

COVID-19 MORTALITY IN BELGRADE

Nataša Rosić¹, Milena Šantrić Milićević²¹ Gradski zavod za javno zdravlje Beograd, Srbija¹ Gradski zavod za javno zdravlje Beograd, Srbija² Medicinski fakultet Univerziteta u Beogradu, Institut za socijalnu medicinu, Centar-Škola javnog zdravlja i zdravstvenog menadžmenta, Beograd, Srbija² Faculty of Medicine University of Belgrade, Institute of Social Medicine, Center-School of Public Health and Health Management, Belgrade, Serbia

SAŽETAK

Uvod: Mortalitetni podaci najpouzdanije pokazuju broj života koje je jedna zajednica izgubila zbog bolesti KOVID-19, i predstavljaju minimum podataka neophodnih za javnozdravstveno odlučivanje.

Cilj: Prikazati osnovne karakteristike smrtnosti stanovnika od bolesti KOVID-19, u Beogradu, u 2020. godini.

Metod: Kao jedinica posmatranja u studiji preseka za deskripciju smrtnosti od bolesti KOVID-19 u 2020. godini, uzeto je stanovništvo Beograda (ukupno, po polu, i po starosnim intervalima). Bolest KOVID-19 je analizirana kao osnovni uzrok smrti (MKB-10: U071, U072). Posmatrani su: broj umrlih, udeo umrlih (%), opšta stopa umiranja (na 1.000 stanovnika), i specifična stopa umiranja (na 100.000 stanovnika). Kao izvor podataka, korišćeni su zvanični podaci o vitalnim događajima Republičkog zavoda za statistiku Srbije.

Rezultati: U 2020. godini, kod 10,5% od ukupno umrlih, uzrok smrti bio je KOVID-19, a većinu umrlih činio je muški kontigent stanovnika Beograda. Stopa smrtnosti od KOVID-19 bolesti bila je 158,78 na 100.000 stanovnika (211,7 za muški pol i 111,4 za ženski pol). Bolest KOVID-19 je bila drugi vodeći uzrok smrti u Beogradu.

Zaključak: Rezultati istraživanja ukazuju na postojanje prevremene smrtnosti stanovnika Beograda zbog KOVID-19 oboljenja. U 2020. godini, prema specifičnim stopama mortaliteta, ova bolest bila je drugi vodeći uzrok smrti kod stanovnika Beograda muškog pola, a treći kod stanovnika ženskog pola. Ovo istraživanje pruža dokaze kojima se može obogatiti diskusija koja se na međunarodnom nivou vodi o gubicima društva zbog KOVID-19 pandemije.

Ključne reči: stope mortaliteta, KOVID-19, uzroci smrti, Srbija

ABSTRACT

Introduction: Mortality data are the most reliable indicators of the number of lives that a community has lost due to COVID-19 and represent the minimum data necessary for public health decision-making.

Aim: The aim of the study is to describe the basic characteristics of population mortality from COVID-19 in Belgrade in 2020.

Methods: The unit of observation in this cross-sectional study for the description of mortality from COVID-19 in 2020 was the population of Belgrade (total, by sex, and by age intervals). COVID-19 was analyzed as the main cause of death (ICD-10: U071, U072). The number and the structure of deaths (%), the crude death rate (per 1,000 population) and the specific death rate (per 100,000 population) were analyzed. The data sources for the study were official statistics on vital events of the Statistical Office of the Republic of Serbia.

Results: In 2020, 10.5% of the total number of deaths were due to COVID-19, and the majority of deaths was from the male contingent of Belgrade residents. The mortality rate due to COVID-19 was 158.78 per 100,000 population (211.7 for males and 111.4 for females). COVID-19 was the second leading cause of death in Belgrade.

Conclusion: The results of this study indicate the existence of premature mortality in Belgrade. In 2020, COVID-19 was the second leading cause of death among the male residents of Belgrade, while in female residents, it was the third leading cause of mortality. This research provides evidence that can contribute to the international discussion about societal losses caused by the COVID-19 pandemic.

Key words: mortality rates, COVID-19, causes of death, Serbia

Autor za korespondenciju:

Nataša Rosić

Gradski zavod za javno zdravlje Beograd

Bulevar despota Stefana 54a, 11000 Beograd, Srbija

E-mail: natasa.rosic@zdravlje.org.rs

Corresponding author:

Nataša Rosić

Belgrade City Institute of Public Health

54a Bulevar despota Stefana, 11000 Belgrade, Serbia

E-mail: natasa.rosic@zdravlje.org.rs

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UVOD

Na brifingu za novinare, 11. marta 2020. godine, generalni direktor Svetske zdravstvene organizacije (SZO), dr Tedros Adhanom Gebreyesus¹ istakao je da je broj slučajeva KOVID-19 bolesti izvan Kine rapidno i trinaestostruko porastao, te da se zbog trostruko većeg broja ugroženih zemalja proglašava pandemija nove zarazne bolesti - KOVID-19 [1].

KOVID-19 je bolest koju uzrokuje nekoliko nedovoljno poznatih varijanti koronavirusa, što otežava kompletno opisivanje kliničkog toka i prognostičkih aspekata bolesti, kod odraslih i dece [2]. Nedovoljno se zna o inkubacionom periodu KOVID-19 infekcije [3], kao i o poreklu, epidemiološkoj slici, dužini transmisije među stanovništvom, i spektru kliničkih manifestacija [4-6].

U većini zemalja, uključujući i Srbiju, primenjuju se mere javnog zdravlja za prevenciju infekcije KOVID-19, koje su zasnovane na prethodnom iskustvu prenošenja respiratornih patogena sa čoveka na čoveka. Ove mere podrazumevaju izolaciju i karantin, policijski čas, zatvaranje preduzeća i škola, fizičko distanciranje, ograničene društvene interakcije, poboljšanu respiratornu higijenu, nošenje zaštitnih maski za lice i rukavica (bez ograničavanja samo na medicinske), i upotrebu efikasnih i bezbednih vakcina.

Do sada smo skoro svakodnevno dobijali informacije o različitim procenama o gubicima koje je KOVID-19 pandemija prouzrokovala od lokalnog do globalnog nivoa. Zdravstveni gubici se najčešće izražavaju pokazateljima mortaliteta. U Međunarodnoj statističkoj klasifikaciji bolesti i srodnih zdravstvenih problema, 10. reviziji (MKB-10) [7], prema međunarodnim smernicama za potvrđivanje i klasifikaciju (šifriranje) Kovid-19 kao osnovnog uzroka smrti [8], smrt usled oboljenja Kovid-19 definiše se kao smrt koja potiče od bolesti koja ima klinički odgovarajuće karakteristike, a u verovatnom ili potvrđenom slučaju oboljenja Kovid-19, osim u slučaju kada postoji jasan alternativni uzrok smrti koji ne može biti povezan sa bolešću Kovid-19 (npr. trauma). Važno je naglasiti da smernice jasno navode kako „ne bi trebalo da postoji period između potpunog oporavka od KOVID-19 bolesti i smrti“. Ove smernice izdate su 16. 04. 2020. godine, u svrhu nadzora za slučaj KOVID-19, koji je identifikovan ili pak nije identifikovan ali je kliničko-epidemiološki dijagnostikovano, ili za verovatan slučaj KOVID-19, odnosno za moguć slučaj/slučaj sumnje na KOVID-19. Na osnovu ovih smernica je u MKB-10 uključena nova XXII grupa, sa U00-U89 šiframa za posebne namene, gde je bolest KOVID-19 šifrirana kao:

- U07.1 KOVID-19, identifikovan virus; i
- U07.2 KOVID-19, nije identifikovan virus.

