

## EPIDEMIOLOŠKE KARAKTERISTIKE KOVID-19 OBOLJENJA U JUŽNOBANATSKOM OKRUGU U 2021. GODINI

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### SAŽETAK

**Uvod/Cilj:** Novi korona virus ili SARS-CoV-2, se u kratkom periodu nakon svoje pojave, u Vuhanu u Kini, krajem 2019. godine, brzo proširio na ceo svet zbog čega je 11. marta 2020. godine Svetska zdravstvena organizacija proglasila pandemiju kovida 19. Do sada je prijavljeno preko 750 miliona potvrđenih slučajeva kovida 19 i 6,9 miliona umrlih. Cilj ovog istraživanja je da se analiziraju demografske i kliničke karakteristike osoba sa kovid-19 oboljenjem u Južnobanatskom okrugu u 2021. godini.

**Metode:** U radu je primenjena deskriptivna studija koja je obuhvatila 34.912 ispitanika, oba pola i svih uzrasta. U istraživanje su uključeni svi pacijenti kod kojih je u 2021. godini, u Južnobanatskom okrugu, laboratorijski potvrđena SARS-CoV-2 infekcija brzim antigenskim ili RT-PCR testom, bez podataka da li se infekcija javila prvi put ili ne. Za potrebe ovog istraživanja korišćeni su podaci o demografskim i kliničkim karakteristikama obolelih od kovid-19 bolesti. Kao pokazatelj obolevanja korišćena je incidencija. Kao imenilac stope incidencije korišćen je broj stanovnika za Južnobanatski okrug i osam pripadajućih opština (Alibunar, Bela Crkva, Vršac, Kovačica, Kovin, Opovo, Pančevo i Plandište), prema popisu iz 2011. godine. Svi podaci su obrađeni u IBM SPSS Statistics 22 (SPSS Inc., Chicago, IL, USA) softverskom paketu.

**Rezultati:** U 2021. godini, u Južnobanatskom okrugu je prijavljeno 34.912 obolelih pacijenata sa potvrđenom SARS-CoV-2 infekcijom. Stopa incidencije kovid-19 bolesti je bila 11.885,7/100.000 stanovnika. Najviša stopa incidencije zabeležena je u opštini Kovačica (15.618,7/100.000), kao i u uzrastu 40-49 godina (16.040,9/100.000). U svim uzrasnim grupama stope incidencije za kovid-19 su bile veće za žene nego muškarce, osim u uzrastima 0-14 i 60 i više godina. U oktobru 2021. godine registrovana je najviša stopa incidencije kovid-19 bolesti (2759,3/100.000). Tešku kliničku sliku je imalo 8% obolelih, a 22,8% bar jedan komorbiditet, od kojih je hipertenzija (62,1%) bila najčešća. Najčešće zabeleženi simptom bolesti bila je febrilnost (73,6%). Kompletna vakcinacija sprovedena je kod 17,9% obolelih, a najčešće primenjena vakcina je bila *Sinopharm* (69,9%).

**Zaključak:** Neophodno je stalno raditi na edukaciji stanovništva o važnosti imunizacije, a pogotovo osoba koje imaju veći rizik od razvoja teže forme kovid-19 bolesti.

**Cljučne reči:** SARS-CoV-2 infekcija, kovid-19 bolest, težina bolesti, pol, uzrast, komorbiditeti, vakcinalni status

### Uvod

Novi korona virus ili SARS-CoV-2 se u kratkom periodu nakon svoje pojave, u Vuhanu u Kini krajem 2019. godine, brzo proširio na ceo svet zbog čega je 11. marta 2020. godine Svetska zdravstvena organizacija (SZO) proglasila pandemiju kovida 19.

Prema podacima SZO u svetu je prijavljeno preko 750 miliona potvrđenih slučajeva kovid-19 bolesti i 6,9 miliona umrlih (1). Činjenica je da prijavljeni broj obolelih potcenjuje ukupni teret kovid-19 bolesti, obzirom da se veliki broj akutnih infek-

cija ne dijagnostikuje i ne prijavljuje. Tome u prilog govore istraživanja o seroprevalenciji u Sjedinjenim Američkim Državama (SAD) i Evropi koja ukazuju da stopa incidencije premašuje incidenciju prijavljenih slučajeva za približno 10 ili više puta (2-4).

Studija koja je koristila više izvora podataka, uključujući baze podataka o broju obolelih i umrlih od COVID-19 i seroprevalenciju, procenila je da je do novembra 2021. godine više od 3 milijarde osoba, ili 44 % svetske populacije, bilo zaraženo

## EPIDEMIOLOGICAL CHARACTERISTICS OF THE COVID-19 DISEASE IN THE SOUTH BANAT DISTRICT IN 2021

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### SUMMARY

**Introduction/Aim:** The new coronavirus or SARS-CoV-2, in a short period of time after its appearance in Wuhan, China at the end of 2019, quickly spread throughout the world, which is why on March 11, 2020, the World Health Organization declared a covid pandemic 19. Over 750 million confirmed cases of COVID-19 and 6.9 million deaths have been reported so far. The aim of this research is to analyze the demographic and clinical characteristics of people with COVID-19 in the South Banat District in 2021.

**Methods:** The paper used a descriptive study that included 34,912 subjects of both sexes and all ages. The research included all patients in whom SARS-CoV-2 infection was laboratory-confirmed by a rapid antigen or RT-PCR test in 2021, in the South Banat District, without data on whether the infection occurred for the first time or not. For the purposes of this analysis, data on demographic and clinical characteristics of patients with COVID-19 disease were used. Incidence was used as an indicator of morbidity. As the denominator of the incidence rate, the number of inhabitants was used for the Južno Banat district and eight associated municipalities (Alibunar, Bela Crkva, Vršac, Kovačica, Kovin, Opovo, Pančevo and Plandište), according to the 2011 census. All data were processed in the IBM SPSS Statistics 22 (SPSS Inc., Chicago, IL, USA) software package.

