predelu genitalija te umanjenom hidratacijom kože penisa (4). Cilj ovog rada je da prikaže retku lokalizaciju dermatofitne infekcije na telu penisa kod zdrave muške osobe.

Prikaz pacijenta

Prikazujemo pacijenta starog 34 godine koji se javio dermatologu zbog promene na telu penisa praćene svrabom, koju je primetio pre deset dana. Pregledom je utvrđeno prisustvo jasno ograničenog eritematoznog polja sa skvamom koje se nalazilo na telu penisa (slika 1A). Nije imao nikakvih drugih promena po koži, vidljivim sluznicama i noktima i bio je dobrog opšteg zdravlja. Upućen je u laboratoriju gde je sa kožne promene strugan-jem uzet materijal (skvama) kojem su dodate dve kapi 20% rastvora kalijum-hidroksida (5) i direktnim mikroskopiranjem su uočeni gljivični elementi – transparentni fragmenti hifa. Zasejavanjem ostatka materijala na selektivnu podlogu DTM (engl. *Dermatophyte Test Medium*) agar sa dodatkom cikloheksimida, hloramfenikola i gentamicina, koji inhibiraju porast bakterija i plesni, nakon inkubacije na temperaturi od 25°C u vlažnoj atmosferi bez svetla (6) posle 11 dana uočen je porast kolonija sivkasto-beličaste boje i praškaste površine koje ukazuju na *Trichophyton mentagrophytes* (slika 2). Mikroskopske kulturelne karakteristike su uočene na nativnom preparatu i na preparatu sa celofanskom lepljivom trakom i LPB (engl. *Lactophenol blue* – laktofenol plavo) kontrastnom bojom (slika 3) u vidu septiranih hifa, velikog broja grozdasto raspoređenih mikrokonidija okruglog oblika. Takođe su viđene i spiralne hife, dok makrokonidije nisu uočene.

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CASE REPORT

TINEA OF THE PENIS – A RARE LOCALIZATION OF A DERMATOPHYTE INFECTION

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SUMMARY

Background/Aim: Dermatophyte infection of male genitalia is not common and the aim of this paper is to show the rare localization of this disease on the shaft of the penis in a healthy man.
Case report: We present a 34-year-old man with pruritic annular erythematous scaly patch on the shaft of the penis. There are no other skin lesions. Sample preparation of changes from the body of the penis made with the addition of potassium hydroxide is positive, and culture revealed *Trichophyton mentagrophytes*. The patient was treated with a topical antifungal therapy for two weeks and skin lesions resolved.
Conclusion: Although genital localization of dermatophyte infection is rare, this disease should be considered, diagnosed and treated early otherwise it may become a focus for recurrent fungal infections.

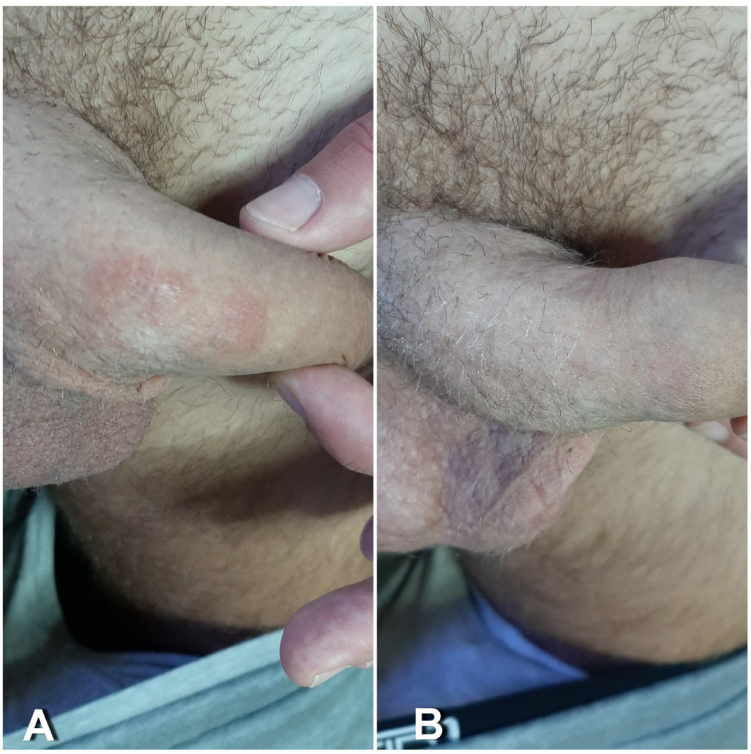
Key words: tinea, male genitalia, *Trichophyton mentagrophytes*

Introduction

Fungal superficial infections of the penis and scrotum are most frequently caused by yeasts that are part of the normal microbiota of male genitalia from *Candida* or *Malessezia species*, and much less frequently by dermatophytes, keratinophilic microorganisms that invade the keratinized structures of the skin, hair or nails (1). A dermatophyte infection of the genitalia is relatively rare in comparison to the infection that affects the moist inguinal-crural region in men (2,3), which is explained by reduced secretion of eccrine sweat glands in the genital region and reduced hydration of skin on the penis (4). The aim of this paper is to show the rare localization of a dermatophyte infection on the shaft of the penis in a healthy man.

Case report

We present a 34-year-old patient who came to the dermatologist because of a change on the shaft of the penis accompanied by pruritus, which he had noticed ten days before. The examination revealed the presence of a clearly defined erythematous scaly patch on the shaft of the penis (Figure 1A). There were no other lesions on the skin, visible mucosa and nails and his general health status was good. He was referred to the laboratory, where the material (squama) was collected from the skin change by scraping, to which a drop of 20% potassium hydroxide solution was added (5), and direct microscopy revealed fungal elements – transparent fragments of hyphae. By planting the rest of the material on the selective medium, DTM (Dermatophyte Test Medium) agar containing cycloheximide, chloramphenicol and gentamicin, which inhibit the growth of bacteria and fungi, after incubation at a temperature of 250C in a humid atmosphere without light (6), the growth of grayish-white colonies with a powdery surface indicating Trichophyton mentagrophytes was observed (Figure 2). Microscopic cultural characteristics were observed in the native preparation and in the preparation with cellophane adhesive tape and LPB (Lactophenol blue) contrast dye (Figure 3) in the form of septate hyphae, a large number of clustered microconidia of round shape. Spiral hyphae were also observed, while macroconidia were not observed.

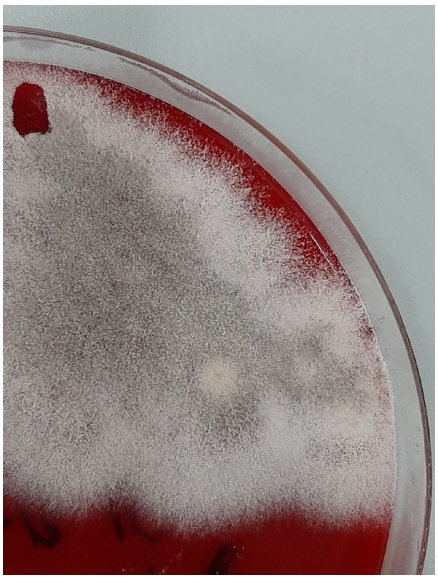


Slika 1. A – anularno eritematozno polje sa skvamom na telu penisa; B – kompletna regresija promena nakon terapije

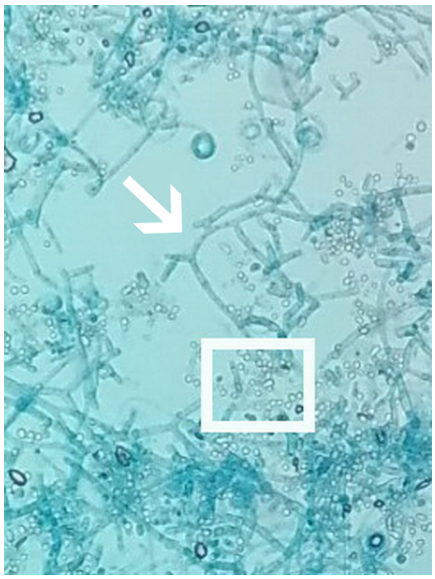
S obzirom na to da je dijagnostikovana dermatofitna infekcija penisa i da pacijent nije imao na drugim delovima kože manifestacije gljivične infekcije, pregledan je i njegov seksualni partner koji nije imao znake dermatomikoze. Pacijent je često bio u kontaktu sa kućnim ljubimcima svojih prijatelja. U terapiji je koristio 1% terbinafine krem dva puta dnevno i nakon dve nedelje promene na koži su se potpuno povukle (slika 1B).

Diskusija

Različite regije kože mogu biti zahvaćene dermatofitnom infekcijom, a najčešće lokalizacije su na trupu i ekstremitetima (*Tinea corporis*) i ingvino-kruralnim i interglutealnim predelima (*Tinea cruris*), dok je zahvaćenost genitalija znatno ređa (7). Studija iz Indije na 2200 pacijenata sa različitim dermatofitnim infekcijama je opisala zahvaćenost



Slika 2. Praškast rast kolonije *Trichophyton mentagrophytes*



Slika 3. Laktofenol plavo priprema: grozdasto raspoređene mikrokonidije okruglog oblika označene kvadratom i septirane hife označene strelicom

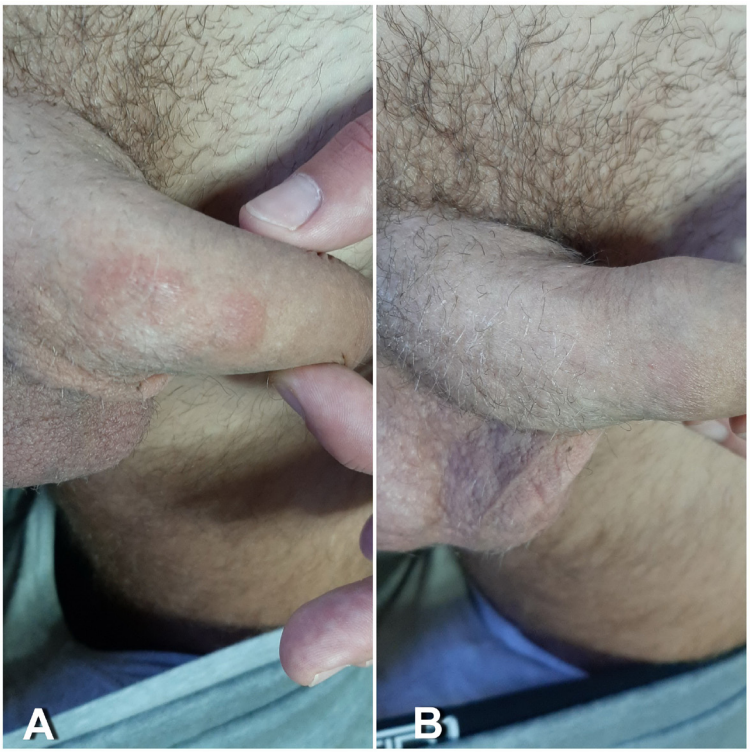


Figure 1. A – an annular erythematous scaly patch on the shaft of the penis; B – complete regression of the lesion after treatment

Considering that a dermatophyte infection of the penis was diagnosed and that the patient did not have any other manifestations of fungal infection on other parts of the skin, we also examined his sexual partner, who did not have any signs of dermatomycosis. The patient was often in contact with his friends' pets. He used 1% terbinafine cream two times a day during the treatment, and after seven weeks the skin changes completely disappeared (Figure 1B).