¹ Tedros Adhanom Ghebreyesus

INTRODUCTION

At the press briefing held on March 11, 2020, Dr Tedros Adhanom Ghebreyesus, Director-General of the World Health Organization (WHO) pointed out that the number of COVID-19 cases outside China had rapidly increased thirteen-fold, and that, due to the tripled number of affected countries, the WHO was declaring a pandemic of the new infectious disease - COVID-19 [1].

COVID-19 is a disease caused by several lesser-known variants of coronavirus, which makes the complete description of the clinical course and the prognostic aspects of the disease, in children and adults, more difficult [2]. Sufficient knowledge is also lacking as to the incubation period of COVID-19 [3], its origin, epidemiological presentation, length of transmission in the population, and spectrum of clinical manifestations [4-6].

In most countries, including Serbia, public health-care measures for preventing the spread of COVID-19 are being implemented. These measures are based on previous experience of respiratory pathogen transmission from human to human, and include isolation and quarantine, curfew, the closing of businesses and schools, physical distancing, limited social interaction, improved respiratory hygiene, wearing face masks and gloves (not limited only to medical masks and gloves), and the application of efficient and safe vaccines.

So far, we have almost daily been receiving updates on the different estimates of the losses that the COVID-19 has caused, from the local to the global level. Health losses are most frequently expressed in mortality indicators. In the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD - 10) [7], according to the International guidelines for certification and classification (coding) of COVID-19 as cause of death [8], death caused by COVID-19 is defined as “a death resulting from a clinically compatible illness, in a probable or confirmed COVID-19 case, unless there is a clear alternative cause of death that cannot be related to COVID disease (e.g., trauma)”. It is also important to note that the guidelines state that “there should be no period of complete recovery from COVID-19 between illness and death”.

These guidelines were published on April 16, 2020, for the purpose of the surveillance of identified or unidentified but clinically-epidemiologically diagnosed COVID-19 cases, or probable COVID-19 cases, i.e., possible/suspected cases of COVID-19. Based on these guidelines, a new chapter was added to the ICD-10 - Chapter XXII with U00-U89 Codes for special purposes, where COVID-19 is coded as:

- U07.1 COVID-19, virus identified; and
- U07.2 COVID-19, virus not identified.

Važno je istaći da podaci Republičkog zavoda za statistiku navode da su svi registrovani umrli u XXII grupi u 2020. godini bili samo umrli od KOVID-19 oboljenja, odnosno svi umrli u celoj U00-U89 grupi su umrli samo od KOVID-19 oboljenja.

Mortalitetni podaci najpouzdanije pokazuju broj života koje je jedna zajednica izgubila zbog bolesti KOVID-19, i predstavljaju minimum podataka neophodnih za javnozdravstveno odlučivanje. Analize i poređenja pokazatelja mortaliteta mogu pružiti informacije donosiocima odluka i pomoći im u formulisanju javnozdravstvenih preporuka i mera za unapređenje zaštite zdravlja i života stanovnika. Od 3. januara 2020. godine do 3. septembra 2021. godine, Svetska zdravstvena organizacija [9] je u svetu registrovala više od 218 miliona potvrđenih slučajeva i 4,5 miliona smrti od KOVID-19, a u Srbiji više od 769 hiljada potvrđenih slučajeva i 7.322 umrlih lica.

CILJ RADA

Cilj rada je da se prikažu osnovne karakteristike smrtnosti stanovnika od KOVID-19 oboljenja kao osnovnog uzroka smrti, u Beogradu, u 2020. godini.

METOD RADA

U ovom radu korišćena je deskriptivna studija preseka za analizu umiranja stanovnika Beograda od KOVID-19 oboljenja kao osnovnog uzroka smrti u 2020. godini. Za jedinicu posmatranja u istraživanju uzeto je stanovništvo Beograda posmatrano ukupno, po polu, i po starosnim intervalima. Posmatrana je opšta smrtnost, kao i smrtnost od KOVID-19 kao osnovnog uzroka smrti. U MKB-10, u grupi XXII - Šifre za posebne namene (U00-U89), bilo je samo umrlih lica sa osnovnim uzrokom smrti - KOVID-19 (U07.1, U07.2). Izvor podataka za istraživanje bile su elektronske baze o stanovništvu Republičkog zavoda za statistiku Srbije [10]. Za deskriptivnu analizu smrtnosti korišćeni su pokazatelji kao što su apsolutni broj umrlih, prosečna starost umrlih (srednja vrednost i mere varijabiliteta), udeo umrlih (%), i stopa umiranja (opšta, na 1.000 stanovnika i specifična na 100.000 stanovnika).

REZULTATI

U 2020. godini, u Beogradu je umrlo ukupno 25.526 ljudi, od čega 51,1% ženskog pola (13.063) i 48,9% muškog pola (12.463). Najveći broj umrlih stanovnika Beograda bio je u dobnoj grupi 85 i više godina (6.582), od toga 38,8% (2.557) muškog i 61,2% (4.025) osoba ženskog pola. Iste godine, od KOVID-19 oboljenja (U00-U89 grupa, tj, U07.1 i U07.2) umrlo je 2.690 ljudi ili 10,5% od ukupno umrlih, odnosno 13% od ukupno umrlih muškaraca i 8% od ukupno umrlih žena.

It is important to emphasize that the Statistical Office of the Republic of Serbia data state that all registered deaths in Chapter XXII, in 2020 were only deaths caused by COVID-19, i.e., all deaths in the entire U00-U89 group were caused by COVID-19.

Mortality data are the most reliable indicators of the number of lives that a community has lost due to COVID-19, and they represent the minimum data necessary for public health decision-making. Analyses and comparisons of mortality indicators may inform decision makers and help them in formulating public health recommendations and measures for promoting the care for the health and lives of the population. Between January 3, 2020, and September 3, 2021, the World Health Organization [9] registered more than 218 million confirmed COVID-19 cases worldwide as well as 4.5 million COVID-19 deaths, while in Serbia, more than 769 thousand confirmed cases and 7,322 deaths were registered.

AIM

The aim of the study is to describe the basic characteristics of population mortality from COVID-19 as the main cause of death, in Belgrade, in 2020.

METHODS

In this paper, a descriptive cross-sectional study was applied for analyzing mortality from COVID-19 as the main cause of death, in the population of Belgrade, in 2020. The unit of observation in the study was the population of Belgrade, observed in total, by sex, and by age intervals. Overall mortality, as well as mortality from COVID-19 as the main cause of death was observed. In the ICD-10, Chapter XXII, Codes for special purposes (U00-U89), there were only deaths with the main cause of death – COVID-19 (U07.1, U07.2). The data sources for the study were the electronic databases on population of the Statistical Office of the Republic of Serbia [10]. Indicators such as the absolute number of deaths, the average age at death (mean value and measures of variability), the structure of deaths (%), the death rate (crude death rate per 1,000 population and specific death rate per 100,000 population) were used for descriptive analysis of mortality.