**Results:** In 2021, 34,912 sick patients with confirmed SARS-CoV-2 infection were reported in the South Banat District. The incidence rate of COVID-19 was 11,885.7/100,000 inhabitants. The highest incidence rate was recorded in the municipality of Kovačica (15,618.7/100,000) and in the 40-49 age group (16,040.9/100,000). In all age groups, the incidence rates for COVID-19 were higher for women than for men, except for ages 0-14 and 60 and over. In October 2021, the highest incidence rate of the COVID-19 disease was registered (2759.3/100,000). 8% of patients had a severe clinical picture, and 22.8% had at least one comorbidity, of which hypertension (62.1%) was the most common. The most frequently recorded symptom of the disease was fever (73.6%). Complete vaccination was carried out in 17.9% of patients, and the most frequently administered vaccine was Sinopharm (69.9%).

**Conclusion:** It is necessary to constantly educate the population about the importance of immunization, especially people with a higher risk of developing a more severe form of the covid-19 disease.

**Keywords:** SARS-CoV-2 infection, COVID-19 disease, disease severity, gender, age, comorbidities, vaccination status

### Introduction

The new corona virus or SARS-CoV-2, shortly after its appearance in Wuhan, China at the end of 2019, quickly spread all around the world, and therefore, the World Health Organization (WHO) declared the pandemic of COVID-19 on the 11th of March, 2020.

According to the WHO data, over 750 million confirmed cases of COVID-19 and 6.9 million deaths have been reported worldwide (1). The

fact is that the reported number of patients underestimates the total burden of COVID-19, considering that a large number of acute infections are not diagnosed and reported. This is supported by research on seroprevalence in the United States of America (USA) and Europe, which indicates that the incidence rate exceeds the incidence of reported cases by approximately 10 or more times (2-4).

SARS-CoV-2 najmanje jednom (5). Studija sprovedena u periodu od marta do juna 2022. godine među zdravstvenim radnicima Autonomne pokrajine Vojvodine pokazala je da je 92,96% zdravstvenih radnika i saradnika zaposlenih u zdravstvu bilo SARS-CoV-2 IgG pozitivno pre pojave omikron BA.4/BA.5 podvarijanti (6).

Kada govorimo o broju umrlih od kovida 19, prema Međunarodnim smernicama za potvrđivanje i klasifikaciju (šifriranje), smrt usled kovid-19 oboljenja definisana je, u svrhu nadzora, kao smrt koja potiče od bolesti koja ima klinički odgovarajuće karakteristike, a u verovatnom ili potvrđenom slučaju obolevanja od kovid-19, osim u slučaju kada postoji jasan alternativni uzrok smrti koji ne može biti povezan sa kovid-19 oboljenjem (npr. trauma) (7).

Na osnovu svih dostupnih informacija, SZO je zaključila da je broj prijavljenih umrlih od kovid-19 bolesti potcenjen i da je realnije oslanjati se na višak smrtnosti koji se definiše kao umiranje iznad očekivanja zasnovanog na prepandemijskim stopama mortaliteta u ispitivanoj populaciji. Iako su prijavljeni smrtni slučajevi usled kovid-19 između 1. januara 2020. i 31. decembra 2021. iznosili ukupno 5,94 miliona širom sveta, procenjeno je da je 18,2 miliona ljudi umrlo zbog pandemije kovid-19 (mereno viškom mortaliteta) tokom tog perioda (8-10).

Prema preporukama kojih se drži Evropski centar za sprečavanje i suzbijanje bolesti (ECDC), ključna javnozdravstvene mere za ublažavanje negativnih posledica kovid-19 na nivou pojedinca, zajednice i stanovništva, je sprovođenje imunizacije (11). Vakcine protiv kovid-19 su razvijene i razvijaju se koristeći nekoliko različitih platformi. One su zasnovane na celom virusu, partikuli virusa, virusnom vektoru i nukleinskim kiselinama. Vakcine proizvedene na bazi ovih platformi mogu se podeliti u tri generacije. U vakcine prve generacije spadaju inaktivisane i atenuirane virusne vakcine. Drugu generaciju čine proteinske subjedinične i virusu slične partikule, a treću generaciju vakcina čine virusne vektorske i DNK i RNK vakcine (12). Ukupna korist odobrenih vakcina protiv kovid-19 u prevenciji bolesti prevazilazi rizike od neželjenih efekata. Vremenom nakon vakcinacije, zaštita od infekcije opada kako se postepeno smanjuje titar antitela u serumu, ali se može obnoviti davanjem dodatnih doza. Studije pokazuju da prethodna infekcija virusom SARS-CoV-2 smanjuje rizik od pon-

ovne infekcije virusom SARS-CoV-2. Kako bolest kovid-19 nastavlja da se razvija, sve više pojedinaca na globalnom nivou dobija tzv. „hibridni imunitet“ (imunitet koji se dobija kombinacijom vakcinacije i najmanje jedne prethodne infekcije). Ljudi sa hibridnim imunitetom pokazuju najviši nivo i trajanje zaštite od ponovne infekcije, prijema u bolnicu i teške bolesti (13,14). Efikasnost najznačajnijih vakcina protiv kovid-19 bolesti se kreće od 66,5 - 95%, a za tešku formu bolesti 85,4 - 100%.

U Republici Srbiji je kampanja vakcinacije protiv kovid-19 započela 24. decembra 2020. godine i još uvek se sprovodi kao vanredna, besplatna, preporučena po Programu imunizacije. Agencija za lekove Srbije (ALIMS) odobrila je pet vakcina (plus dve kombinovane-bivalentne revakcine) za zaštitu protiv kovid-19 u R. Srbiji (Pfizer-BioNTech BNT162b2 (Comirnat<sup>®</sup>); Gamaleia Research Institute Gam-COVID-Vac (Sputnjik V<sup>®</sup>); Sinopharm BBIBP-CorV (Vero Cell<sup>®</sup>); Oksford ChAdOk1ene-ca -S/nCoV-19 AZD1222 (Vakzevria<sup>®</sup>); Moderna mRNA-1273 (Spikevak<sup>®</sup>)). Divalentna formulacija (Pfizer-BioNTech COVID-19 vakcina, bivalentna [Original i Omicron BA.4/BA.5]) je odobrena kao dodatna doza za osobe od 12 godina ili više, a bivalentna formulacija (Moderna COVID-19 vakcina, bivalentna [Original i Omicron BA.4/BA.5]) je odobrena kao dodatna doza za osobe od 18 godina ili više (15).