Discussion

Different regions of the skin can be affected by dermatophyte infection, while the most common localizations are on the trunk and extremities (*Tinea corporis*) and inguinal-crural and intergluteal areas (*Tinea cruris*), while it appears less frequently on the genitalia (7). A study from India which included 2200 patients with various dermatophyte infections described how the penis was affected in 1% of patients (8). According to the results of

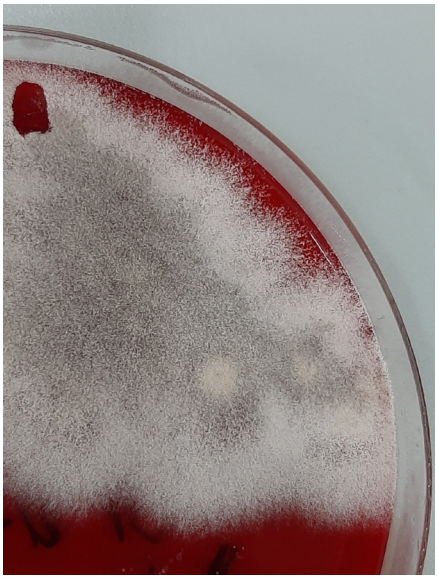


Figure 2. *Powdery growth of Trichophyton mentagrophytes*

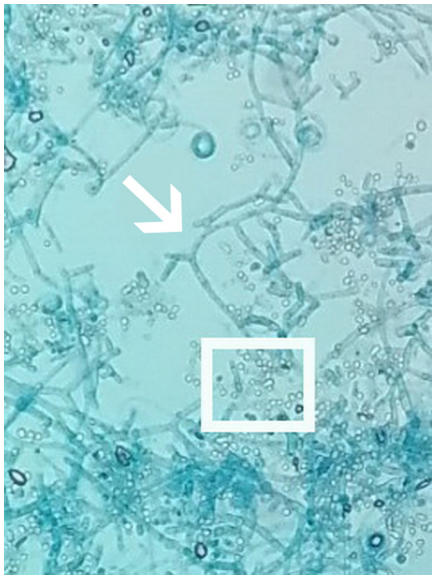


Figure 3. Lactophenol blue mount: round shaped microconidia arranged in clusters marked with a square and septate hypha marked with an arrow

penisa kod 1% obolelih (8). Prema rezultatima istraživanja sprovedenog u Sarajevu u Bosni i Hercegovini učestalost javljanja dermatofitne infekcije muških genitalija iznosila je 5,4% (9). Nasuprot ovim podacima u tropskim regijama je opisana češća zahvaćenost kože penisa, naročito kod pacijenata sa simptomatskom dermatofitnom infekcijom kruralne regije i iznosila je oko 20% (10,11).

Dermatofitnoj infekciji penisa često prethode gljivične infekcije ingvino-kruralne regije i stopala ili noktiju na nogama, koje predstavljaju rezervoar zaraze (2,3,9,10), mada se lezije na penisu mogu javiti i bez zahvaćenosti drugih delova kože (9) kao što je opisano i kod našeg pacijenta. Pored prethodno pomenutih već postojećih gljivičnih infekcija kože, kao faktori rizika za nastanak dermatofitne infekcije penisa pominju se povećana lokalna vlažnost, maceracija kože, tesan, često sintetički donji veš, atopijski dermatitis, *diabetes mellitus* i imunosupresija (1).

Najčešći uzročnici dermatofitoze muških genitalija su *Trichophyton rubrum*, *Trichophyton mentagrophytes* (izolovan i kod našeg pacijenta) i *Epidermophyton floccosum* (2,3,12,13). Studija sprovedena u Bosni i Hercegovini (9) je pokazala da je *Microsporum canis* bio najčešći uročnik infekcije penisa što se objašnjava visokom prevalencijom ovog patogena u pomenutoj geografskoj regiji (14). Zbog nedostatka molekularne tipizacije nismo bili u mogućnosti da kod našeg pacijenta utvrdimo da li se radi o antropofilnom ili zoofilnom soju *Trichophyton mentagrophytes* jer je morfološka diferencijacija klasičnim mikroskopskim i biohemijskim metodama često problematična, čak i u rukama iskusnih mikologa.

Tinea penis se klinički najčešće manifestuje u vidu jasno ograničenih anularnih polja sa skvamom, kao što je prikazano i kod našeg pacijenta, a ponekad se na penisu mogu pojaviti i pustule. Promene su obično lokalizovane pri bazi ili na telu penisa, nešto ređe na skrotumu a izuzetno retko i na prepucijumu (7). U diferencijalnoj dijagnozi dermatofitne infekcije penisa u obzir dolaze psorijaza, atopijski dermatitis i anularne promene u sekundarnom stadijumu sifilisa. Zdravstveni radnici bi uvek trebalo da razmišljaju o sifilisu kada su prisutne genitalne lezije kod mladih seksualno aktivnih osoba jer je ovo oboljenje u poslednjoj deceniji u porastu u našoj sredini (15). Klinička dijagnoza se potvrđuje laboratorijskom detekcijom spora i hifa u direktnom mikroskopskom preparatu i kultivisanjem materijala na selektivnim podlogama, a u terapiji se obično koriste lokalni antimikotski preparati koji dovode do brzog povlačenja kožnih promena.

Zaključak

Iako je genitalna lokalizacija dermatofitne infekcije retka, o ovom oboljenju bi trebalo razmišljati, dijagnostikovati ga i rano lečiti, da ne bi postalo fokus za rekurentne gljivične infekcije.

Konflikt interesa

Autori su izjavili da nema konflikta interesa.

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a study conducted in Bosnia and Herzegovina, the incidence of dermatophyte infection of male genitalia was 5.4% (9). In contrast to these data, more frequent penile skin involvement was observed in tropical regions, especially in patients with symptomatic dermatophyte infection of the crural region and it amounted to 20% (10,11).

Dermatophyte infection of the penis is often preceded by fungal infections of the inguinal-crural region, feet or toenails, which represent a reservoir of infection (2,3,9,10), although lesions on the penis can also occur without the involvement of other parts of the skin (9), as it was described in our patient, as well. In addition to the already existing fungal infections of the skin, which had been previously mentioned, increased local humidity, skin maceration, tight, often synthetic underwear, atopic dermatitis, diabetes mellitus and immunosuppression are risk factors for the occurrence of dermatophyte infection of the penis (1).

The most common causes of dermatophytosis of male genitalia are *Trichophyton rubrum, Trichophyton mentagrophytes* (isolated in our patient, as well) *Epidermophyton floccosum* (2,3,12,13). A study that was conducted in Bosnia and Herzegovina (9) showed that *Microsporum canis* was the most common cause of the infection of the penis, which is explained by high prevalence of this pathogen in the mentioned geographic region (14). Due to the lack of molecular typing, we were not able to determine in our patient whether it was an antropophilic or zoophilic strain of *Trichophyton mentagrophytes*, because morphological differentiation by classical microscopic and biochemical methods is often problematic even in the hands of experienced mycologists.

Tinea penis is clinically most frequently manifested as clearly defined annular scaly patches, as it was reported in our patient, while pustules can sometimes appear on the penis. Changes are usually localized at the base or on the shaft of the penis, somewhat less on the scrotum and extremely rarely on the foreskin (7). Psoriasis, atopic dermatitis and annular changes in the secondary stage of syphilis are considered in the differential diagnosis of dermatophyte infections of the penis. Healthcare workers should always think about syphilis when genital lesions are present in young, sexually active persons because this disease has been on the rise in our environment in the last decade (15). Clinical diagnosis is confirmed by laboratory detection of spores and hyphae in a direct microscopic preparation and by culturing the material on selective media, while local antimycotic preparations are usually used for the treatment, and they lead to the rapid withdrawal of skin changes.

Conclusion

Although genital localization of dermatophyte infection is rare, this disease should be considered, diagnosed and treated early in order not to become a focus for recurrent fungal infections.

Competing interests

The authors declared no competing interests.

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UTICAJ COVID-19 PANDEMIJE NA MENTALNO ZDRAVLJE STANOVNIKA SRBIJE

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SAŽETAK

Dosadašnja istraživanja u oblasti mentalnog zdravlja i COVID-19 bolesti su otkrila različite reakcije i poremećaje mentalnog zdravlja tokom pandemije COVID-19. Ovaj rad predstavlja analizu podataka objavljenih u stručnim i naučnim radovima i izveštajima nakon sprovedenih istraživanja uticaja pandemije COVID-19 bolesti na mentalno zdravlje, kako opšte populacije, tako i vulnerabilnih grupa. Prema podacima Svetske zdravstvene organizacije, u prvoj godini pandemije globalna prevalencija anksioznosti i depresije porasla je za čak 25%. U Republici Srbiji, prema podacima SZO za 2017. godinu, 5% populacije živi sa depresijom, a 3,8% sa anksioznim poremećajem. Mnoge studije ukazuju da su vanredno stanje i karantin tokom COVID-19 pandemije uticali na mentalno zdravlje. Kod 28,9% odraslih postojala je umerena do teška depresija, a kod nešto više od jedne trećine anksioznost i simptomi stresa. Tokom vanrednog stanja, od 1103 mladih uzrasta 15-30 godina, 16,3% se osećalo veoma ugroženo, a 19% ugroženo. Veću ugroženost iskazale su mlade žene, mladi koji žive u gradovima, kao i mladi sa većim stepenom obrazovanja. Tokom vanrednog stanja 33,4% ispitanika je ukazalo da je osećalo ugroženu bezbednost, 42,7% zdravstvenu ugroženost, a strah su najčešće imali u vezi sa mogućnošću da zaraze članove porodice, da se ne zaraze bliski prijatelji i oni sami. Osećanje optimizma u pogledu budućnosti nije imala ¼ ispitanika, ⅓ se osećala potpuno beskorisno, a 14,3% je smatralo da im je veoma pogoršano mentalno zdravlje. Mlađi su smatrali da im je manje pogoršano mentalno zdravlje tokom vanrednog zdravlja nego stariji. U toku vanrednog stanja 11,1% mladih je doživelo nasilje, od čega je najviše bilo reči o verbalnom i *online* nasilju, a u 10,4% o fizičkom. Sva sprovedena istraživanja u Republici Srbiji mogu biti korisna za planiranje intervencija u oblasti mentalnog zdravlja, s ciljem da u uslovima pojave novih pandemija zemlja bude spremna da primeni mere u cilju očuvanja mentalnog zdravlja.

Ključne reči: mentalno zdravlje, pandemija, COVID-19

Uvod

Pandemija se definiše kao epidemija koja se javlja širom sveta ili na veoma širokom području, prelazi međunarodne granice i pogađa veliki broj ljudi (1).