RESULTS

In Belgrade, in 2020, a total of 25,526 people died, of whom 51.1% female (13,063) and 48.9% male (12,463). The greatest number of deaths in the population of Belgrade was in the age group 85 years and older (6,582) of whom 38.8% (2,557) male and 61.2% (4,025) female individuals. In the same year, the number of deaths caused by COVID-19 (group U00-U89, i.e., U07.1 and U07.2) was 2,690 or 10.5% of the total number of deaths, i.e., 13%

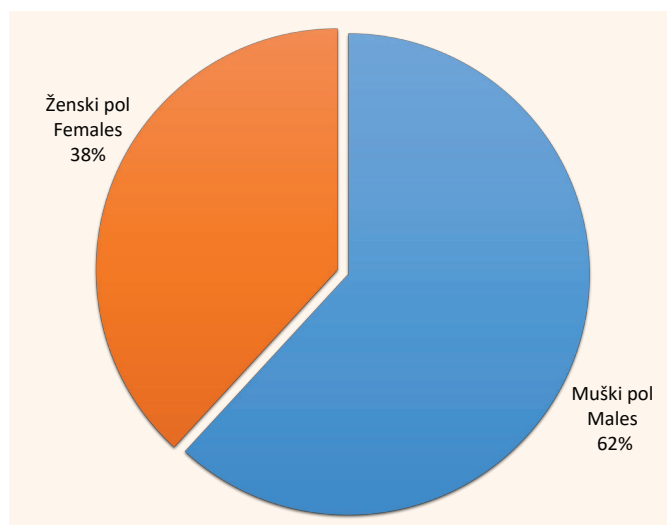
Različita je zastupljenost bolesti KOVID-19 u odnosu na druge grupe uzroka smrti po starosnim intervalima. Treba istaći da je u starosnim intervalima 20 - 24 godine i 25 - 29 godina samo KOVID-19, u odnosu na sve ostale grupe uzroka smrti, odneo čak 33,3% muškaraca odnosno 28,6% žena. Kod muškog pola, u starosnim intervalima 70 - 74 godine i 45 - 49 godina, KOVID-19 je, u odnosu na sve ostale grupe uzroka smrti, bio zastupljen sa 16% odnosno 15,8% smrtnih slučajeva.

Kada se posmatraju samo lica umrla od KOVID-19 oboljenja (Grafikon 1), skoro dve trećine umrlih su bili muškog pola, odnosno 63% ili 1.693 umrlih osoba muškog pola i 37% ili 997 osoba ženskog pola. U 2020. godini, od bolesti KOVID-19 (MKB-10: U071, U072), najviše je umrlih bilo u dobnoj grupi od 70 - 74 godine starosti (ukupno 480 ili 17,8% umrlih od KOVID-19), zatim u dobnim grupama 80 - 84 godine (17,3%), 85 i više godina (16,8%) i 65 - 69 godina (14,4%). Najviše muškaraca umrlih zbog KOVID-19 oboljenja bilo je u dobnoj grupi 85 i više godina (20,4%), potom u grupi 80 - 84 godine (20,2%) i grupi 70 - 74 godine (17,5%).

U 2020. godini, opšta stopa smrtnosti u Beogradu bila je 15,1 na 1.000 stanovnika, a stopa smrtnosti od KOVID-19 oboljenja bila je 158,75 na 100.000 stanovnika (Grafikon 2). Opšte stope smrtnosti za oba pola su slične (16,33 za muški pol i 13,93 za ženski pol).

Specifične stope smrtnosti od bolesti KOVID-19 se razlikuju po polu: skoro je dvostruko veća učestalost ove stope smrtnosti kod muškaraca nego kod žena (211,68 za muški pol i 111,43 za ženski pol) (Grafikon 2).

Opšta stopa smrtnosti za oba pola postaje dvocifrena u starosnom intervalu 60 - 64 godine (16,29 na 1.000 stanovnika), a trocifrena u starosnom intervalu 80 - 84 godine (106,24 na 1.000 stanovnika) (Grafikon 3).



Grafikon 1. Umrli (%) od KOVID-19 u Beogradu, 2020. godine, po polu

Figure 1. Deaths (%) due to COVID-19 in Belgrade, 2020, by sex

of the total number of deceased male residents and 8% of the total number of deceased female residents. The proportion of COVID-19 as the cause of death in relation to other groups of causes of death differs across age intervals, i.e., groups. It should be noted that in the age groups 20 - 24 years and 25 - 29 years, COVID-19 alone, as compared to other groups of causes of death, was the cause of death for 33.3% of men and 28.6% of women. In men, in the age groups 70 - 74 years and 45 - 49 years, COVID-19 was, in relation to other causes of death, present in 16% and 15.8% of deaths, respectively.

When only individuals who had died from COVID-19 are observed (Figure 1), almost two thirds of the deceased persons were male, i.e., 63% or 1,693 deceased male individuals, while 37% or 997 were female individuals. In 2020, the greatest number of people dying from COVID-19 (ICD-10: U071, U072) was in the age group 70 - 74 years (480 or 17.8% persons deceased from COVID-19 in total), followed by the age groups 80 - 84 years (17.3%), 85 years and older (16.8%), and 65 - 69 years (14.4%). The greatest number of men deceased due to COVID-19 was in the age group 85 years and older (20.4%), followed by the age group 80 - 84 years (20.2%), and the age group 70 - 74 years (17.5%).

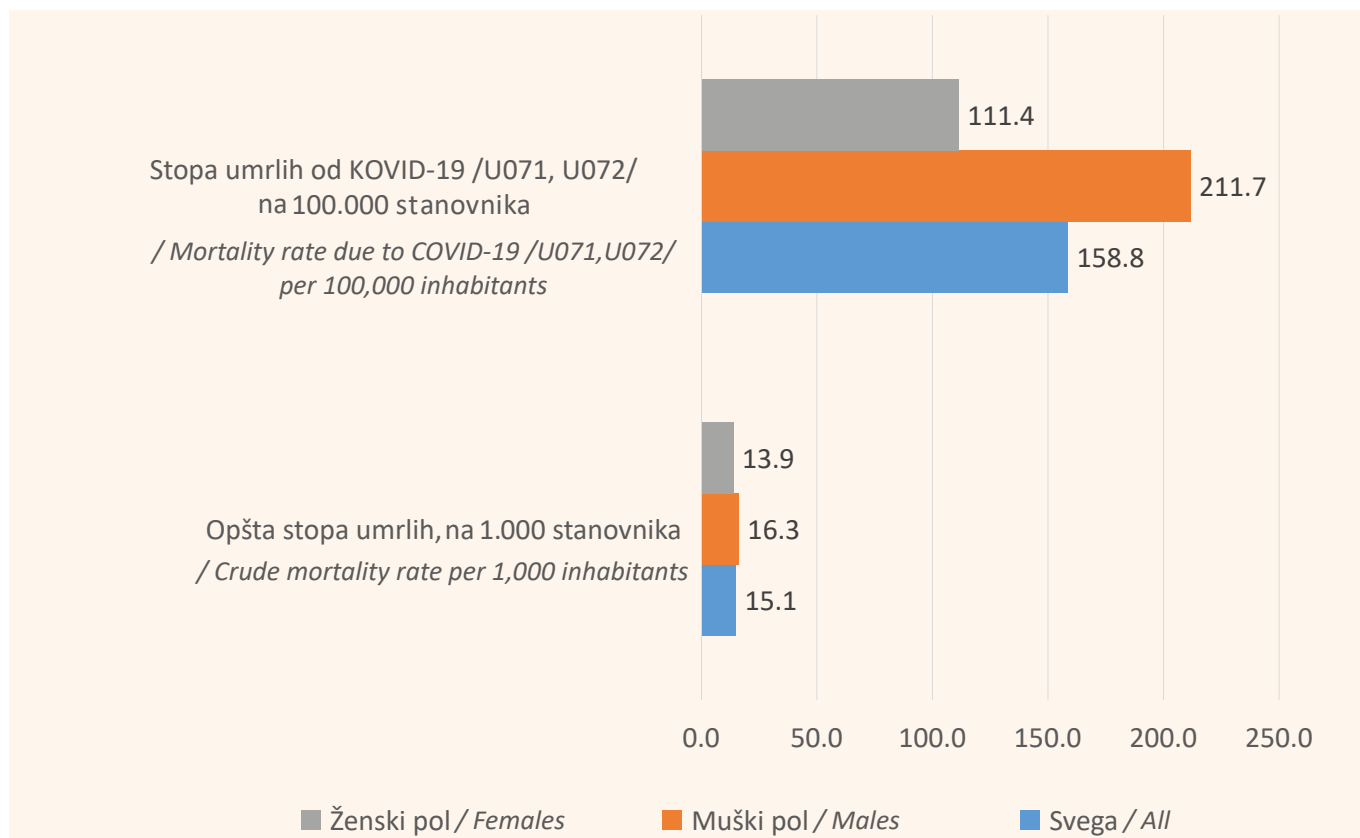
In Belgrade, in 2020, the crude mortality rate was 15.1 per 1,000 population, while the mortality rate due to COVID-19 was 158.75 per 100,000 population (Figure 2). The crude mortality rates for both sexes were similar (16.33 for men and 13.93 for women).