Cilj ovog istraživanja je da se analiziraju demografske i kliničke karakteristike osoba sa kovid-19 oboljenjem u Južnobanatskom okrugu u 2021. godini.

## Metode

U radu je primenjena deskriptivna studija koja je obuhvatila 34.912 ispitanika, oba pola i svih uzrasta. U istraživanje su uključeni svi pacijenti kod kojih je tokom 2021. godine, u Južnobanatskom okrugu, laboratorijski potvrđena SARS-CoV-2 infekcija brzim antigenim ili RT-PCR testom, bez podataka da li se infekcija javila prvi put ili ne.

Izvor podataka bili su nepublikovani podaci iz anketnih upitnika koji su popunjavali lekari Kovid ambulanti osam domova zdravlja, dve opšte i tri specijalne bolnice na teritoriji nadležnosti Zavoda za javno zdravlje Pančevo. Sve popunjene ankete su prosleđivane epidemiološkoj službi Zavoda za javno zdravlje Pančevo gde su naknadno obrađivane i dopunjene nedostajućim podacima, pozivanjem pacijenata ili doktora koji je popunja-

It was estimated in the study, which used multiple data sources, including databases on the number of cases and deaths caused by COVID-19 and seroprevalence, that by November 2021, more than 3 billion people, or 44% of the world's population, were infected with SARS-CoV-2 at least once (5). A study, which was conducted from March to June 2022 among healthcare workers in the Autonomous Province of Vojvodina showed that 92.96% of healthcare workers and their associates had been SARS-CoV-2 IgG positive before the appearance of omicron BA.4/BA.5 variants (6).

As far as the number of deaths caused by COVID-19 is concerned, according to the International Guidelines for the Certification and Classification (coding) of deaths related to COVID-19, it is defined, for the purpose of surveillance, as a death caused by a disease that has certain clinical characteristics, in a probable or confirmed case of COVID-19, except in the case when there is a clear, alternative cause of death that cannot be associated with COVID-19 (e.g. trauma) (7).

Based on all available information, the WHO has concluded that the number of reported deaths due to COVID-19 has been underestimated and that it is more realistic to rely on excess mortality, which is defined as the number of deaths above expectations based on pre-pandemic mortality rates in the study population. Although the number of reported deaths from COVID-19 between January 1st, 2020 and December 31st, 2021 amounted to 5.94 million cases worldwide, it was estimated that 18.2 million people worldwide died due to the COVID-19 pandemic (measured by excess mortality) during that period (8-10).

According to the recommendations of the European Center for Disease Prevention and Control (ECDC), the key public health measure used to mitigate the negative consequences of COVID-19 at the individual, community and population level is the implementation of immunization (11). Vaccines against COVID-19 have been developed with the help of several different platforms. They have been based on the whole virus, virus particle, viral vector and nucleic acids. Vaccines produced on the basis of these platforms can be divided into three generations. The first generation vaccines are inactivated and attenuated viral vaccines. The second generation consists of protein subunits and virus-like particles and the third generation of vaccines consists of viral vector and DNA and

RNA vaccines (12). The overall benefit of approved vaccines against COVID-19 in the prevention of disease exceeds the risks related to side effects. Over time, after vaccination, the protection against this infection decreases as the serum antibody titer gradually declines, but it can be restored by administration of additional doses. Studies have shown that the previous infection with the SARS-CoV-2 virus reduces the risk of re-infection with this virus. As the disease COVID-19 continues to develop, more and more individuals globally are getting the so-called "hybrid immunity" (immunity obtained through the combination of vaccination and at least one previous infection). People with hybrid immunity have shown the highest level and duration of protection against re-infection, hospital admission and severe disease (13,14). The effectiveness of the most important vaccines against COVID-19 disease ranges from 66.5-95%, and for severe forms of disease 85.4-100%.

In the Republic of Serbia, the vaccination campaign against COVID-19 began on the 24th of December, 2020 and it is still being carried out as free vaccination recommended for emergency situations within the Immunization Program. The Medicines and Medical Devices Agency of Serbia (ALIMS) has approved five vaccines (plus two combined-bivalent revaccinations) for the protection against COVID-19 in the Republic of Serbia (Pfizer-BioNTech BNT162b2 (Comirnat<sup>®</sup>); Gamaleia Research Institute Gam-COVID-Vac (Sputnik V<sup>®</sup>); Sinopharm BBIBP-CorV (Vero Cell<sup>®</sup>); Oxford ChAdOk1eneca -S/nCoV-19 AZD1222 (Vakzevria<sup>®</sup>); Moderna mRNA-1273 (Spikevak<sup>®</sup>)). The bivalent formulation (Pfizer-BioNTech COVID-19 vaccine, bivalent [Original and Omicron BA.4/BA.5]) has been approved as a booster dose for individuals aged 12 and older, while the bivalent formulation (Moderna COVID-19 vaccine, bivalent [Original and Omicron BA.4/BA.5]) has been approved as a booster dose for individuals aged 18 and older (15).

The aim of this study was to analyze the demographic and clinical characteristics of persons with COVID-19 in the South Banat District in 2021.

## Methods

The descriptive study was applied in this paper and it included 34,912 participants of both sexes and all ages. The study included all patients, in whom, during 2021, in the South Banat District, SARS-CoV-2 infection was confirmed by a rapid antigen



vao anketu telefonom, od strane doktora epidemiologa i/ili sanitarnih tehničara službe, a zatim su podaci unošeni u elektronsku bazu Instituta za javno zdravlje Vojvodine - Epidemiološki nadzor Kovid-19. Unos podataka sprovodio se na dnevnom nivou, za sve SARS CoV-2 laboratorijski potvrđene slučajeve na teritoriji Južnobanatskog okruga, u predhodna 24 časa.