Pandemije obično nastaju zbog nekog oblika zarazne bolesti, odnosno bolesti za koju je većina ljudi osetljiva. Istorijski gledano, istraživači i zdravstvene vlasti su zanemarivali značaj psiholoških faktora tokom dosadašnjih pandemija, uprkos dokazima da su pandemije u velikoj meri i psihološki fenomeni u kojima uverenja i ponašanja utiču na opštu psihičku uznemirenost, širenje bolesti i društvene poremećaje.

Psihološki faktori su važni kada je u pitanju pridržavanje mera i primena metoda ublažavanja pandemije (npr. socijalno distanciranje, zatvaranje mesta za javna okupljanja, nošenje maski, primena vakcinacije), društveni poremećaji u vezi sa pandemijom (npr. panično kupovanje, rasizam, protestni skupovi protiv društvenih ograničenja) i uznemirenost u vezi sa pandemijom koja je povezana sa problemima kao što su anksioznost, poremećaji raspoloženja, opsesivno-kompulzivni poremećaj, produžena tuga i posttraumatski stresni poremećaj (2).

REVIEW PAPER

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THE IMPACT OF THE COVID-19 PANDEMIC ON THE MENTAL HEALTH OF THE POPULATION OF SERBIA

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SUMMARY

To date research in the field of mental health and COVID-19 disease revealed a variety of mental health responses and disorders during the COVID-19 pandemic. This paper represents an analysis of data published in professional and scientific papers and reports after research conducted on the impact of the COVID-19 pandemic on the mental health of both, general population, and vulnerable groups. According to the World Health Organization, during the first year of the pandemic, the global prevalence of anxiety and depression increased by as much as 25%. In the Republic of Serbia, according to the WHO data for 2017, 5% of the population lives with depression, and 3.8% with anxiety disorder. Many studies indicate that the state of emergency and quarantine during the COVID-19 pandemic had an impact on the mental health: 28.9% of adults had moderate to severe depression, and slightly more than ⅓ had anxiety and stress symptoms. During the state of emergency, out of 1103 young people aged 15-30, 19% felt vulnerable, and 16.3% very vulnerable. Young women, young people living in cities, and young people with higher level of education expressed greater vulnerability. During the state of emergency, 33.4% of respondents indicated that they felt their safety was threatened, 42.7% that their health was threatened, and most often they had fear related to the possibility of infecting family members, close friends and themselves. ¼ of respondents did not feel optimistic about the future, ⅓ felt completely useless, and 14.3% considered that their mental health had deteriorated greatly. Younger people felt that their mental health worsened less during health emergency, in comparison to older people. During the state of emergency, 11.1% of young people experienced violence, mostly verbal and online, and 10.4% physical violence. All the research conducted in the Republic of Serbia can be useful for planning interventions in the field of mental health, so that in the case of the emergence of new pandemics, the country will be ready to implement measures aimed at preserving mental health.

Keywords: mental health, pandemic, COVID-19

Introduction

A pandemic is defined as an epidemic that occurs worldwide or in a very wide area, crosses international borders and affects a large number of people (1).

Pandemics are usually caused by some form of infectious disease, that is, a disease to which most people are susceptible. Historically, researchers and health authorities have neglected the importance of psychological factors during past pandemics, despite evidence that pandemics are largely psychological phenomena in which beliefs and behaviors affect general psychological distress, the spread of disease and social disorders.

Psychological factors are important when it comes to adherence to measures and the implementation of pandemic mitigation methods (e.g. social distancing, closing places of public gatherings, wearing masks, vaccination), social disorders related to the pandemic (e.g. panic shopping, racism, protests against social restrictions) and pandemic-related distress that is associated with problems such as anxiety, mood disorders, obsessive-compulsive disorder, prolonged mourning, and post-traumatic stress disorder (2).

The COVID-19 pandemic has led to dramatic social and economic changes. The first studies

Pandemija COVID-19 bolesti dovela je do dramatičnih društvenih i ekonomskih promena. Prve studije su pokazale uticaj na mentalno zdravlje opšte populacije koji je podrazumevao veći nivo anksioznosti, stresa i depresije (3).

U početku je prijavljen povećan nivo psihičkog stresa od strane opšte javnosti i kod medicinskog osoblja na prvoj liniji, ali karakteristike stresa nisu bile dobro utvrđene. Osetljivost na psihički stres u pandemiji COVID-19 bolesti može se pripisati različitim faktorima, uključujući pol, društvenu podršku, specifična iskustva sa SARS-CoV-2 infekcijom, dužinu izolacije i količinu izloženosti medijskim sadržajima.

Prva studija koja je imala za cilj istraživanje psihološkog zdravlja populacionih grupa sa različitim nivoima izloženosti epidemiji COVID-19 bolesti, i to pacijenata koji su doživeli SARS-CoV-2 infekciju, pojedinaca u karantinu i šire javnosti, otkrila je različite nivoe psihičkog stresa u navedenim grupama. Povećana prevalencija depresije pronađena je pretežno kod pacijenata koji su imali SARS-CoV-2 infekciju, dok prevalencija anksioznosti nije bila statistički različita u ove tri grupe. Identifikovani su trendovi povećane prevalencije depresije u kombinaciji sa anksioznošću kod pacijenata koji su imali infekciju, ali i kod opšte javnosti i u poređenju sa onima u karantinu.

Pacijenti koji su imali infekciju i opšta javnost češće su pokazali depresivno raspoloženje i somatske simptome u poređenju sa pojedincima u karantinu. Ponašanje nalik anksioznosti, uključujući i razdražljivost, manifestovalo se prvenstveno u opštoj populaciji i kod pacijenata koji su imali infekciju (4).

Istraživanja su pokazala da zbog društvene izolacije, uočene opasnosti, neizvesnosti, fizičke nelagodnosti, neželjenih efekata lekova, straha od prenošenja virusa na druge i negativnih vesti na društvenim mrežama, pacijenti sa COVID-19 bolešću mogli su da iskuse usamljenost, bes, anksioznost, depresiju, nesanicu i posttraumatske simptome stresa koji mogu imati negativan uticaj na pojedince, društveno i profesionalno funkcionisanje i kvalitet života (5).

Prema naučnom izveštaju koji je objavila Svetska zdravstvena organizacija (SZO), u prvoj godini pandemije, globalna prevalencija anksioznosti i depresije porasla je za čak 25%. Jedno od glavnih objašnjenja za veću učestalost poremećaja mentalnog zdravlja je stres izazvan društvenom izolacijom kao posledicom pandemije i ograničenjima radne sposobnosti, podrške voljenih i angažovanja u zajednici. Usamljenost, strah od infekcije, patnje i smrti za sebe i za najbliže, tuga nakon gubitka bliskih osoba i finansijske brige su takođe navedeni kao stresori koji dovode do anksioznosti i depresije. Među zdravstvenim radnicima, iscrpljenost je bila glavni okidač za pojavu suicidalnih misli (6).

Izveštaj koji je zasnovan na sveobuhvatnom pregledu postojećih dokaza o uticaju COVID-19 bolesti na mentalno zdravlje i pružanje usluga u domenu mentalnog zdravlja, koji uključuje procene iz najnovije studije Globalno opterećenje bolestima pokazuje da je pandemija najviše uticala na mentalno zdravlje mladih ljudi, žena i osoba sa već postojećim fizičkim poremećajima zdravlja, kao što su astma, maligna oboljenja i bolesti srca, koji su češće razvijali simptome mentalnih poremećaja. Osobe sa već postojećim mentalnim poremećajima su imale veću verovatnoću za hospitalizacijom, za teškom formom bolesti i smrtnim ishodom u poređenju sa osobama bez mentalnih poremećaja. Posebno su bile ugrožene osobe sa težim mentalnim poremećajima, kao što su psihoze, ali i mlađe osobe sa mentalnim poremećajima (6).

Tokom većeg dela pandemije, zdravstvene usluge za mentalna, neurološka oboljenja i poremećaje usled zloupotrebe supstanci značajno su bile ugrožene. Mnoge zemlje su prijavile da je pružanje usluga koje se odnose na prevenciju samoubistava bilo u velikoj meri ograničeno (6).U nemogućnosti direktnog pristupa zdravstvenim službama, mnogi su tražili podršku na mrežama, signalizirajući hitnu potrebu da se pouzdani i efikasni digitalni alati učine lako dostupnim. Međutim, razvoj i primena digitalnih intervencija ostaje veliki izazov u zemljama i okruženjima sa ograničenim resursima.

Do kraja 2021. situacija se donekle poboljšala, ali i danas veliki broj ljudi i dalje nije u mogućnosti da dobije negu i podršku koja im je potrebna, kako za postojeće tako i za novonastale probleme mentalnog zdravlja. Zabrinutost zbog potencijalnog povećanja učestalosti poremećaja mentalnog zdravlja je navela 90% anketiranih zemalja da uključe mentalno zdravlje i psihosocijalnu podršku u svoje planove za reagovanje na COVID-19 bolest (6).

Cilj ovog preglednog rada je da analizira podatke do sada objavljenih istraživanja u stručnim i naučnim radovima i izveštajima o uticaju pandemije COVID-19 bolesti na mentalno zdravlje kako opšte populacije, tako i vulnerabilnih grupa.

showed an impact on the moral health of the general population, which included higher levels of anxiety, stress and depression (3).

Initially, increased levels of psychological stress were reported by the general public and frontline medical staff, but the characteristics of stress were not well established. Susceptibility to psychological stress in the COVID-19 pandemic may be attributed to various factors including gender, social support, specific experiences with SARS-CoV-2 infection, length of isolation, and amount of exposure to media content.

The first study that aimed to investigate the psychological health of population groups with different levels of exposure to the pandemic of COVID-19, namely patients who experienced SARS-CoV-2 infection, individuals in quarantine and the general public, revealed different levels of psychological stress in the above mentioned groups. The increased prevalence of depression was found predominantly in patients who had SARS-CoV-2 infection, while the prevalence of anxiety was not statistically different in these three groups. Trends of increased prevalence of depression combined with anxiety were identified in patients who had the infection, but also in the general public and compared to those in quarantine.

Patients who had the infection and the general public were more likely to show depressive mood and somatic symptoms compared to individuals in quarantine. Behavior similar to anxiety, including irritability, was manifested primarily in the general population and patients who had the infection (4).

Research has shown that due to social isolation, observed danger, uncertainty, physical discomfort, side effects of medications, fear of spreading the virus to others and negative news on social networks, patients with the COVID-19 disease could experience loneliness, anger, anxiety, depression, insomnia and post-traumatic stress symptoms that can have a negative impact on individuals, social and professional functioning and the quality of life (5).

According to the scientific report published by the World Health Organization (WHO), in the first year of the pandemic, the global prevalence of anxiety and depression increased by 25%. One of the main explanations for the higher incidence of mental health disorders is the stress caused by social isolation as a result of the pandemic and restrictions of work capability, support from the loved ones and engagement in the community. Loneliness, fear of infection, suffering and death, grief because of the loss of loved ones and financial worries are also listed as stressors leading to anxiety and depression. Among healthcare workers, exhaustion was the main trigger for suicidal thoughts (6).