Specific death rates due to COVID-19 differ by sex: the frequency of the death rate due to COVID-19 is almost twice as high in men as compared to women (211.68 for men and 111.43 for women) (Figure 2).

The crude death rate for both sexes enters the double digits in the age group 60 - 64 years (16.29 per 1,000 population) and triple digits in the age group 80 - 84 years (106.24 per 1,000 population) (Figure 3).

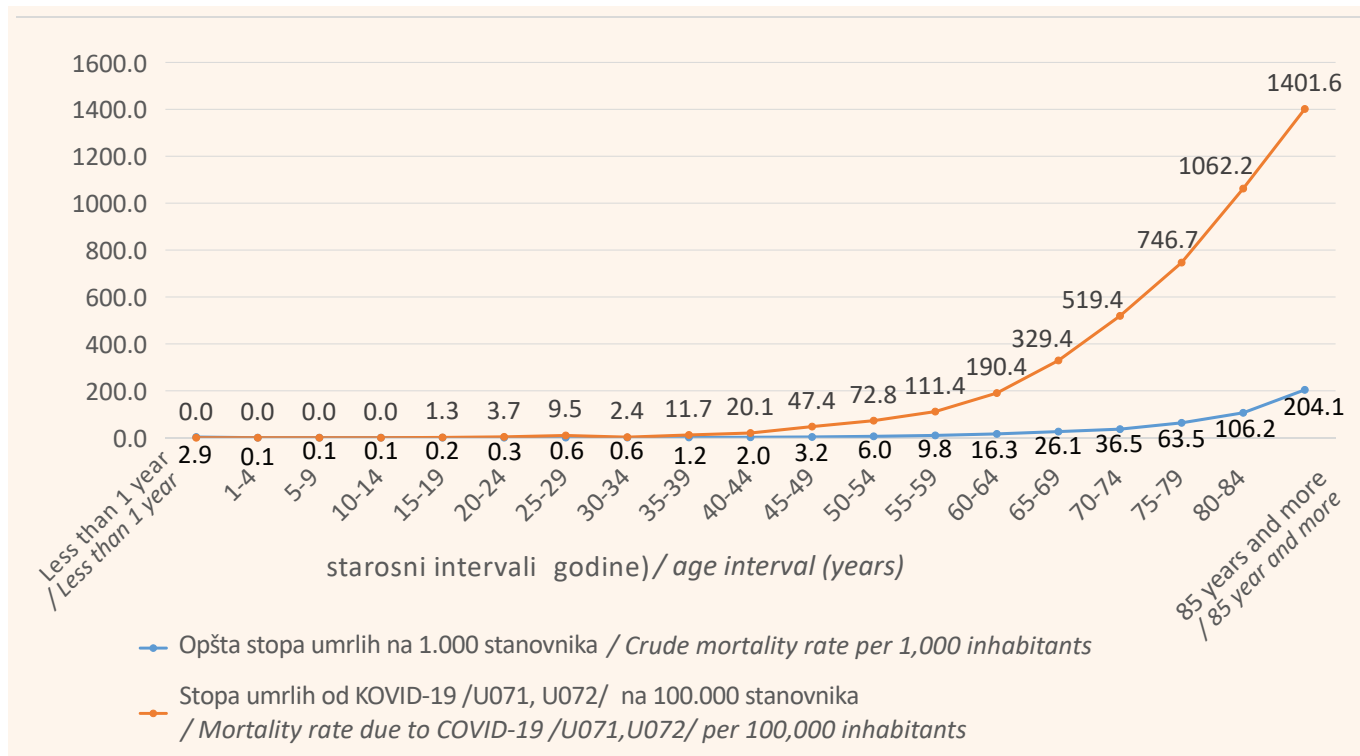
The distribution of the specific rate indicates that COVID-19 significantly affected younger adults. The specific death rate due to COVID-19 for both sexes enters the double digits in the age group 35 - 39 years (11.73 per 100,000 population), triple digits in the age group 55 - 59 years (111.43 per 100,000 population), and it becomes higher than 1,000 in the age group 80 - 84 years (1062.18 per 100,000 population) and older (Figure 3).

Crude death rates in male and female residents have similar distribution across age groups (Figure 4). The crude death rate in men enters the double digits in the age group 55 - 59 years (13.69 per 1,000 population), and the triple digits in the age group 80 - 84 years (125.99 per 1,000 population), while in women it is in the double digits in the age group 60 - 64 years (10.97 per 1,000 population), and in the triple digits in