Za potrebe ovog israživanja korišćeni su podaci o demografskim karakteristikama pacijenta (pol, uzrast, prebivalište, zanimanje), kliničkim karakteristikama bolesti (febrilnost, kašalj, bolovi u grlu, bolovi u mišićima, bolovi u zglobovima, glavobolja, mučnina, povraćanje, proliv, gubitak čula ukusa i mirisa, curenje nosa, zapušenost nosa), težini kliničke slike, prisustvu i vrsti komorbiditeta i podaci o vakcinalnom statusu obolelih. Zanimanje pacijentata je obuhvatalo četiri grupe: uslužna delatnost, zdravstvena delatnost, penzioner i ostali. Podaci o težini bolesti odnosili su se na asimptomatske slučajeve, blage, teške i kritične. Zbog malog broja kritičnih i asimptomatskih slučajeva, asimptomatski i blagi su posmatrani kao laki, a teški i kritični kao teži slučajevi bolesti. Kriterijum za blagi oblik bolesti bila je ispunjenost definicije slučaja oboljenja sličnog gripu i asimptomatske forme bolesti, a teški slučajevi bolesti bili su pacijenti sa pneumonijom i/ili kiseoničnom terapijom i pacijenti na respiratoru u jedinici intenzivne nege. Podaci koji se odnose na komorbiditete podrazumevali su prisustvo i odsustvo komorbiditeta kao i njihov broj i vrstu: povišeni krvni pritisak, hronična plućna bolest, dijabetes, maligna bolest, kardiovaskularna bolest, gojaznost i ostale bolesti i stanja.

U odnosu na vakcinalni status pacijenti su podeljeni u dve grupe: neimunizovani (oni koji nisu primili ni jednu dozu vakcine ili su primili jednu dozu vakcine ili dve doze, ali je od poslednje doze vakcine do pojave bolesti prošlo manje od 14 dana) i potpuno imunizovani (oni koji su primili dve doze vakcine pri čemu je od poslednje primljene doze do pojave bolesti prošlo više od 14 dana). U imunizaciji su primenjivane četiri vrste kovid-19 vakcine: Sinopharm, Pfizer-Biontek, Sputnik V i Astra Zeneka.

Kao pokazatelji oboljevanja od SARS CoV-2 infekcije u posmatranom periodu korišćene su opšte i uzrasno specifične stope incidencije. Kao imenilac za izračunavanje stopa incidencije korišćeni su podaci Republičkog zavoda za statistiku o popisu stanovništva iz 2011. godine za Južnobanatski okrug i osam pripadajućih opština: Alibunar, Bela Crkva, Vršac, Kovačica, Kovin, Opovo, Pančevo i Plandište.

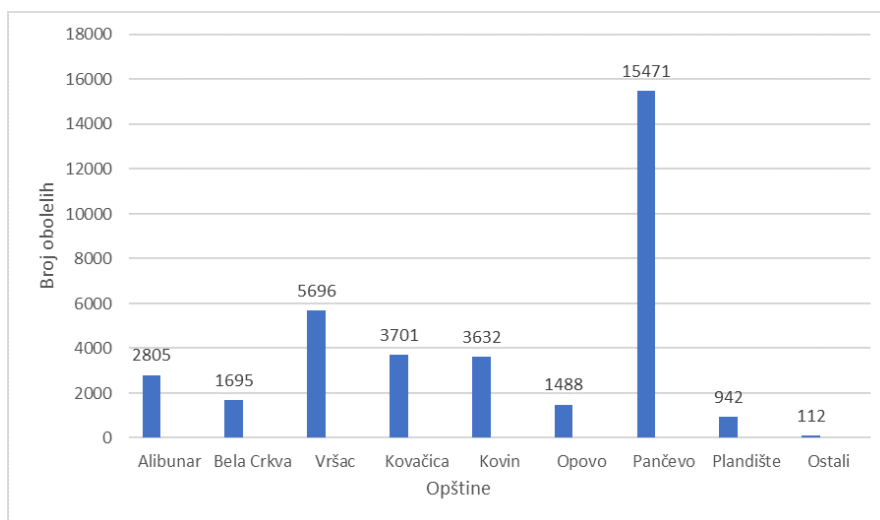
Rezultati su prikazani tabelarno i grafički. Svi podaci su obrađeni u *IBM SPSS Statistics 22 (SPSS Inc., Chicago, IL, USA)* softverskom paketu.

## Rezultati

U 2021. godini u Južnobanatskom okrugu je prijavljeno 34.912 osoba kod kojih je laboratorijski potvrđena SARS-CoV-2 infekcija, sa stopom incidencije kovid-19 oboljenja od 11.885,7/100.000.

Prosečna starost svih pacijenata obolelih od kovid-19 bolesti je bila 46,21 ± 20,19 godina. Najmlađi oboleli je imao jednu, a najstariji 101 godinu.

Najveći broj obolelih od kovid-19 oboljenja je bio na teritoriji opštine Pančevo (15.474), zatim



**Grafikon 1.** Distribucija obolelih od kovid-19 bolesti po opštinama Južnobanatskog okruga u 2021. godini

test or RT-PCR test, without data on whether the infection occurred for the first time or not.