The report, which is based on the comprehensive review of existing evidence about the impact of COVID-19 on mental health and providing services in the domain of mental health, including the estimates from the latest study Global Burden of Disease, shows that the pandemic affected most the mental health of young people, women, and people with the already existing physical health disorders such as asthma, malignancies, and heart diseases, who more often developed the symptoms of mental disorders. People with the pre-existing mental disorders had a higher probability of hospitalization, severe form of the disease and deathly outcome in comparison to people without mental disorders. People with severe mental disorders, such as psychosis, as well as young persons with mental disorders were especially at risk (6).

During the pandemic, health services for mental, neurological and disorders related to substance abuse were significantly compromised. Many countries reported that the provision of services related to suicide prevention was severely limited (6). Since people could not directly access health services, many of them sought support online, signaling the urgent need to make reliable and effective digital tools readily available. However, the development and application of digital interventions remains a major challenge in countries and environments with limited resources.

By the end of 2021, the situation has improved to some extent, but even today, a large number of people are still unable to get the care and support they need, both for existing and emerging mental health problems. Concerns about the potential increase in mental health disorders have induced 90% of surveyed countries to include mental health and psychosocial support in their plans to respond to the COVID-19 disease (6).

Metode

U okviru ovog preglednog rada biće uključeni rezultati dosadašnjih istraživanja objavljenih u stručnim i naučnim radovima, kao i izveštaji, koji se odnose na uticaj pandemije COVID-19 bolesti na mentalno zdravlje kako opšte populacije tako vulnerabilnih grupa. Ovim istraživanjem obuhvaćen je period od 2020. do 2023. godine, a u pretraživanju literature korišćene su sledeće ključne reči: pandemija COVID-19, mentalno zdravlje, depresija, anksioznost i stres. U cilju pretraživanja podataka korišćena je MEDLINE baza podataka.

Mentalni poremećaji u opštoj populaciji Republike Srbije

U Republici Srbiji ne postoji registar za mentalne poremećaje na osnovu kojeg bi mogli da pratimo kretanje ovih poremećaja zdravlja u populaciji, odnosno epidemiološku situaciju. U Republici Srbiji, prema podacima SZO za 2017. godinu, 5% populacije živi sa depresijom, a 3,8% sa anksioznim poremećajem (7).

Prema podacima istraživanja pod nazivom „Istraživanje zdravlja stanovništva Srbije 2019. godine", koje je obuhvatilo period pre pandemije, 2,1% stanovnika Republike Srbije ima simptome depresije, a 4,3% je obolelih od depresije prema sopstvenom iskazu (8).

Mnogi stručnjaci iz oblasti psihologije, psihijatrije i srodnih disciplina, iz sektora zdravstva i obrazovanja, kao i organizacija civilnog društva, su sproveli istraživanja u našoj zemlji, baveći se uticajem pandemije COVID-19 na mentalno zdravlje različitih populacionih grupa.

Filozofski fakultet u Beogradu je sproveo istraživanje 2020. godine, posle uvođenja vanrednog stanja u R. Srbiji 15.03.2020. godine, gde su identifikovane tri psihološke faze vanrednog stanja (9). Sve ove tri faze (akutna faza, faza adaptacije, faza relaksacije) međusobno su bile različite u odnosu na emocije, bolest, poverenje u različite izvore informisanja i preventivno ponašanje. Zabrinutost je tokom prve faza rasla, procenjivana je verodostojnost informacija iz različitih izvora, kao i važnost sprovođenja preventivnih mera. U fazi adaptacije zabrinutost i strah po pitanju COVID-19, kao i sprovođenje preventivnih mera je bilo na relativno stabilnom nivou. U fazi relaksacije, došlo je do redukcije straha, zabrinutosti i okupiranosti koronavirusom kod ljudi, ali i preventivnim ponašanjem i razmatranjima verodostojnosti informacija.

U drugom istraživanju koje je sprovedeno u Srbiji tokom 35 dana vanrednog stanja, ispitivane su longitudinalne promene u četiri emocionalna stanja tokom pandemije: zabrinutost, strah, dosada i ljutnja (10). Rezultati ukazuju da su tokom vremena učestalostsva četiri emocionalna stanja smanjena tokom vremena. Najveći pad je zabeležen kod zabrinutosti, zatim straha i dosade. Pridržavanje mera zaštite, kao i povećana izloženost medijima, značajno su bili povezani sa pojavom zabrinutosti i straha.

U preglednom radu publikovanom 2021. godine se ukazuje na neuropsihijatrijske efekte samog virusa tokom pandemije COVID-19, kao i da pandemija može da dovede do psihičkih smetnji uticajem psiholoških, socijalnih i bioloških faktora (11).

U studiji Vujčić i saradnika, sprovedenoj od marta do aprila 2020. godine, ispitan je uticaj vanrednog stanja i karantina tokom epidemije COVID-19 na mentalno zdravlje (12). Studija je metodom grudve snega obuhvatila 1057 odraslih ispitanika R. Srbije. Rezultati istraživanja su pokazali da je kod 28,9% ispitanika postojala umerena do teška depresija, a kod nešto više od ⅓ ispitanika anksioznost i simptomi stresa. Depresija, anksioznost i stres su značajno inverzno bili povezani sa nivom socioekonomskog stanja. Oni su češće bili prisutni kod ispitanika koji su osećali nemir u vezi sa vestima o COVID-19 i bespomoćnost, kao i onih koji su smatrali da imaju veći rizik od smrti i prisustvo simptoma COVID-19. Mlađi su imali značajno veći stepen depresije i stresa u odnosu na ispitanike starije životne dobi.

Mentalni poremećaji u vulnerabilnim grupama u Republici Srbiji

U istraživanju Kuljanić i saradnika, sprovedenom tokom maja i juna 2020. godine, ukazano je na posledice pandemije uzrokovane SARS-CoV-2 virusom, već posle prvog talasa i restriktivnih mera u Republici Srbiji (13). One su se ispoljile ne samo po pitanju javljanja mentalnih poremećaja kod lica bez psihijatrijskih bolesti, nego i po pitanju pogoršanja zdravstvenog stanja ranije obolelih lica od psihijatrijskih bolesti u vidu anksiozne i depresivne simptomatologije, poremećaja sna, postojanja suicidalnih misli i zloupotrebe sedativa.

Studija UNICEF-a i USAID-a, koja je obuhvatila 1061 domaćinstvo sa decom uzrasta do 17 godina

The aim of this review article is to analyze the data of research published so far in professional and scientific studies and reports on the impact of COVID-19 pandemic on the mental health of both the general population and vulnerable groups.

Methods

This review article will include the results of the previous research published in professional and scientific papers, as well as reports related to the impact of the COVID-19 pandemic on the mental health of both the general population and vulnerable groups. This study will include the period from 2020 to 2023, and the following key words will be used in literature search: COVID-19, pandemic, mental health, depression, anxiety and stress. The MEDLINE database was used for the search of data.

Mental disorders in the general population of the Republic of Serbia

In the Republic of Serbia, there is no registry for mental disorders based on which we could monitor the movement of these health disorders in the population, that is, the epidemiological situation. In the Republic of Serbia, according to the WHO for 2017, 5% of the population lives with depression, and 3.8% with anxiety disorder (7).

According to the data of the research entitled "Research on the health of the population of Serbia in 2019", which included the period before the pandemic, 2.1% of the inhabitants of the Republic of Serbia had symptoms of depression and 4.3% were suffering from depression according to their own statement (8).

Many experts in the field of psychology, psychiatry and related disciplines, from the health and education sectors, as well as civil society organization, have conducted research in our country, dealing with the impact of the COVID-19 pandemic on the mental health of different population groups.

The Faculty of Philosophy in Belgrade conducted a research in 2020, after the state of emergency was introduced in the Republic of Serbia on the 15th of March, 2020, where the three psychological phases of emergency state were identified (9). All these three phases (acute phase, adaptation phase and relaxation phase) were different in relation to emotions, illness, trust in different sources of information and preventive behavior. Concerns grew during the first phase, the credibility of information from different sources was evaluated, as well as the importance of implementing preventive measures. In the adaptation phase, concerns and fear regarding COVID-19, as well as the implementation of preventive measures were at a relatively stable level. In the relaxation phase, there was a reduction in fear, concern, and preoccupation with the coronavirus, but also in preventive behavior and considerations of the credibility of information.

In another study, which was conducted in Serbia during 35 days of the state of emergency, longitudinal changes in four emotional states during the pandemic were examined: worry, fear, boredom, and anger (10). The results indicate that the frequency of all four emotional states decreased over time. The biggest decrease was recorded for anxiety, followed by fear and boredom. The adherence to protective measures and the increased exposure to media were significantly associated with the occurrence of anxiety and fear.

In a review article, which was published in 2021, it was pointed to the neuropsychiatric effects of the virus itself during the COVID-19 pandemic, as well as that the pandemic could lead to psychological problems due to the influence of psychological, social and biological factors (11).

In the study of Vujčić and associates, which was conducted from March to April 2020, the impact of the state of emergency and quarantine during the COVID-19 epidemic on mental health was examined (12). The study included 1,057 adult respondents from the Republic of Serbia and it was conducted using the snowball method. The research results showed that 28.9% of respondents had moderate to severe depression, and slightly more than ⅓ of respondents had anxiety and symptoms of stress. Depression, anxiety and stress were significantly inversely related to the level of socioeconomic status. They were more often present in respondents who felt uneasiness related to the news about COVID-19 and helplessness, as well as those who felt that they had a higher risk of death and the presence of symptoms of COVID-19. Younger people had significantly higher levels of depression and stress compared to older respondents.

u periodu od juna do jula 2020. godine, je ukazala na porast zabrinutosti majki/staratelja usled pandemije COVID-19 (37%) u odnosu na prethodno istraživanje sprovedeno u aprilu 2020. godine na istom uzorku (27%) (14). U posmatrana dva perioda dolazi do neznatnog pada broja majki/staratelja koje se psihički osećaju lošije, kao i do porasta onih sa poboljšanjim fizičkim zdravljem. Potrebu za psihološkom pomoći u poslednjih mesec dana imalo je 5% ispitanica, a svaka druga nije uspela da je realizuje, najčešće jer nisu znale kome da se obrate. Takođe, ovom studijom analizirano je mentalno zdravlje dece na osnovu procene majki/staratelja. Svaka treća majka/staratelj smatrala je da je mentalno zdravlje deteta bolje posle ukidanja vanrednog stanja zbog COVID-19 epidemije. Najčešće kod dece bila je prisutna nervoza i iritabilnost (30%). Skoro kod svakog petog deteta javljala se teška usredsređenost, osećaj usamljenosti i uznemirenost.