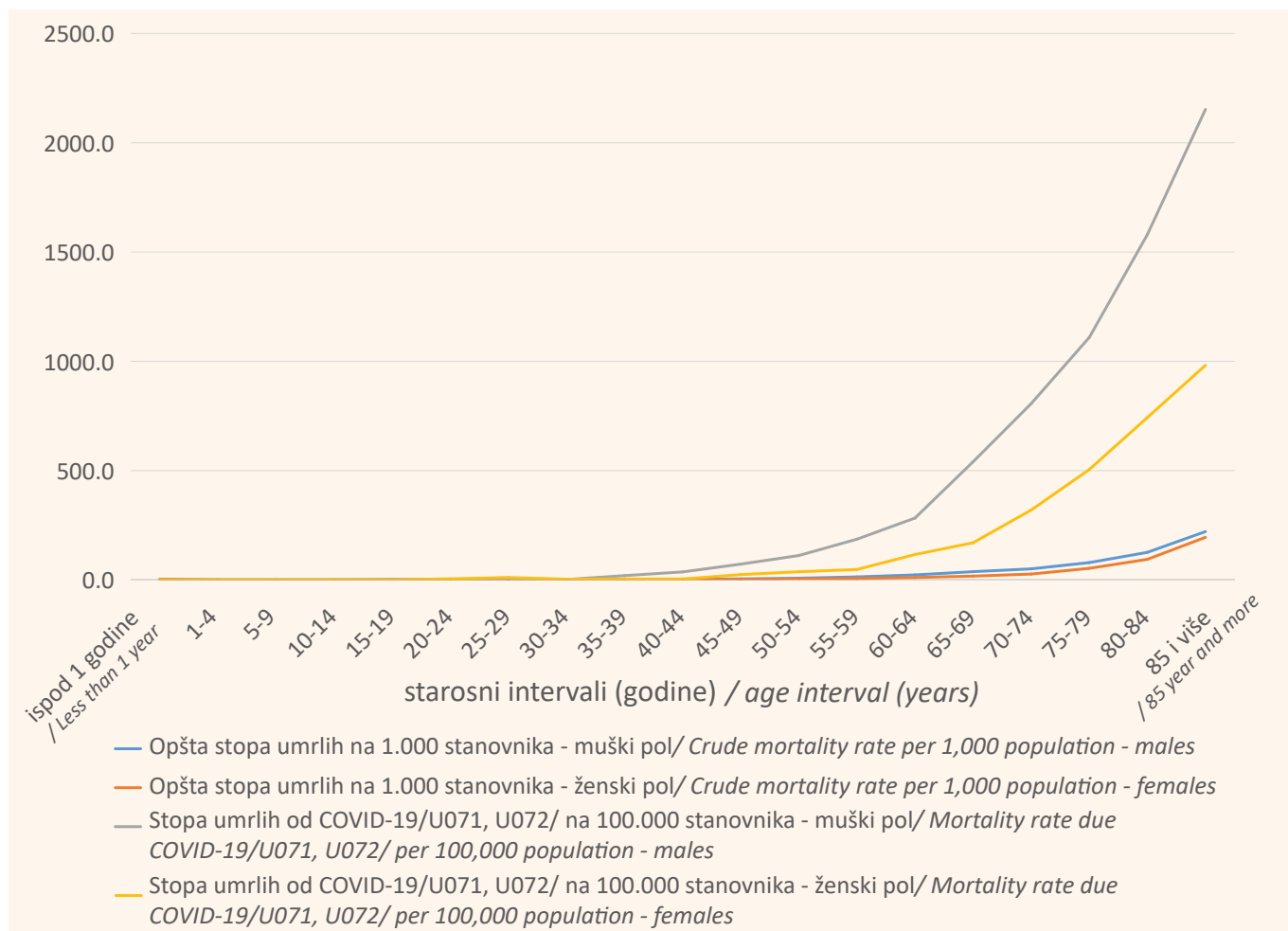
Grafikon 2. Opšte stope smrtnosti (na 1.000 stanovnika) i specifične stope smrtnosti od KOVID-19 oboljenja (na 100.000), distribucija po polu, Beograd, 2020. godine

Figure 2. Distribution by sex of the crude mortality rate (per 1,000 population) and the specific mortality rate due to COVID-19 (per 100,000) in Belgrade, 2020



Grafikon 3. Opšte stope smrtnosti (na 1.000 stanovnika) i specifične stope smrtnosti od KOVID-19 oboljenja (na 100.000), distribucija po starosti, Beograd, 2020. godine

Figure 3. Age distribution of the crude mortality rate (per 1,000 population) and the specific mortality rate due to COVID-19 (per 100,000) in Belgrade, 2020



Grafikon 4. Distribucija, po starosti i polu, opšte stope smrtnosti (na 1.000 stanovnika) i specifične stope smrtnosti od KOVID-19 oboljenja (na 100.000) u Beogradu, 2020. godine

Figure 4. Age distribution of the crude mortality rate (per 1,000 population) and the specific mortality rate due to COVID-19 (per 100,000) in Belgrade, 2020

Distribucija specifične stope ukazuje da je KOVID-19 značajno pogodio mlađe odrasle osobe. Specifična stopa smrtnosti od KOVID-19 oboljenja za oba pola postaje dvocifrena u starosnom intervalu 35 - 39 godina (11,73 na 100.000 stanovnika), trocifrena u starosnom intervalu 55 - 59 godina (111,43 na 100.000 stanovnika), i četvorocifrena od starosnog intervala 80 - 84 godine (1062,18 na 100.000 stanovnika) i na dalje (Grafikon 3).

Opšte stope smrtnosti kod stanovnika muškog i ženskog pola imaju sličnu distribuciju po starosnim intervalima (Grafikon 4). Opšta stopa smrtnosti kod muškaraca postaje dvocifrena u starosnom intervalu 55 - 59 godina (13,69 na 1.000 stanovnika), a trocifrena u starosnom intervalu 80 - 84 godine (125,99 na 1.000 stanovnika), dok je kod žena dvocifrena u starosnom intervalu 60 - 64 godine (10,97 na 1.000 stanovnika), a trocifrena u starosnom intervalu 85 i više godina (194,64 na 1.000 stanovnika) (Grafikon 4).

Specifične stope smrtnosti od KOVID-19 oboljenja kod stanovnika muškog i ženskog pola nemaju sličnu distribuciju po starosnim intervalima (Grafikon 4).

the age group 85 and older (194.64 per 1,000 population) (Figure 4).

Specific death rates due to COVID-19 in male and female residents do not have similar distribution across age groups (Figure 4). The specific death rate due to COVID-19 in men enters the double digits in the age group 35 - 39 years (19.61 per 100,000 population), the triple digits in the age group 50 - 54 years (111.52 per 100,000 population), and exceeds 1,000 in the age group 75 - 79 years (1108.91 per 100,000 population) and older, while in women it is in the double digits in the age group 25 - 29 years (11.11 per 100,000 population), and enters the triple digits in the age group 60 - 64 years (116.14 per 100,000 population) and older (Figure 4).

In Belgrade, in 2020, the ICD-10 group U00-U89, where deaths were registered only due to COVID-19 (U07.1, U07.2) represents the third leading cause of death, with a rate of 158.75 per 100,000 population, after 'Diseases of the circulatory system' (I00-I99), which are in the lead, with a rate of 672.42 per 100,000 population, and 'Tumors' (C00-D48), which are the second leading cause of death, with a rate of 314.85 per

Tabela 1. Pet najčešćih uzroka smrti stanovnika prema grupama dijagnoza, u Beogradu, u 2020. godini (% ukupnog broja umrlih i stope na 100.000, po polu)

Uzroci smrti (MKB 10 revizija)	Oba pola			Muški pol			Ženski pol		
	Rang	% ukupnog broja umrlih	stopa na 100.000	Rang	% ukupnog broja umrlih	stopa na 100.000	Rang	% ukupnog broja umrlih	stopa na 100.000
Causes of death (ICD-10 revision)	Both sexes			Males			Females		
	Rank	% of all deaths	Rate per 100,000	Rank	% of all deaths	Rate per 100,000	Rank	% of all deaths	Rate per 100,000
Druge bolesti srca (I26-I51) / Other heart diseases (I26-I51)	I	22,47	338,51	I	45,17	323,96	I	25,23	351,52
KOVID-19 (U07.1, U07.2) / COVID-19 (U07.1, U07.2)	II	10,54	158,75	II	12,36	211,68	III	8,0	111,43
Bolesti krvnih sudova mozga (I60-I69) / Cerebrovascular diseases (I60-I69)	III	8,20	123,58	IV	7,04	115,03	II	9,42	131,22
Ishemične bolesti srca (I20-I25) / Ischemic heart diseases (I20-I25)	IV	6,97	105,05	III	7,53	122,91	IV	6,39	89,08
Maligni tumori dušnika, dušnice i pluća (C33-C34) / Malignant neoplasms of the trachea, bronchus and lung (C33-C34)	V	5,21	78,49	V	6,42	104,90	V	4,42	61,59

Table 1. Centers for Disease Control (CDC) data on monthly COVID-19 cases and deaths, from March 2020 - May 2021

Specifična stopa smrtnosti od KOVID-19 oboljenja kod muškaraca postaje dvocifrena u starosnom intervalu 35 - 39 godina (19,61 na 100.000), trocifrena u starosnom intervalu 50 - 54 godine (111,52 na 100.000), i četvorocifrena od starosnog intervala 75 - 79 godina (1108,91 na 100.000 stanovnika) i na dalje, dok je kod žena dvocifrena u starosnom intervalu 25 - 29 godina (11,11 na 100.000 stanovnika), a postaje trocifrena od starosnog intervala 60 - 64 godine (116,14 na 100.000 stanovnika) i na dalje (Grafikon 4).