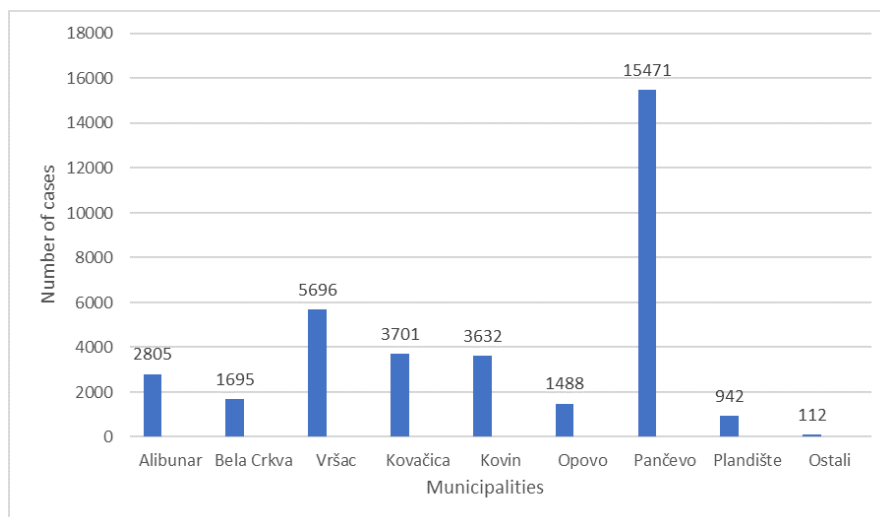
The source of data included the unpublished data from questionnaires, which had been filled out by doctors from Covid clinics of eight health centers, two general and three special hospitals in the territory of the Public Health Institute Pančevo. All completed questionnaires were sent to the epidemiological department of the Public Health Institute Pančevo, where they were subsequently analyzed and supplemented with missing data, by calling the patients or doctor who filled out the questionnaire by telephone, by the epidemiologist and/or sanitary technicians from the service, and then the data were entered into the electronic database of the Public Health Institute of Vojvodina – Epidemiological surveillance of COVID-19. Data entry was carried out on a daily basis, for all SARS-CoV-2 laboratory-confirmed cases in the territory of the South Banat District in the previous 24 hours.

For the purposes of this research, data on the patient's demographic characteristics were used (gender, age, place of residence, occupation), as well as data on the clinical characteristics of the disease (fever, cough, sore throat, muscle pain, joint pain, headache, nausea, vomiting, diarrhea, loss of senses of taste and smell, rhinorrhea, nasal congestion), the severity of clinical picture, the presence and type of comorbidities and data on the vaccination status of patients. The occupation of patients included four groups: service industry, health care, retired persons and others. Data on the severity of disease referred to asymptomatic cases, mild, severe and critical cases. Due to the

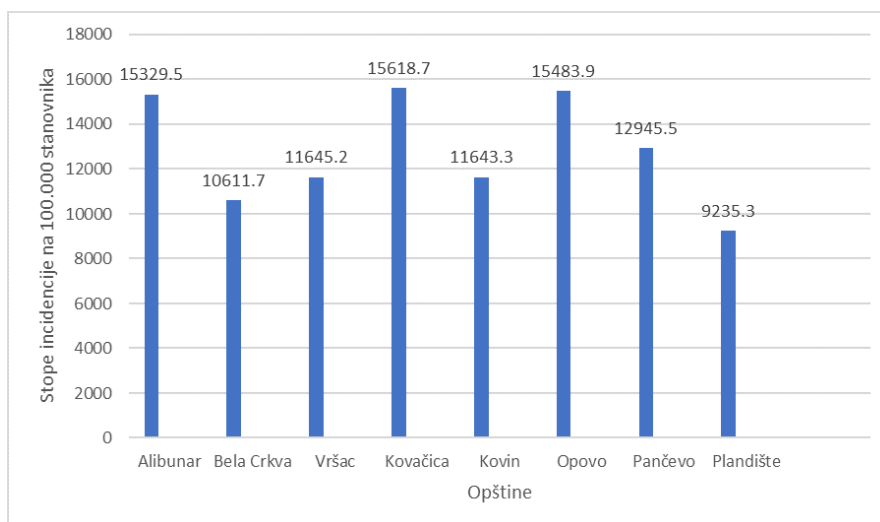
small number of critical and asymptomatic cases, asymptomatic and mild cases were observed as mild, while severe and critical were observed as severe cases of disease. The criterion for the mild form of disease was the fulfillment of the case definition of disease with flu-like symptoms and the asymptomatic form of disease, while severe cases were patients with pneumonia and/or oxygen therapy and patients on a respirator in intensive care units. Data related to comorbidities included the presence and absence of comorbidities, as well as their number and type: hypertension, chronic lung disease, diabetes, malignant disease, cardiovascular disease, obesity and other diseases and conditions.

As far as vaccination status is concerned, patients were divided into non-immunized (those who did not receive a single dose of vaccine or received one dose or two doses, but less than 14 days passed from the last dose of vaccine till the onset of disease) and fully immunized (those who received two doses of vaccine, where more than 14 days passed from the last received dose till the onset of disease). Four types of COVID-19 vaccine were administered in the immunization: Sinopharm, Pfizer-Biontek, Sputnik and Astra Zeneca.

General and age-specific incidence rates were used as indicators of SARS-CoV-2 infection in the observed period. The data of the Republic Institute of Statistics on the 2011 census for the South Banat District and its eight municipalities: Alibunar, Bela Crkva, Vršac, Kovačica, Kovin, Opovo, Pančevo and Plandište were used as the denominator for calculating the incidence rates.



**Figure 1.** Distribution of COVID-19 cases by municipalities in the South Banat District in 2021



**Grafikon 2.** Stope incidencije (na 100.000) kovid-19 bolesti po opštinama Južnbanatskog okruga u 2021. godini

u opštini Vršac (5.696), Kovačica (3.701), Kovin (3.632), Alibunar (2.805), Bela Crkva (1695) i Opovo (1488), a najmanji u opštini Plandište (942) (Grafikon 1).

Najviše stope incidencije kovid-19 oboljenja zabeležene su u opštini Kovačica (15.618,7/100.000), Opovo (15.483,9/100.000), Alibunar (15.329,5/100.000), Pančevo (12.954,5/100.000), Vršac (11.645,2/100.000), Kovin (11.643,3/100.000), Beloj Crkvi (10.611,7/100.000), a najniža u opštini Plandište (9.235,3/100.000) (Grafikon 2).