Međutim, studija Markovića i saradnika (15) bavila se ispitivanjem uticaja COVID-19 epidemije na mentalno zdravlje ljudi koji rade u obrazovanju, vojsci i zdravstvu. Ukupno je bilo uključeno 110 ispitanika, a od toga oko 60% su činile žene. Studija je sprovedena jula 2020. pokazala je da su informacije u vezi sa epidemijom putem medija češće bile uznemirujuće za zdravstvene radnike i žene. Veći prosečan nivo anksioznosti imali su zdravstveni radnici nego lica u vojsci, a žene ne samo anksioznost, već i depresiju, u odnosu na muškarce. Uočeno je da nepoverenje u zdravstveni sistem i mere koje se donose može značajno da utiče na psihičko zdravlje (16). Uočeno je da osobe sa hroničnim bolestima imaju, takođe, češće stres, depresivnost i anksioznost, u odnosu na osobe bez komorbiditeta, kada je procena rađena pet meseci od proglašenja COVID-19 pandemije.

U studiji sprovedenoj od avgusta do oktobra 2020. godine uključeno je 1103 mladih uzrasta 15-30 godina, sa ciljem sagledavanja uticaja COVID-19 pandemije na njihov život i zdravlje (17). Tokom vanrednog stanja 16,3% mladih se osećalo veoma ugroženo, a 19% ugroženo. Veću ugroženost iskazale su mlade žene, mladi koji žive u gradovima, kao i mladi sa većim stepenom obrazovanja. Tokom vanrednog stanja 33,4% ispitanika je ukazalo da je osećalo ugroženu bezbednost, 42,7% zdravstvenu ugroženost, a strah su najčešće imali u vezi sa mogućnošću da zaraze članove porodice, da se ne zaraze bliski prijatelji i oni sami. Osećanje optimizma u pogledu budućnosti nije imala ¼ ispitanika, ⅓ se osećala potpuno beskorisno, a 14,3% je smatralo da im je veoma pogoršano mentalno zdravlje. Mlađi su smatrali da im je manje pogoršano mentalno zdravlje tokom vanrednog zdravlja nego stariji. U toku vanrednog stanja 11,1% mladih je doživelo nasilje, od čega najviše je bilo reči o verbalnom i *online* nasilju, a u 10,4% o fizičkom.

Prediktori mentalnih poremećaja

Epidemiološko istraživanje koje je sprovedeno od juna do oktobra 2021, tokom druge godine pandemije, je razmatralo uticaj stresora povezanih sa COVID-19 (infekcija SARS-CoV-2, infekcija bliskog rođaka, samoizolacija i nedostatak zaštitne opreme na radu), i uticaj drugih stresora tokom pandemije koji nisu direktno povezani sa rizikom od infekcije, na mentalno zdravlje odrasle populacije (18–65 godina) (18). Stresori povezani sa COVID-19 bolešću, iako se često prijavljuju, nisu dramatično uticali na prevalenciju mentalnih poremećaja. Prisutnost bilo kog mentalnog poremećaja evidentirano je kod 15,2% ispitanika, poremećaji raspoloženja kod 4,6%, poremećaji anksioznosti kod 4,3% i poremećaji upotrebe supstanci kod 8,0%. Nedostatak zaštitne opreme bio je povezan sa većom učestalošću anksioznih poremećaja. Ova studija nije pružila dokaze da je prevalencija mentalnih poremećaja premašila opseg pre pandemije na osnovu podataka iz postojeće literature.

Interesantno je i istraživanje sprovedeno na reprezentativnog uzorku od 1000 ispitanika, uzrasta 18-65 godina sa područja Republike Srbije. Rezultati ovog istraživanja su pokazali da 15,6% (11,1% muškarci i 20,1% žene) ispitanika ima simptome depresije, 7,2% (4,1% muškarci i 10,2% žene) simptome anksioznosti, a 1,6% (2,4% muškarci i 1,8% žene) suicidalne misli (19). Od svih prediktora psihičkih tegoba najvažnijim se smatra stres i trauma koji su se desili u poslednjih godinu dana (npr. teška bolest, povreda, napad, smrt člana porodice, smrt bliskog prijatelja, raskid duge veze i drugo). Međutim, suicidalnost se povezuje sa celoživotnim iskustvom traume. Tako su onda i stresna iskustva tokom pandemije COVID-19 uzrok pojave simptoma depresije, anksioznosti, suicidalnih ideja itd.

Potrebna su dalja istraživanja u ovoj oblasti i preduzimanje odgovarajućih mera u cilju smanjenja rizika od razvoja mentalnih bolesti u

Mental disorders in vulnerable groups in the Republic of Serbia

In the study of Kuljanić and associates, which was conducted during May and June 2020, it was pointed out to the consequences of the pandemic caused by the SARS-CoV-2 virus, already after the first wave and restrictive measures in the Republic of Serbia (13). They manifested themselves not only as mental disorders in people without psychiatric diseases, but also in terms of deterioration of the health status of people who previously suffered from psychiatric diseases in the form of anxiety and depressive symptomatology, sleep disorders, existence of suicidal thoughts and abuse of sedatives.

A study by UNICEF and USAID, which included 1061 households with children aged up to 17 years in the period from June to July 2020, indicated an increase in the concerns of mothers/guardians due to the COVID-19 pandemic (37%) compared to the previous research conducted in April 2020 on the same sample (27%) (14). In the two observed periods, there was a slight decrease in the number of mothers/guardians who felt worse psychologically, as well as an increase in those with improved physical health. 5% of female respondents had a need for psychological help in the previous month, while every second one failed to realize it, most often because they did not know who to turn to. Also, this study analyzed the mental health of children based on the evaluation of mothers/guardians. Every third mother/guardian believed that the child's mental health was better after the state of emergency due to the COVID-19 epidemic was ended. Nervousness and irritability were most often present in children (30%). Almost every fifth child reported difficulties while concentrating, feelings of loneliness and anxiety.

However, the study of Marković and associates (15) examined the impact of the COVID-19 epidemic on the mental health of people working in education, army and healthcare. A total of 110 respondents were included, and about 60% of them were women. The study was conducted in July 2020 and showed that the information related to the epidemic through media was more likely to be distressing for health workers and women. Healthcare workers had a higher average level of anxiety than people in the military, while women had a higher level of anxiety and depression compared to men. It was observed that distrust in the health system and taken measures could significantly affect psychological health (16). It was also observed that people with chronic diseases also had more often stress, depression and anxiety compared to people without comorbidities, when the evaluation was made five months after the declaration of the COVID-19 pandemic.

A study, which was conducted from August to October 2020, included 1103 young people aged 15-30 years, with the aim of assessing the impact of the COVID-19 pandemic on their life and health (17). During the state of emergency, 16.3% of young people felt very vulnerable, while 19% felt vulnerable. Young women, young people living in cities, as well as young people with a higher level of education expressed greater vulnerability. During the state of emergency, 33.4% of respondents indicated that their felt their safety was threatened, 42.7% felt their health was threatened, and they most often had fear related to the possibility of infecting family members, their close friends and themselves. ¼ of respondents did not feel optimistic about the future, ⅓ felt completely useless, and 14.3% felt that their mental health worsened greatly. Younger respondents thought that their mental health worsened less in comparison to older people. During the state of emergency, 11.1% of young people experienced violence, mostly verbal and online violence, and 10.4% experienced physical violence.

Predictors of mental disorders

The epidemiological study, which was conducted from June to October 2021, during the second year of the pandemic, analyzed the impact of stressors associated with COVID-19 (SARS-CoV-2 infection, infection of a close relative, self-isolation and lack of protective equipment at work), and the impact of other stressors during the pandemic that are not directly related to the risk of infection on the mental health of the adult population (18-65 years) (18). Stressors associated with the COVID-19 disease, although frequently reported, did not dramatically affect the prevalence of mental disorders. The presence of any mental disorder was recorded in 15.2% of respondents, mood disorders in 4.6%, anxiety disorders in 4.3% and disorders related to substance abuse in 8%. The lack of protective equipment was associated with a higher frequency

vanrednim situacijama, što uključuje donošenje novih strategija kako u oblasti mentalnog zdravlja tako i u oblasti planiranja reagovanja u vanrednim situacijama.

Zaključak

Rezultati našeg preglednog rada pokazuju da je vanredna situacija kao što je epidemija COVID-19 negativno uticala na mentalno zdravlje stanovništva i da je neophodno u budućnosti staviti akcenat na ranu identifikaciju poremećaja mentalnog zdravlja što će omogućiti pravovremenu primenu javno zdravstvenih intervencija. Iako studije pokazuju da se prevalencija mentalnih poremećaja donekle smanjila tokom trajanja pandemije, nije jasno da li će posledice ove krize ostaviti dugoročan efekat po mentalno zdravlje. Psihologija pandemija je raznolika i kompleksna, a njeno izučavanje je od vitalnog značaja za oblikovanje kliničke prakse i smernica javnog zdravlja za COVID-19 i buduće pandemije.

Konflikt interesa

Autor je izjavio da nema konflikta interesa.

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of anxiety disorders. This study did not provide evidence that the prevalence of mental disorders exceeded the number before the pandemic based on data from the existing literature.

The study, which was conducted on a representative sample of 1000 respondents aged 18-65 years from the territory of the Republic of Serbia, is interesting. The results of this study showed that 15.6% of respondents (11.1% of men and 20.1% of women) had symptoms of depression, 7.2% (4.1% of men and 10.2% of women) had symptoms of anxiety, and 1.6% (2.4% of men and 1.8% of women) had suicidal thoughts (19). Of all the predictors of psychological problems, stress and trauma that happened in the last year are considered the most important (e.g. serious illness, injury, attack, death of a family member, death of a close friend, breakup of a long relationship, etc.). However, suicidality is associated with the lifelong experience of trauma. Stressful experiences during the COVID-19 pandemic are also the cause of symptoms of depression, anxiety, suicidal thoughts, etc.

Further research is needed in this field and taking appropriate measures to reduce the risk of developing mental illnesses in emergency situations, which includes adopting new strategies both in the field of mental health and in the field of emergency response planning.

Conclusion

The results of our review article show that the emergency situation such as the COVID-19 epidemic has had a negative impact on the mental health of the population and that it is necessary in the future to emphasize the early identification of mental health disorders, which will enable the timely application of public health interventions. Although studies show that the prevalence of mental disorders has decreased to a certain extent during the pandemic, it is not clear whether the consequences of this crisis will have a long-term effect on mental health. The psychology of pandemics is diverse and complex, and its study is of vital importance for clinical practice and public health guidelines for COVID-19 and future pandemics.

Competing interests

The author declared no competing interests.

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DALJI RAZVOJ MEDICINSKOG TURIZMA U VRNJAČKOJ BANJI UVOĐENJEM *SCHROTH* METODE

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SAŽETAK

Vrnjačka Banja poseduje veoma veliku ponudu usluga u svim oblastima turizma, a posebno u medicinskom turizmu. Cilj rada je da se analizira mogućnost daljeg razvoja medicinskog turizma u Vrnjačkoj Banji uvođenjem *Schroth* (šrot) terapije. Cilj ove terapije je derotacija, ispravljanje i stabilizacija kičmenog stuba u trodimenzionalnoj ravni, kako bi se sprečile posledice skolioze koje je jedino moguće otkloniti operacijom. Imajući u vidu da uspešnost ove terapije zavisi od odnosa pacijenta i razumevanja zahteva fizioterapeuta koji pred njima postavljaju, mogućnost realizacije je samo sa decom starijom od 10 godina, jer pacijenti moraju biti fokusirani i mentalno i fizički. Šrot vežbe utiču na kičmu u sagitalnoj, frontalnoj i transverzalnoj ravni. Ova metoda je posebno prihvatljiva jer predstvalja nehirurški tretman vežbama koje su usmerene na ostvarivanje balansa čitavog tela, zauzimanje pravilnog položaja tela i stabilno držanje. SWOT analiza je pokazala da nisu ispunjeni svi uslovi za uvođenje ove terapijske metode. Neophodno je dalje raditi na obezbeđivanju svih uslova za uvođenje šrot terapije, kao i na daljem razvoju medicinskog turizma u Vrnjačkoj Banji.