U Beogradu, u 2020. godini, MKB-10 grupa U00-U89, u kojoj su smrti registrovane samo zbog KOVID-19 oboljenja (U07.1, U07.2) predstavlja treći uzrok smrti, sa stopom od 158,75 na 100.000 iza „Bolesti sistema krvotoka“ (I00-I99), koje su na prvom mestu sa stopom od 672,42 na 100.000, i „Tumora“ (C00-D48), koji su na drugom mestu sa stopom od 314,85 na 100.000.

Rangiranje pet vodećih dijagnoza kao osnovnih uzroka smrti stanovnika Beograda u 2020. godini (Tabela 1), razlikuje se po polu: KOVID-19 (U07.1, U07.2) je drugi vodeći uzrok smrti za oba pola (158,75 na 100.000), i samo za muškarce (211,68 na 100.000) ali je treći vodeći uzrok smrti samo za žene (111,43 na 100.000). Uzroci smrti na prvom mestu kod muškaraca i žena su „Druge bolesti srca“ (I26-I51). Međutim, dok su „Bolesti krvnih sudova mozga“ (I60-I69) na trećem mestu kod muškaraca, one su na drugom mestu kod žena. „Ishemične bolesti srca“ (I20-I25) i „Maligni tumori dušnika, dušnice i pluća“ (C33-C34) su na četvrtom i petom mestu kod oba pola.

100,000 population.

The ranking of the five leading diagnoses as main causes of death for residents of Belgrade in 2020 (Table 1), differs between sexes: COVID-19 (U07.1, U07.2) is the second leading cause of death for both sexes (158.75 per 100,000 population), and for men only (211.68 per 100,000 population), however it is the third leading cause of death for women only (111.43 per 100,000 population). The leading causes of death for men and women are 'All other forms of heart disease' (I26-I51). However, while 'Cerebrovascular diseases' (I60-I69) are the third leading cause of death in men, they are the second leading cause of death in women. 'Ischemic heart diseases' (I20-I25) and 'Malignant neoplasms of the trachea, bronchus and lung' (C33-C34) are in the fourth and fifth place for both sexes.

DISCUSSION

According to the data of the Statistical Office of the Republic of Serbia, in Belgrade, in 2020, the population was 1.7 million. In the same year, 2,690 Belgrade citizens died from COVID-19, and the majority of deaths was from the male contingent of residents. The COVID-19 pandemic has become fatal for men aged 35 years and older and for women older than 50 years.

Similar results were obtained in studies carried out worldwide, including Europe [11,12]. Although globally [13] precise evaluations of the effects of COVID-19 on the ranking of causes of death in 2020 are lacking, there

DISKUSIJA

Prema podacima Republičkog zavoda za statistiku, u Beogradu je, u 2020. godini, živelo oko 1,7 miliona stanovnika. Iste godine, od bolesti KOVID-19 umrlo je 2.690 građana Beograda, a većinu umrlih činio je muški kontigent stanovnika. Pandemija KOVID-19 postala je fatalna za muškarce od 35 godina i više, i za žene starije od 50 godina.

Do sličnih rezultata došlo se i u istraživanjima u svestu i Evropi [11,12]. Iako na globalnom nivou [13] još uvek nema preciznih evaluacija efekata KOVID-19 oboljenja na rangiranje uzroka mortaliteta u 2020. godini, takve procene postoje za pojedine zemlje. Procenjuje se da je, u 2020. godini, KOVID-19 bio treći vodeći uzrok smrti u Belgiji (180,9 na 100.000 stanovnika), Škotskoj (150,7 na 100.000 stanovnika), Portugalu (131,57 na 100.000 stanovnika), Španiji (127,7 na 100.000 stanovnika), Sjedinjenim Američkim Državama (122,7 na 100.000 stanovnika), Švedskoj (118,8 na 100.000 stanovnika), Holandiji (81,7 na 100.000 stanovnika), i Nemačkoj (68,4 na 100.000 stanovnika) [11,12]. Kao i u našem istraživanju, procenjeno je da je KOVID-19 bio drugi uzrok smrti u nekim evropskim zemljama [12], na primer u Engleskoj i Velsu (124,9/100.000) i Francuskoj (94,3/100.000), ali na petom mestu u Danskoj (37,6/1000), te na devetom u Norveškoj (10,7/100.000). Na nivou Srbije, u 2020. godini, od bolesti koje mogu da se dovedu u vezu sa infekcijom KOVID-19 umrlo je 10.356 lica (8,9% od svih umrlih, odnosno 6.629 muškaraca i 3.727 žena), te se nalaze na trećem mestu posle „Bolesti sistema krvotoka“ (na prvom mestu sa 47,3% svih umrlih) i „Tumora“ (na drugom mestu sa 18,3% svih umrlih) [14].

U 2020. godini, prosečno očekivano trajanje života živorođenih u Beogradu, prema skraćenim aproksimativnim tablicama mortaliteta, procenjeno je na 72,31 godine za muškarce i na 78,18 godina za žene [10]. Iako je od bolesti KOVID-19 najviše umrlih bilo u starosnoj dobi 70 - 74 godine, specifične stope mortaliteta za KOVID-19 pokazuju da je ova bolest odnela živote i mnogo mlađih muškaraca i žena, i time doprinela prevremenoj smrtnosti.

U Beogradu, prema procentualnom udelu u ukupnom mortalitetu za oba pola, KOVID-19 je bio drugi vodeći uzrok smrti. U prethodne dve godine, zvanični podaci o vitalnim događajima Republičkog zavoda za statistiku Srbije, pokazuju da su u Beogradu „Druge bolesti srca“ bile na prvom mestu kao vodeći uzrok smrti; na drugom mestu su se našle „Bolesti krvnih sudova mozga“; treće mesto su zauzele „Ishemične bolesti srca“; a na četvrtom mestu su bili „Maligni tumori dušnika, dušnice i pluća“. U 2018. godini, na petom mestu su se našle „Bolesti disajnih organa“, a u 2019. godini, „Bolesti povišenog krvnog pritiska“ [10]. U 2020. godini, KOVID-19 je poremetio rangiranje ovih bolesti i umetnuo se na drugo mesto.

are such assessments for individual countries. It has been assessed that, in 2020, COVID-19 was the third leading cause of death in Belgium (180.9 per 100,000 population), Scotland (150.7 per 100,000 population), Portugal (131.57 per 100,000 population), Spain (127.7 per 100,000 population), United States of America (122.7 per 100,000 population), Sweden (118.8 per 100,000 population), Holland (81.7 per 100,000 population), and Germany (68.4 per 100,000 population) [11,12]. As is the case in our study, it has been estimated that COVID-19 was the second leading cause of death in some European countries [12], for instance in England and Wales (124.9 per 100,000 population) and France (94.3 per 100,000 population), but it was the fifth leading cause of death in Denmark (37.6 per 1,000 population), and in the ninth place in Norway (10.7 per 100,000 population). At the level of Serbia, in 2020, from diseases that can be connected to COVID-19, 10,356 people died (8.9% of all deaths, i.e., 6,629 men and 3,727 women), and these diseases are in the third place after 'Diseases of the circulatory system' (which are in the first place with 47.3% of all deaths) and 'Tumors' (which are in the second place with 18.3% of all deaths) [14].