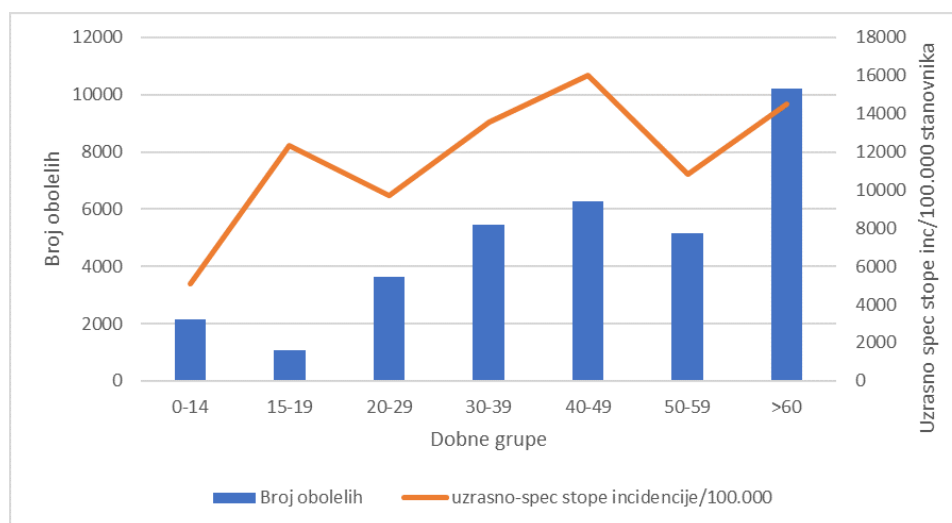
Najviše uzrasno-specifične stope incidencije kovid-19 bolesti su bile u uzrastima 40-49 godina (16.040,9/100.000), 60 i više godina (14.499,8/100.000) i 30-39 godina (13.549,5/100.000), nešto niže u uzrastima 15-19 godina (12.330,9/100.000), 50-59 godina (10.838,9/100.000) i 20-29 godina

(9.715,1/100.000), a najniža u uzrastu 1-14 godina (5.064,9/100.000) (Grafikon 3).

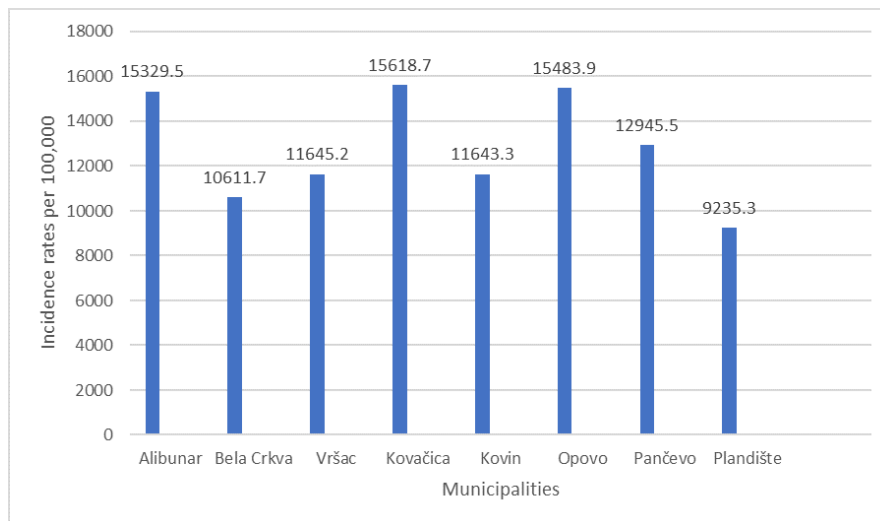
Žene su češće obolevale od kovid-19 bolesti (53,6%) nego muškarci 46,4%. Odnos obolelih žena i muškaraca je iznosio 1,16:1. Takođe, u svim uzrasnim grupama žene su češće obolevale od kovid-19 bolesti nego muškarci, osim u uzrastu 0-14 godina gde je obolevanje bilo slično po polovima (Grafikon 4).

Stope incidencije kovid-19 bolesti su bile veće kod žena nego muškaraca u svim uzrasnim grupama osim u uzrastu 0 do 14 godina i 60 i više godina (Grafikon 5).

Najveća registrovana stopa incidencije kovid-19 bolesti je zabeležena u oktobru mesecu 2021. godine (2759,3/100.000), a najniža u julu mesecu 2021. godine (32,0/100.000) (Grafikon 6).



**Grafikon 3.** Distribucija broja obolelih i uzrasno-specifičnih stopa incidencije (na 100.000) kovid-19 bolesti u Južnbanatskom okrugu u 2021. godini



**Figure 2.** Incidence rates (per 100,000) of COVID-19 by municipalities in South Banat District in 2021

The results are presented in tables and graphs. All data were analyzed using the IBM SPSS Statistics 22 (SPSS Inc., Chicago, IL, USA) software package.

## Results

In 2021, 34,912 persons were reported in the South Banat District with laboratory-confirmed SARS-CoV-2 infection, with the incidence rate of 11,885.7/100,000.

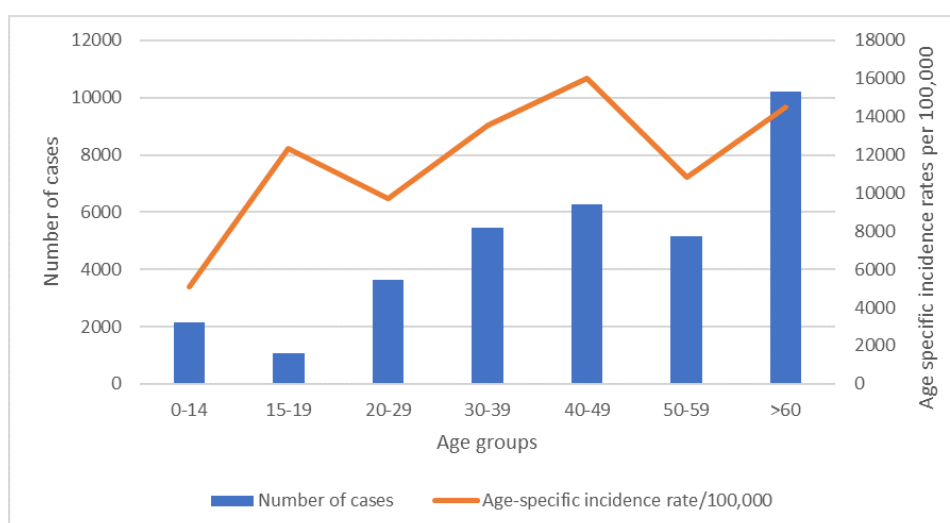
The average age of all patients suffering from COVID-19 was 46.21±20.19 years. The youngest patient was one, and the oldest was 101 years old.