Ključne reči: Šrot terapija, rehabilitacija, terapijski metod

Uvod

Jedna od veoma važnih terapija koja je razvijena u celom svetu, a kod nas se veoma malo koristi i o njoj se malo zna je *Schroth* („šrot") terapija. Ova terapija se primenjuje kod osoba sa deformitetom kičmenog stuba, odnosno idiopatskom skoliozom i lošim skoliotskim držanjem. Sprovodi se u cilju poboljšanja stanja deformiteta, ako je moguće pre nego što se završi razvoj samog kičmenog stuba, što je oko 17 godina (1). Mogu je koristiti i odrasli, ali u cilju sprečavanja daljeg pogoršanja stanja uzrokovanog deformitetom, odnosno sa ciljem redukcije bolnih stanja izazvanih deformitetom. Ova terapija je posebno važna za dečiju populaciju. Današnji način života je takav da su deca sve manje aktivna, što dovodi do sve češće pojave ovog deformiteta. Da bi se ovaj problem rešio na adekvatan način, potrebni su centri koji mogu da obezbede najbolje moguće uslove i što efikasnije sprovođenje ove terapije uz brzo učenje i njegovo delovanje (2,3). Zbog toga je potreban intenzivan rad i stalan boravak u samom mestu gde se terapija sprovodi. Banje u Srbiji ne nude ovu vrstu terapije ili je ona veoma malo zastupljena.

Cilj ovog rada je da se razmotre mogućnosti za uvođenje šrot terapije u Vrnjačkoj Banji, što bi doprinelo daljem razvoju medicinskog turizma u ovoj banji.

Atraktivni i receptivni elementi destinacije

Vrnjačka Banja se nalazi u centralnom delu Republike Srbije, oko 200 km južno od Beograda. Smeštena je u Vrnjačkoj kotlini, u dolini Zapadne Morave. Nadmorska visina je od 210m do 300m. Jednim delom banja se nalazi na obroncima planine Goč, koji je zaklanja sa juga istoka i zapada, i deo je ogromnog šumsko-planinskog kompleksa Kopaonik. Od planina koje su prisutne u okolini su Stolovi, Jastrebac i Željin. Banjska klima je umere-

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THE ROLE OF THE SCHROTH METHOD IN THE DEVELOPMENT OF MEDICAL TOURISM IN VRNJAČKA BANJA

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SUMMARY

Vrnjačka Banja has a very large offer of services in all areas of tourism, especially in medical tourism. The aim of this paper is to analyze the possibility of further development of medical tourism in Vrnjačka Banja by introducing the Schroth therapy. The goal of this therapy is derotation, straightening and stabilization of the spinal column in a 3D three-dimensional plane, in order to prevent the consequences of scoliosis, which can only be removed by surgery. Bearing in mind that the success of this therapy depends on the patient's attitude and the understanding of the physiotherapist's demands, it is possible to implement it only with children over 10 years old, because patients must be focused both mentally and physically. Shrot exercises affect the spine in the sagittal, frontal and transverse planes. This method is particularly acceptable because it represents a non-surgical treatment with exercises aimed at achieving the balance of the entire body, taking the correct position of the body, stable posture. Results of the SWOT analysis show that not all conditions for the introduction of this therapeutic method have been met. It is necessary to continue to work on ensuring all the conditions for the introduction of shot therapy, as well as on the further development of medical tourism in Vrnjačka Banja.

Key words: Schroth therapy, rehabilitation, therapeutic method

Introduction

One of the very important therapies is Schroth therapy, which has been developed all over the world, but it is very little used in our country and little is known about it. This therapy is applied to people with spinal column deformities, i.e. idiopathic scoliosis and poor scoliotic posture. It is carried out in order to improve the condition of the deformity, which is possible before the development of the spinal column itself has been completed, which is around the age of 17 (1). It can also be used by adults, but with the aim of preventing further deterioration of the condition caused by the deformity, i.e. with the aim of reducing painful conditions caused by the deformity. This therapy is especially important for the pediatric population. It can be seen that the majority of users of this therapy are children. Today's way of life is such that children are less and less active, which leads to the more frequent occurrence of this deformity. In order to solve this problem in an adequate way, centers are needed that can provide the best possible conditions and perform these therapies as efficiently as possible with fast learning and its action (2,3). That is why it requires intensive work and constant stay in the very place where the therapy is carried out. Spas in Serbia do not offer this type of therapy or it is present to a very small extent. This therapy is especially important for the pediatric population. Today's way of life is such that children are less and less active, which leads to the more frequent occurrence of this deformity.

The aim of this paper is to consider all the possibilities for the development of Schroth therapy in Vrnjačka Banja.

no kontinentalna sa nekim manjim odstupanjima zbog svoje specifičnosti, tako da su ovde leta prijatna, a zime umerene (4).

Vrnjačka Banja je bogata kulturno-istorijskim nasleđem, brojnim prirodnim lepotama, događajima, zabavnim mestima, kao i širokom zdravstvenom i medicinskom ponudom. Banja poseduje i veliki broj sportskih terena, spa i velnes centara, bazena, akva park, veštačku stenu za penjanje i druge objekte (5-8). Kao odeljak medicinskog turizma u banji postoji lečilište i rehabilitacioni centar sa upotrebom termomineralne vode.

Vrnjačka Banja važi za jednu od najbolje organizovanih destinacija u Srbiji, tako da je sa razlogom i najposećenije banjsko lečilište. Ukupni smeštajni kapaciteti su oko 15.000 ležajeva, što se odnosi na hotelski smeštaj, apartmane, vile i privatne kuće. Hotelski smeštaj ima negde oko 4500 ležajeva. Sa najvećim kapacitetom je Specijalna bolnica „Merkur“ sa 850 ležajeva, koji se nalaze u više objekata. HTP „Fontana“ broji 800 ležajeva, to je hotel sa dugom tradicijom, koji je kompletno renoviran 2019. godine. Ovaj hotel poseduje veliki kongresni centar, drugi po veličini u Srbiji. Ono što krasi banjsku ponudu su moderni hoteli po ugledu na svetske kao što su „Tonanti“, „Cepter“, „Vrnjačke terme i dr. (9,10). U Banji postoje i čitava apartmanska naselja kao što su „Solaris resorts“ i Apartmani „Jezero“. Privatni smeštaj je veoma rasprostranjen u banji i prima preko 10.000 gostiju.

Veliki broj hotela i apartmana nudi smeštaj prilagođen porodičnoj upotrebi (11). Usluge ishrane su raznovrsne, a specifičan režim ishrane propisuju lekari iz „Merkurovog” specijalističkog tima prema oboljenjima koje neko od korisnika terapije može da ima (12). U okviru većine novih hotela („Vrnjačke Terme“, „Solaris“, „Tonanti“, „Fontana“ itd.) nalaze se i igraonice za decu, što je od velikog značaja jer su uglavnom deca podvrgavaju šrot terapiji.

Medicinski turizam

Vrnjačka Banja je lider među banjama u Republici Srbiji, jer nudi širok spektar usluga. Kao ponuda banjskog turizma, od svih se svakako izdvajaju „Merkur“ (celokupnom ponudom iz raznih oblasti) i „Vrnjačke Terme“ (13). Ova dva objekta jedina nude termalnu mineralnu vodu za kupanje. Vellness turizam kao ponuda je prisutan u: „Solaris resorts“, „Tonanti“, „Iva“, „Vnjačke Terme“, „Sunni Hill“, „Kazablanka“, „Aleksandar“, „Biser“, „Cvetni konaci“.

Medicinski turizam iz nekoliko specijalizovanih oblasti nudi se u „Merkuru“, kao i stomatološki turizam (14-16). Specijalna bolnica "Merkur" je ujedno i "Nacionalni centar za prevenciju i edukaciju dijabetičara". Takođe, ima više specijalističkih i subspecijalističkih ambulanti (fizikalna, urološka, neuropsihijatrijska, ginekološka, oftalmološka, pedijatrijska, interna, medicina rada, medicina sporta, subspecijalistička ambulanta za ishranu), kao i dijagnostički centar. U fizikalnom bloku se nalazi čitav niz fizikalnih sredstava, kineziterapije, a u posebnom objektu i hidroterapija i hidromasaža.

Radi sveobuhvatnijeg sagledavanja problema i iznošenja adekvatnih zaključaka, urađena je analiza turističkog prometa za period od 2015. do 2019. godine, gde je praćen broj domaćih i stranih turista koji su boravili u Vrnjačkoj Banji, kao i broj noćenja naših gostiju i stranaca i prosečan broj noćenja (tabela 1).

U periodu od 2015. do 2019. godine dolazi do porasta posećenosti svih turista Vrnjačkoj Banji za 61,8%. U istom periodu iz godine u godinu beleži se porast domaćih turista, a izuzetak predstavlja-

Tabela 1. Turistički promet u Vrnjačkoj banji od 2015. do 2019. godine (17)

Godina	Broj domaćih turista	Broj stranih turista	Ukupno	Broj noćenja domaćih turista	Broj noćenja stranih turista	Ukupno	Prosečan broj noćenja domaćih turista	Prosečan broj noćenja stranih turista
2015.	146.208	28.945	175.153	481.150	81.712	562.862	3,3	2,8
2016.	163.997	38.823	202.820	573.394	104.296	677.690	3,5	2,7
2017.	176.202	36.992	213.994	603.279	98.343	701.622	3,4	2,7
2018.	200.343	47.366	247.709	695.171	122.874	818.045	3,5	2,6
2019.	230.887	52.604	283.491	774.206	133.686	907.892	3,4	2,5

Attractive and receptive elements of the destination

Vrnjačka spa is located in the central part of the Republic of Serbia, about 200 km south of Belgrade. It is located in the Vrnjačka basin, in the West Morava valley. The altitude is from 210m to 300m. A part of the spa is located on the slopes of Mount Goč, which hides it from the south, east and west, and is part of the huge Kopaonik mountain range. Among the mountains present in the area are Stolovi, Jastrebac and Željin. The spa climate is moderately continental with some minor deviations due to its specificity, so the summers here are pleasant and the winters are moderate (4).

Vrnjačka spa is rich in cultural and historical heritage, numerous natural beauties, events, entertainment places, as well as a wide range of health and medical services. The spa also has a large number of sports fields, spa and wellness centers, swimming pools, aqua parks, artificial rocks for climbing and other facilities (5-8). As part of medical tourism, Vrnjacka banja has a spa and a rehabilitation center with the use of thermal mineral water.