In Belgrade, in 2020, the average life expectancy of live-born individuals, according to abridged approximate mortality tables, was estimated at 72.31 years for men and 78.18 years for women [10]. Although the greatest number of deaths from COVID-19 was in the age group 70 - 74 years, specific mortality rates for COVID-19 show that this disease has taken the lives of much younger men and women, thus contributing to premature mortality.

In Belgrade, according to the percentual proportion in overall mortality for both sexes, COVID-19 was the second leading cause of death. In the previous two years, the official data on vital events of the Statistical Office of the Republic of Serbia show that, in Belgrade, 'All other forms of heart disease' were in the first place as the leading cause of death; 'Cerebrovascular diseases' were in the second place; 'Ischemic heart diseases' were in the third place, while 'Malignant neoplasms of the trachea, bronchus and lung' were the fourth leading cause of death. In 2018, 'Respiratory diseases' were the fifth leading cause of death, while in 2019, 'Hypertensive diseases' were in the fifth place [10]. In 2020, COVID-19 disrupted the ranking of these diseases and inserted itself in the second place.

Our research, performed on the example of a number of European countries, including Serbia, has confirmed previous estimates of the vulnerability of older residents with comorbidities [15]. Relatedly, it is assumed that COVID-19 has prematurely taken the lives of persons who would probably have died during the year

Naše istraživanje, rađeno na primeru više zemalja u Evropi, uključujući i Srbiju, potvrdilo je prethodne procene o vulnerabilnosti starijih stanovnika sa komorbiditetima [15]. S tim u vezi, pretpostavlja se da je KOVID-19 prevremeno odneo i živote osoba koje bi najverovatnije (ali kasnije) u toku godine umrli [16]. U tom svetlu, bilo bi dragoceno da se sprovedu istraživanja po metodologiji Opterećenja društva bolešću (engl. *Burden of Disease*) na nacionalnom i subnacionalnom nivou (u Srbiji i u Beogradu, na primer), kao što je to već urađeno u nekim zemljama [17-35].

Prema kliničkim dokazima [4], pacijenti sa najtežim oblikom bolesti KOVID-19 bili su najčešće ljudi starije dobi i sa komorbiditetima, od kojih se najviše pominju hronične bolesti kao što su bolesti srca, dijabetes, plućne bolesti, i bubrežna insuficijencija, kao i gojaznost, od faktora rizika. Najverovatnije su to razlozi zašto je KOVID-19 potisnuo neke uzroke smrti sa liste vodećih pet uzorka smrti u Beogradu. Osim toga, i drugi, ne-klinički faktori mogu da doprinesu krajnjim efektima KOVID-19 oboljenja. Tu spadaju mobilnost [36-38], stepen pripravnosti i spremnosti zdravstvenog sistema da odgovori na zahteve za uslugama u pandemiji [39], način praćenja kontakata u epidemiji [40], bihevioralni i društveni faktori koji podržavaju široko rasprostranjeno testiranje stanovništva [41,42] pridržavanje mera socijalnog distanciranja [43], i ostalo. U ove faktore treba uključiti i postojanje jakih porodičnih veza i mreža podrške [44], koje najverovatnije objašnjavaju tzv. Mortalitetni paradoks kod Lationamerikanaca [45].

Naše istraživanje, sa socijalno-medicinskog aspekta, razmatra jedan vitalni događaj - smrtnost tokom jednog perioda pandemije i u jednoj zajednici. Rezultati istraživanja ukazuju na pojavu prevremene smrtnosti od bolesti KOVID-19 tokom 2020. godine i pored primene preventivnih mera. Adekvatna, dosledna i pravovremena primena kombinacije javnozdravstvenih i kliničkih mera može prevenirati pojavu bolesti i ublažiti posledice KOVID-19 pandemije na stanovništvo. Mnoge studije su do sada već pokazale dobiti od promocije zdravlja i primenjivanja mera zaštite, prevencije i kontrole bolesti, kao što su: nošenje maski i zaštitnih rukavica, pridržavanje preporučene udaljenosti, izolacija, socijalno distanciranje, policijski čas, podizanja imuniteta, obezbeđivanje i pružanje zdravstvene zaštite, poštovanje preporuka zdravstvene zaštite, i vakcinacija [45-48].

Osim bazičnih i kliničkih istraživanja, potrebna su javnozdravstvena istraživanja koja bi pokazala efikasnost primene svih gorepomenutih mera u Beogradu, i koja bi doprinela donošenju zaključaka o tome koliko je njihova primena doprinela sprečavanju oboljevanja i prevremenih smrti u Beogradu.

(but at a later time) [16]. Bearing this in mind, it would be of value to perform research according to the Burden of Disease methodology at the national and subnational levels (in Serbia and in Belgrade, for instance), as has already been done in some countries [17-35].

According to clinical evidence [4], patients with the most severe form of COVID-19 were most frequently older people with comorbidities, among which the ones most frequently mentioned were chronic diseases, such as heart diseases, diabetes, pulmonary diseases and renal insufficiency, as well as obesity as a risk factor. These are probably the reasons why COVID-19 has displaced some causes of death from the list of five leading causes of death in Belgrade. Also, other, non-clinical factors may contribute to the ultimate effects of COVID-19. Amongst them are mobility [36-38], the level of preparedness and readiness of the healthcare system to respond to service demands during the pandemic [39], the method of the surveillance of contacts during the epidemic [40], behavioral and social factors which support wide population testing [41,42] adherence to measures of social distancing [43], etc. The existence of strong family bonds and support networks should be included amongst these factors [44], as they most probably explain the Latin American Mortality Paradox in [45].

From the socio-medical aspect our study analyzes a vital event – mortality during a specific period in one community. The results of the study indicate the occurrence of premature mortality from COVID-19 during 2020, despite the implementation of preventive measures. Adequate, consistent and timely implementation of a combination of public health and clinical measures may prevent the occurrence of the disease and mitigate the effects of the COVID-19 pandemic on the population. Many studies have already demonstrated the benefits from health promotion and from applying protective and preventive measures, as well as disease control measures, such as wearing masks and protective gloves, adhering to the recommended physical distance, isolation, social distancing, curfew, boosting immunity, providing healthcare, observing healthcare recommendations, and vaccination [45-48].

In addition to baseline and clinical research, public health studies are also necessary in order to demonstrate the efficiency of the application of all the above-mentioned measures in Belgrade and contribute to the conclusions on how much the application of these measures has contributed to the prevention of disease and premature deaths in Belgrade.