The largest number of patients with COVID-19 was in the municipality of Pančevo (15,474), followed by the municipalities of Vršac (5,696), Kovačica (3,701), Kovin (3,632), Alibunar (2,805), Bela Crkva (1695) and Opovo (1488), while the

smallest number was in the municipality of Plandište (942) (Figure 1).

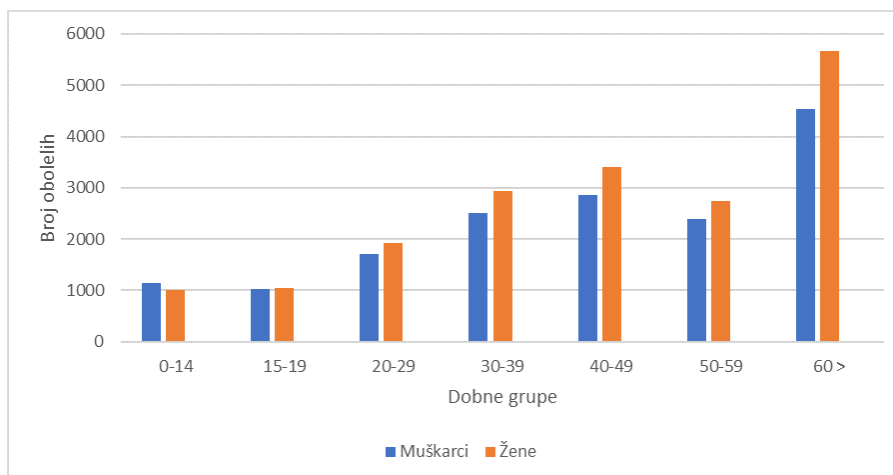
The highest incidence rates of COVID-19 were recorded in the municipalities of Kovačica (15,618.7/100,000), Opovo (15,483.9/100,000), Alibunar (15,329.5/100,000), Pančevo (12,954.5/100,000), Vršac (11,645.2/100,000), Kovin (11,643.3/100,000), Bela Crkva (10,611.7/100,000), while the lowest rate was in the municipality of Plandište (9,235.3/100,000) (Figure 2).

The highest age-specific incidence rates of COVID-19 were in the age groups 40-49 years (16,040.9/100,000), 60 years and older (14,499.8/100,000) and 30-39 years (13,549.5/100,000), while slightly lower rates were in the age groups 15-19 years (12,330.9/100,000), 50-59 years (10,838.9/100,000) and 20-29 years

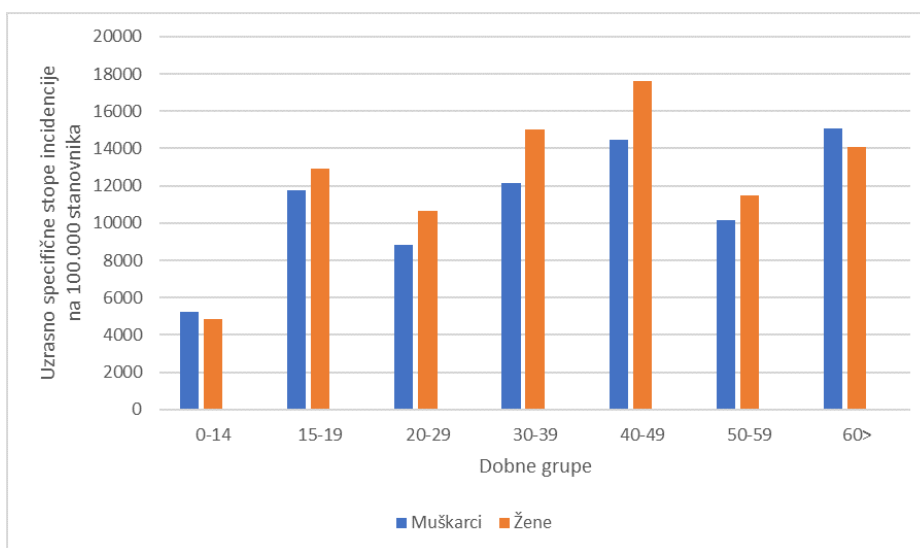


**Figure 3.** Distribution of cases and age-specific incidence rates (per 100,000) of COVID-19 in the South Banat District in 2021