Vrnjačka Spa is considered one of the best organized destinations in Serbia, and therefore, it is the most visited spa resort. The total accommodation capacity is around 15,000 beds, which refers to hotel accommodation, apartments, villas and private houses. The hotel accommodation has around 4500 beds. The largest capacity has the Special Hospital "Merkur" with 850 beds, which are located in several facilities. HTP Fontana has 800 beds, it is a hotel with a long tradition, which was completely renovated in 2019. This hotel has a large congress center, the second largest in Serbia. The spa offer includes modern hotels such as "Tonanti", "Zepter", "Vrnjačke terme", renowned as the most prestigious world hotels. (9). There are also entire apartment complexes in the spa, such as "Solaris resorts" and Apartments "Jezero". Private accommodation is widespread in the spa and accommodates over 10,000 guests.

A large number of hotels and apartments offer accommodation suitable for family use (11). Nutrition services are in accordance with nutritional standards, at least when we talk about a variety of diets, from the halal standard to specific diet regimens prescribed by doctors from "Merkur's" specialist team according to diseases that one of the users of the meal therapy may have (12). Within most of the new hotels ("Vrnjačke Terme", "Solaris", "Tonanti", "Fontana", etc.), there are playrooms for children, which is of great importance because mostly children are subjected to Schroth therapy.

Medical tourism

Vrnjačka Spa is the leader among the spas in the Republic of Serbia and this is for a reason, because it offers a wide range of services as a tourist product from different areas of tourism in different centers. As part of an offer of spa tourism, "Merkur" (with its entire offer from various areas) and "Vrnjačke Terme" (13) certainly stand out. Only these two facilities offer thermal mineral water for bathing. Wellness tourism is offered in: "Solaris resorts", "Tonanti", "Iwa", "Vnjačke Terme", "Sunny Hill", "Casablanca", "Aleksandar", "Biser", "Cvetni Konaci".

Medical tourism is present in "Merkur" including several specialized areas, as well as dental tourism (14-16). The "Merkur" Special Hospital is also the "National Center for the Prevention and Education

Table 1. Tourist traffic in Vrnjačka banja from 2015 to 2019 (17)

Year	Number of domestic tourists	Number of foreign tourists	Total	Number of overnight stays of domestic tourists	Number of overnight stays of foreign tourists	Total	Average number of overnight stays of domestic tourists	Average number of overnight stays of foreign tourists
2015	146,208	28,945	175,153	481,150	81,712	562,862	3.3	2.8
2016	163,997	38,823	202,820	573,394	104,296	677,690	3.5	2.7
2017	176,202	36,992	213,994	603,279	98,343	701,622	3.4	2.7
2018	200,343	47,366	247,709	695,171	122,874	818,045	3.5	2.6
2019	230,887	52,604	283,491	774,206	133,686	907,892	3.4	2.5

ju strani turisti kojih je u 2017. godini bilo manje nego 2016. godne, ali od 2018. godine beleži se dalji njihov porast. Može se primetiti da je i broj noćenja domaćih turista u stalnom porastu. Kada je reč o strancima, broj noćenja stranih studenata je bio manji 2017. nego 2016. godine, ali od 2018. godine broj noćenja stranaca dalje raste.

Primena inovativne „šrot“ terapije

„Šrot“ terapija je inovativna metoda koja se koristi u savremenim medicinskim ustanovama za lečenje, odnosno vežbanje prilikom otklanjanja posledica strukturalne skolioze. Strukturna skolioza je značajno složeniji deformitet kičmenog stuba, koji u osnovi predstavlja rotaciju tela pršljena i pomeranje složenog segmenta kičmenog stuba. Primena ove terapije podrazumeva primenu 3D vežbi osmišljenih da zaustave napredovanje bolesti i olakšaju pacijentu svakodnevne aktivnosti.

Šrot terapija spada u oblast rehabilitacije i sprovodi je fizioterapeut koji je specijalno obučen za ovu vrstu terapije. Ova terapija, kao vid turističkog proizvoda, spada u medicinski turizam. Koristi se za lečenje idiopatske skolioze, uglavnom kod dece uzrasta od 8 do 17 godina, ali ga mogu koristiti i odrasli. Često se dešava da jedan od roditelja dece sa skoliozom može imati isti zdravstveni problem, pa onda zajedno mogu da koriste usluge banjskog lečilišta. Kod ove terapije, glavna ciljna grupa je dečja populacija. Njihov boravak u banji tokom terapije treba učiniti što zabavnijim i sa što više ponuda. Ono što je od velikog značaja za decu je aktivnost i kretanje (18).

Cilj šrot terapije je derotacija, ispravljanje i stabilizacija kičmenog stuba u 3D trodimenzionalnoj ravni, kako bi se sprečile posledice skolioze, koje se mogu ukloniti samo hirurškim putem. Imajući u vidu da uspeh ove terapije zavisi od stava pacijenta i razumevanja zahteva fizioterapeuta, moguće je sprovoditi je samo kod dece starije od 10 godina, jer pacijenti moraju biti psihički i fizički fokusirani.

Šrot vežbe utiču na kičmu u sagitalnoj, frontalnoj i poprečnoj ravni. Ova metoda je posebno prihvatljiva korisniku jer predstavlja nehirurški tretman sa vežbama koje imaju za cilj postizanje ravnoteže celog tela, zauzimanje pravilnog položaja tela i stabilno držanje tela. Takođe, vežbe obuhvataju pravilno disanje (rotaciono disanje), koje koriguje grudni koš, kao i niz vežbi za jačanje tonusa mišića, čime se stabilizuje položaj tela.

Za ovu metodu je važno da se primenjuje individualno, jer svaki pacijent ima specifičan problem vezan za kičmeni stub. Za uspešnu korekciju potrebno je da u samu vežbu bude uključena cela porodica. Neophodno je da dete, ali i roditelj, aktivno učestvuju u vežbi, što podrazumeva promenu kvaliteta svakodnevnog života.

Reljef kičmenog stuba je primarni cilj ovog programa koji je nastao 20-ih godina dvadesetog veka u Nemačkoj. Vežbe danas su namenjene prvenstveno sticanju kontrole nad držanjem tela. Savremeni program je unapređen i usmeren je na poboljšanje položaja tela u sagitalnoj ravni, a postignuti rezultati su neverovatni i kod izuzetno velikih krivina kičmenog stuba. Takozvani „*New Schroth program*“ ima za cilj korigovanje krivina do 70°, međutim, kada krivina kičme pređe 70°, primenjuje se originalni Šrot program kojim se, kako iskustvo pokazuje, postižu najbolji rezultati.

Dobar primer ove terapije, kao vid turističkog proizvoda, u svetu je klinika *Asklepios Clinic* u *Bad Sobernheim*. Ovde je rođena šrot metoda kao tretman. U ovoj klinici se smatra da tretmani treba da budu intenzivni, kako bi ova terapija bila što efikasnija. Zbog toga se sprovodi samo na stacionarnoj osnovi, odnosno u vidu boravka u klinici. Terapijska ponuda obuhvata grupne, treninge u malim grupama i individualne treninge. Veličina grupa je od 5 do 13 pacijenata. Ovde se nudi i radna terapija, koja je usko povezana sa samom šrot terapijom, kao i ergonomski saveti za odgovarajući uzrast i poslove koje obavljaju radno sposobni. U pomenutoj banji, u slobodno vreme, fokus je na kreativnosti i zabavi. O mlađim korisnicima usluga brinu vaspitači za različite starosne grupe. Organizuje se i školska nastava koju mogu pratiti onlajn ili od strane njihovih lica, kao i mogućnost polaganja ispita. Imaju različite mogućnosti za individualne slobodne aktivnosti. Nude im se aktivnosti u vidu sportskih i društvenih igara, planinarenja, kao i razne vrste turnira. Na raspolaganju su im bazen, stoni tenis, košarkaški i fudbalski tereni, odbojka na pesku. Ovaj centar ima i veliko platno slično bioskopu, pa se često organizuju filmske večeri na kojima se mogu pratiti i važniji sportski događaji. U banji se nalaze znamenitosti koje treba posetiti, kao što su neobična i atraktivna prva nemačka staza za bosonoge, železničke staze, pešačke staze sa strmim ivicama, istorijske znamenitosti, manastiri itd. Nude se i klasična fizikalna terapija, klasične masaže i limfna drenaža. Napravljeni su i edukativni programi o ish-

of Diabetics". Also, it has several specialist and subspecialist clinics (physical, urological, neuropsychiatric, gynecological, ophthalmological, pediatric, internal medicine, occupational medicine, sports medicine, subspecialty nutrition clinic). It also has a diagnostic center. In the physical block, there is a whole range of physical agents, kinesitherapy, and in a separate building there is also hydrotherapy and hydromassage.

In order to perceive the problem in a comprehensive way and draw adequate conclusions, the analysis of tourist traffic was carried out for the period 2015 to 2019, where the number of domestic and foreign tourists who stayed in Vrnjačka Banja was monitored, as well as the number of overnight stays of our guests and foreigners and the average number of overnight stays (table 1).

From 2015 to 2019, the number of visits of all tourists to Vrnjacka Banja increased for 61.8% (Table 1). In the same period, the number of domestic tourists increased, while there were fewer foreign tourists in 2017 than in 2016, but since 2018 this number has increased. It can be noted that the number of overnight stays of domestic tourists is also constantly increasing. As far as foreigners are concerned, the number of overnight stays was smaller in 2017 than in 2016, but since 2018, the number of overnight stays of foreigners has increased.

Application of innovative Schroth therapy

Schroth therapy is an innovative method that is used in modern medical institutions for treatment, i.e. exercise when eliminating the consequences of structural scoliosis. Structural scoliosis is a significantly more complex deformity of the spinal column, which basically represents the rotation of the vertebral body and the displacement of the complex segment of the spinal column. The application of this therapy involves the application of 3D exercises designed to stop the progression of the disease and facilitate the patient's daily activities.

Schroth therapy belongs to the field of rehabilitation and is carried out by a physiotherapist who is specially trained for this type of therapy. This therapy, as a type of tourist product, belongs to medical tourism. It is used to treat idiopathic scoliosis, mainly in children aged 8 to 17, but it can also be used by adults. It often happens that one of the parents of children with scoliosis may have the same health problem, so both of them can potentially be users of this product. With this therapy as a type of tourist product, the main target group is the children's population. Their stay in the spa during the therapy should be made as fun as possible and with as many offers as possible. What is of great importance for children is activity and movement (18).

The goal of Schroth therapy is de-rotation, straightening and stabilization of the spinal column in a 3D three-dimensional plane, in order to prevent the consequences of scoliosis, which can only be removed by surgery. Bearing in mind that the success of this therapy depends on the patient's attitude and the understanding of the physiotherapist's demands, it is possible to implement it only with children over 10 years old, because patients must be focused both mentally and physically.