For more efficient decision-making, in addition to research on mortality, it is also necessary to carry out socio-medical studies which would assess how well healthcare institutions are staffed and equipped with

Osim istraživanja o mortalitetu, za efikasnije odlučivanje, potrebna su socijalno-medicinska istraživanja koja procenjuju obezbeđenost ustanova zdravstvenim radnicima i drugim resursima za prevenciju, lečenje, i rehabilitaciju obolelih od KOVID-19 infekcije, kao i ona koja evaluiraju dostupnost, korišćenje, i kvalitet pružanja zdravstvenih usluga obolelima od KOVID-19 oboljenja, i drugim osobama sa sumnjom na infekciju KOVID-19. U nedostatku takvih istraživanja tokom pandemije, kao i profesionalnih procena o incidenciji, prevalenciji i preživljavanju KOVID-19 infekcije, posmatranih kroz distribuciju starosti i pola stanovnika, tumačenje ukupnog opterećenja stanovništva bolešću KOVID-19 ostaje izazov za zajednicu, a mortalitetni podaci najvalidniji za profesionalna razmatranja.

Zbog ograničenja istraživanja, kao što su mali broj posmatranih varijabli, nije moguće izvući šire zaključke o mortalitetu. Za dobijanje šire slike mortaliteta usled KOVID-19 oboljenja i sa sumnjom na KOVID-19 oboljenje, potrebne su dodatne informacije, koje bi omogućavale, na primer, analizu smrtnih slučajeva u odnosu na mesto smrti (zdravstvene ustanove i van njih), po tipu naselja (gradska i ostala), prema stepenu obrazovanja, zaposlenosti, etničkoj pripadnosti, zdravstvenom statusu, tipu osiguranja, kao i prema korišćenju zdravstvenih usluga, odnosno opremljenosti zdravstvenih ustanova u kojima su umrli. Druga ograničenja se odnose na same podatke. U istraživanju su korišćeni zvanični podaci samo o U07.1 i U07.2 kao osnovnom uzroku smrti, a ne neposredni, prethodni i drugi uzroci smrti povezani sa bolešću KOVID-19 [7,8]. S obzirom da obdukcije tokom KOVID-19 pandemije nisu u istoj meri rađene kao i pre pandemije, sa tog stanovišta ne može se sa sigurnošću reći kolika je podregistracija U07.1 i U07.2 slučajeva smrti. Potrebno je analizirati u kojoj meri su lekari, a posebno oni koji su registrovali smrt, bili upoznati sa smernicama za korišćenje U07.1 i U07.2 šifara za osnovni uzrok smrti, koliko prepoznaju značaj pravilnog klasifikovanja uzroka smrti, i da li uspešno prave razliku između osnovnog, prethodnog, neposrednog i ostalih uzroka smrti. Takođe, izvorni podaci se odnose samo na umrle stanovnike Beograda i rezultati istraživanja se ne mogu generalizovati na druge zajednice.

Prednosti ovog istraživanja su što pokazuje obrađene podatke koji izvorno potiču iz potvrde o smrti u Dem-2 obrascu, i koji su prošli sistem kontrole mortaliteta u područnim jedinicama Republičkog zavoda za statistiku, u institutima/zavodima za javno zdravlje i Republičkom zavodu za statistiku. Rezultati istraživanja mogu biti korisni da se u narednom periodu posebna pažnja usmeri na vulnerabilne grupe, kako bi se održalo i unapredilo njihovo očekivano trajanje života. Ostaje da se u studijama koje koriste metodologiju

other resources necessary for the prevention, treatment, and rehabilitation of COVID-19 patients, as well as studies that would evaluate the accessibility, use, and quality of health services offered to COVID-19 patients and other persons with suspected COVID-19 infection. With the lack of such research during the pandemic, as well as the lack of professional assessments of the incidence, prevalence and survival of COVID-19, observed through the age and sex distribution in the population, the interpretation of the overall burden of COVID-19 in the population remains a challenge for the community, while mortality data remain the most relevant data for professional consideration.

Due to the limitations of the study, such as the small number of analyzed variables, it is not possible to draw wider conclusions on mortality. In order to gain a broader understanding of COVID-19 mortality and suspected COVID-19 mortality, additional information is necessary, which would enable, for instance, the analysis of deaths in relation to the location of death (at healthcare facilities or outside healthcare facilities), in relation to the type of community (urban or other), in relation to the level of education of the patient, their employment status, ethnicity, health status, type of healthcare coverage, as well as in relation to the use of health services, i.e., the level of equipment of the healthcare facilities where they had died. Other limitations are related to the data themselves. Official data was used in the study only on U07.1 and U07.2 as the main cause of death, and not on immediate, previous or other causes of death related to COVID-19 [7,8]. Since, during the COVID-19 pandemic, postmortems have not been performed to the same extent as before the pandemic, it is not possible to determine with certainty the extent of the underregistration of U07.1 and U07.2 death cases. It is necessary to analyze to which extent were doctors, especially those registering the deaths, familiar with the guidelines on the use of U07.1 and U07.2 codes for the main cause of death, how well do they understand the significance of the proper classification of the cause of death, and whether they are able to successfully distinguish among the main, previous, immediate and other causes of death. Also, original data refer only to deceased citizens of Belgrade and the results of the study cannot be generalized to refer to other communities.

The advantages of this study lie in the fact that it shows processed data originating from death certificates in the Dem-2 form, which have gone through the system of mortality control at the regional offices of the Statistical Office of the Republic of Serbia, at institutes of public health, and at the statistical Office of the Republic of Serbia. Results of the study may be useful in order to focus special attention, in the coming period,

Opterećenja društva bolešću utvrdi koliko je stanovništvo Beograda izgubilo godina života zbog prevremene smrtnosti u vezi sa KOVID-19 oboljenjem (engl. *years of life lost due to COVID-19*), kao i koliko je godina života provedeno u nesposobnosti zbog KOVID-19 bolesti (engl. *years lived with disability due to COVID-19*) [17-34].

ZAKLJUČAK

Rezultati istraživanja ukazuju na postojanje prevremene smrtnosti stanovnika Beograda zbog KOVID-19 oboljenja. U 2020. godini, prema specifičnim stopama mortaliteta, KOVID-19 je bio drugi vodeći uzrok smrti kod stanovnika Beograda muškog pola a treći kod stanovnika ženskog pola. Ovo istraživanje pruža dokaze kojima se može obogatiti diskusija koja se na međunarodnom nivou vodi o gubicima društva zbog pandemije KOVID-19 infekcije.

Izjave zahvalnosti: Autori zahvaljuju Republičkom zavodu za statistiku Srbije, bez čijih se podataka ovo istraživanje ne bi moglo sprovesti. Autori su članovi CA 18218 (Evropska mreža za opterećenje bolesti; <https://www.burden-eu.net/>) koju podržava Evropska saradnja u nauci i tehnologiji (engl. *European Cooperation in Science and Technology - COST*).

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on vulnerable groups, in order to maintain and improve their life expectancy. What remains is to determine, in studies applying the Burden of Disease methodology, how many years of life has the population of Belgrade lost due to premature death from COVID-19 (Years of Life Lost Due to COVID-19), as well as how many years of life have been spent with disability due to COVID-19 (Years Lived with Disability Due to COVID-19) [17-34].

CONCLUSION

The results of the study indicate the existence of premature death of Belgrade residents from COVID-19. In 2020., according to specific mortality rates, COVID-19 was the second leading cause of death in Belgrade male residents and the third leading cause of death in female residents. This research provides evidence that can contribute to the international discussion about societal losses caused by the COVID-19 pandemic.

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