Schroth exercises affect the spine in the sagittal, frontal and transverse planes. This method is particularly acceptable for the user because it represents a non-surgical treatment with exercises aimed at achieving the balance of the entire body, taking the correct position of the body, stable posture. Also, the exercises include proper breathing (rotational breathing), which corrects the chest, as well as a series of exercises to strengthen the muscle tone, which stabilizes the body position.

It is important for this method that it is applied individually, since each patient is characterized by a special problem of the spinal column. For a successful correction, the whole family needs to be involved in the exercise itself. It is necessary for the child, as well as the parent, to take an active part in the exercise, which means a change in the quality of everyday life.

Exercises today are intended primarily for gaining control over body posture. The modern program has been improved and focuses on improving the position of the body in the sagittal plane, and the results achieved are incredible even with extremely large curvatures of the spine. The so-called "New Schroth program" aims to correct curves up to 70°, however, when the curvature of the spine exceeds 70°, the original Schroth program is applied, which, as experience shows, achieves the best results.

rani i nastavna kuhinja, odnosno kako pripremiti sva potrebna jela. Ova banja je i baza edukativnog centra za šrot terapiju za ceo svet, kako za fizioterapeute, tako i za lekare (19,20). Ono što se može primetiti je širok spektar aktivnosti u slobodno vreme, iako ih zbog intenziteta ove terapije nema mnogo. Uključene su aktivnosti unutar samog kompleksa, kao i spoljne aktivnosti u banji i okolini. Ovde je sačuvan duh društvenog života i zabave, što je takođe važno kako bi na korisnike ove usluge ostavili što bolji utisak i da bi se sa zadovoljstvom vraćali i preneli dobra iskustva svojim bližnjima i eventualnim budućim korisnicima. Efikasnošću ove terapije aktivnosti su proširene na svetsko tržište, što je dovelo do popularnosti same terapije i istovremeno privlačenja velikog broja stručnjaka iz celog sveta, da se edukuju o njenoj upotrebi i da kao instruktori mogu da sprovode edukacije širom sveta. Na taj način omogućen je razvoj ovog mesta kao turističke destinacije i primena šrot terapije (21,22).

SWOT analiza turističke ponude

Za potrebe ovog istraživanja korišćena je SWOT analiza. Ova analiza daje poslovnim organizacijama smernice za razvoj strategija poslovanja i kako da u svom razvoju smanje mogućnost slabljenja tržišne pozicije (23,24). Na osnovu SWOT analize mogu se izvesti zaključci o prednostima i nedostacima Vrnjačke Banje u pogledu korišćenja šrot terapije kao usluge za privlačenje većeg broja korisnika.

Prema SWOT analizi (tabela 2), u banjskim centrima Vrnjačke Banje je razvijen i kontrolisan medicinski program koji obuhvata nutritivno bogatu ishranu, prilagođenu pojedincu, fizikalnu terapiju i druge elemente šrot terapije namenjene poboljšanju psiho-fizičkog stanja pacijenata koji su svakodnevno izloženi stresu. Vrnjačka Banja je veoma dobro povezana putevima sa svim delovima zemlje, kao i sa aerodromima, što je značajno zbog stranih turista kao korisnika šrot terapije. Veliko osveženje za banju su novi i renovirani hoteli sa svojim uslugama i sadržajima, koji su od ključnog značaja za dečiju populaciju, kao većinu korisnika ove terapije. S druge strane, ima dosta starih i nekategorisanih hotela koji ruše reputaciju banje. Ključan problem je što stručan kadar nije edukovan za sprovođenje šrot terapije. Takođe, banji nedostaju dečiji parkovi na otvorenom, kreativne dečije manifestacije, posebno u zimskom periodu, kao i park mikro vozila (bicikli, skuteri i sl.), što umanjuje zabavu dece u slobodno vreme. Na ove nedostatke treba obratiti pažnju kako bi se što pre otklonili za što brži razvoj terapije. Vrnjačka Banja ima šansu da se razvije kao nacionalni centar za šrot terapiju. Uvođenjem ove terapije doprinelo bi privlačenju sve većeg broja domaćih i stranih turista, kao i otvaranje novih radnih mesta. Ova terapija trenutno ima visoku cenu, pa nije široko dostupna domaćim turistima. Međutim, razvoj ove terapije mogao da doprinese da u budućnosti troškovi lečenja budu pokriveni od strane Republičkog fonda za zdravstveno osiguranje. Takođe, nije definisano ko bi finansirao školovanje fizioterapeuta za sprovođenje ove terapije.

Zaključak

Današnji način života svodi se na sve manje kretanja i aktivnosti, što se negativno odražava na razvoj dece i sve veće prisustvo skolioze i sko-

Tabela 2. SWOT analiza mogućnosti za razvoj šrot terapije

Snage	Mane
Dobra drumska saobraćajna povezanost sa svim delovima zemlje, kao i sa aerodromima u Beogradu i Nišu Novi i renovirani hoteli, sa dobrim uslovima smeštaja Veliki broj atrakicja i sezonskih događaja Dečije igraonice u novijim hotelima Dobri prostorni uslovi za izvođenje terapije	Veliki broj starih hotela Nedostatak dečijih parkova Nedostatak kreativnih dečijih dogoađaja Neobučena stručna lica za ovaj vid terapije Nedostatak mikro voznog parka Nedostatak zimskih događaja Nedovonjno poznavanje ove terapije
Šanse	**Opasnosti**
Razvoj terapije na lokalnom i nacionalnom nivou Veći broj domaćih i inostranih gostiju kao korinsika terapije Nova radna mesta Razvoj banje kao nacionalnog centra za šroz terapiju	Loše promovisanje terapije Nedostatak zabave za korisnike Odobravanje novčanih sredstava od strane RZZO za domaće korisnike Finansiranje edukacije za ovu terapiju

A good example of this therapy in the world is the Asklepios Clinic in Bad Sobernheim. This is where the Schroth method as a treatment was born. In this clinic, it is considered that the treatments should be intensive, in order for this therapy to be as effective as possible. That is why it is carried out only on an inpatient basis, ie in the form of a stay in the clinic. The therapeutic offer includes groups, small groups and individual training. The size of the groups is from 5 to 13 patients. Occupational therapy is also offered here, which is closely related to the Schroth therapy itself, as well as ergonomic advice for appropriate ages and jobs done by the working-age population. In this spa, in free time, the focus is on creativity and fun. Younger service users are cared for by educators for different age groups. School classes are also organized online or by their persons, and the possibility of taking exams is offered. They have different options for individual leisure activities. They are offered activities in the form of sports and social games, hiking, as well as various types of tournaments. They have at their disposal a swimming pool, table tennis, basketball and football courts, and beach volleyball. This center also has a large screen similar to the cinema, so movie nights are often organized, where you can also watch major sports events. They also offer classic physical therapy, classic massages and lymphatic drainage. Educational programs on nutrition and educational kitchen were also created, i.e. how to prepare all those meals they need. This spa is also the base of an educational center for Schroth therapy for the whole world, both for physiotherapists and for doctors (19,20). What can be noticed is a wide range of activities in free time, although there are not many of them due to the intensity of this therapy. Activities inside the complex itself are included, as well as outside activities in the spa and in the surrounding area. The spirit of social life and fun has been preserved here, which is also important in order to leave the best possible impression on the users of this therapy, so that they would come back with pleasure and pass on good experiences to their relatives and possible future users.

Due to the effectiveness of this therapy, they managed to expand to the world market, which led to the popularity of the therapy itself and at the same time attracting a large number of experts from all over the world, to be educated about its use as well as instructors who would conduct educations all over the world. They encompassed different types of tourism and thus enabled the development of this place as a tourist destination and Schroth therapy (21,22).

SWOT analysis of the tourist offer

For the purposes of this research, a SWOT analysis was used. This analysis serves to give business organizations guidelines for the development of business strategies and reduce the possibility of weakening the market position in their development (22,23). Based on the SWOT analysis, conclusions can be drawn about the advantages and disadvantages of Vrnjačka Banja regarding the use of Schroth therapy as a service to attract a larger number of users.

Table 2. SWOT analysis of opportunities for the development of Schroth therapy

Strengths	Weaknesses
Good road traffic connections with all parts of the country, as well as with the airports in Belgrade and Niš New and renovated hotels, with good accommodation conditions A large number of attractions and seasonal events Children's playrooms in newer hotels Good spatial conditions for performing therapy	A large number of old hotels Lack of children's parks Lack of creative children's events Untrained professionals for this type of therapy Lack of micro-mobility fleet Lack of winter events Insufficient knowledge of this therapy
Opportunities	**Threats**
Development of therapy at the local and national level Larger number of domestic and foreign guests as users therapy New jobs Development of the spa as a national center for schroth therapy	Poor promotion of therapy Lack of entertainment for users Approval of funds by NHIF for domestic users Funding education about this therapy

liotičnog držanja, za šta je šrot terapija jedna od najefikasnijih metoda. Na osnovu sagledavanja celokupne banjske ponude, može se istaći da Vrnjačka Banja, kao mesto gde je medicinski turizam već visoko razvijen, ima veliki potencijal za razvoj ove terapije, a posebnu pažnju treba posvetiti potrebama dece kojoj je ova terapija namenjena.

Konflikt interesa

Autori su izjavili da nema konflikta interesa.

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Based on the SWOT analysis, conclusions can be drawn regarding the advantages and disadvantages of Vrnjačka Banja regarding the use of Schroth therapy as a service offered to attract an additional number of users. The spa centers have a developed and controlled medical program, which includes a nutritionally rich diet, adapted to the individual, physical therapy and other elements of Schroth therapy intended to improve the psycho-physical condition of the patient who is exposed to stress every day. Vrnjačka spa is very well connected by roads to all parts of the country, as well as to airports, which is important for foreign tourists as users of Schroth therapy. A great refreshment for the spa are new and renovated hotels with their services and facilities, which are of key importance for the children's population, as they represent the majority of users of this therapy. On the other hand, there are a lot of old and uncategorized hotels that ruin the reputation of the spa. The professional staff is not educated for the implementation of Schroth therapy. Also, the spa lacks outdoor children's parks, creative children's events, especially in the winter, as well as a micro-mobility fleet (bicycles, scooters, etc.), which reduces the fun for children in their free time. Attention should be paid to these weaknesses in order to eliminate them as soon as possible for the fastest possible development of therapy. Vrnjačka spa has a chance to develop as a national center for Schroth therapy. The introduction of this therapy would contribute to the attraction of an increasing number of domestic and foreign tourists, as well as the creation of new jobs. This therapy currently has a high price, so it is not widely available to domestic tourists. However, the development of this therapy could contribute to future treatment costs being covered by the Republic Health Insurance Fund. Also, it has not been defined who would finance the training of physiotherapists to implement this therapy.

Conclusion

Today's way of life is reduced to less and less movement and activity, which has a negative impact on the development of children and the increasing presence of scoliosis and scoliotic posture, for which Schroth therapy is one of the most effective methods. Based on an overview of the entire spa offer, it can be pointed out that Vrnjačka Banja, as a place where medical tourism is already highly developed, has great potential for the development of this therapy, and special attention should be paid to the needs of children for whom this therapy is intended.

Competing interests

The authors declared no competing interests.

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