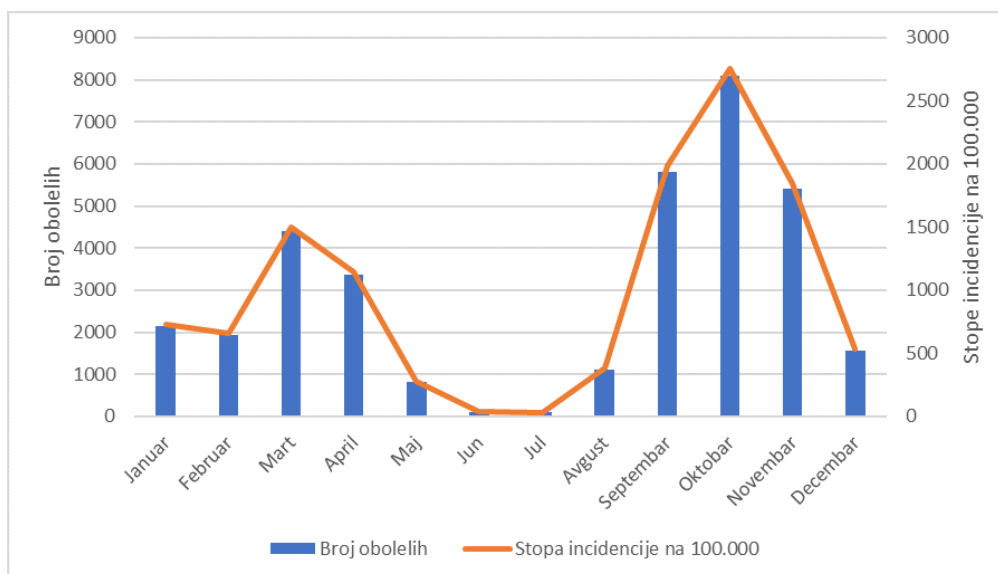




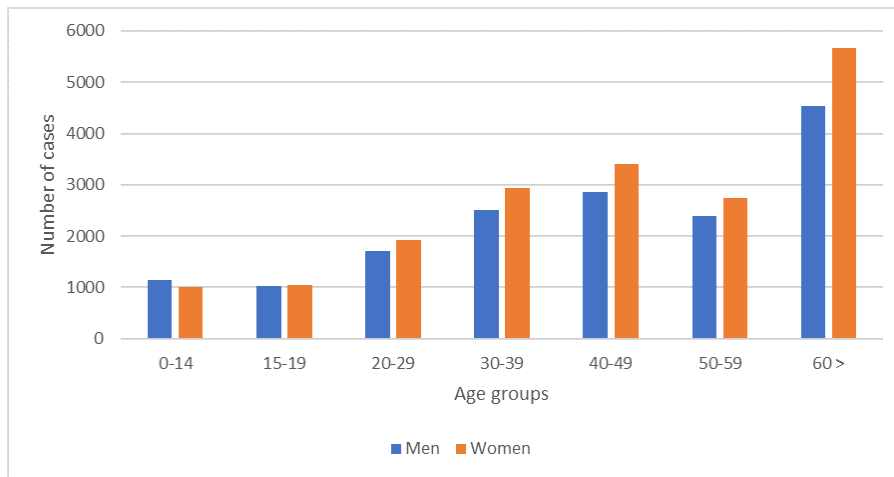
**Grafikon 4.** Distribucija obolelih od kovid-19 bolesti po uzrastu i polu u Južnobanatskom okrugu u 2021. godini



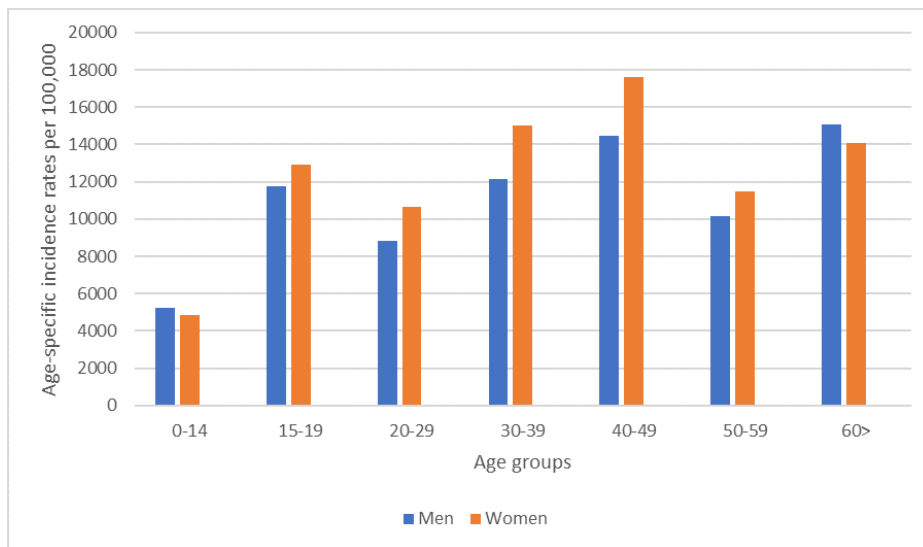
**Grafikon 5.** Stope incidencije (na 100.000) kovid-19 bolesti po polu i uzrastu u Južnobanatskom okrugu u 2021. godini



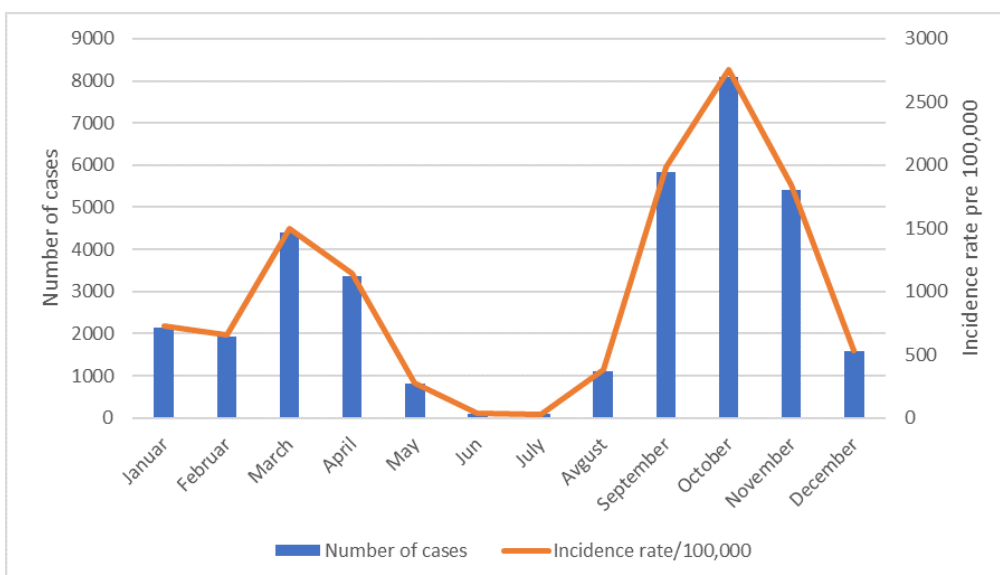
**Grafikon 6.** Stope incidencije kovid-19 bolesti po mesecima u Južnobanatskom okrugu u 2021. godini



**Figure 4.** Distribution of cases of COVID-19 by age and sex in the South Banat District in 2021



**Figure 5.** Incidence rates (per 100,000) of COVID-19 by sex and age in the South Banat District in 2021



**Figure 6.** Incidence rates of COVID-19 by months in the South Banat District in 2021

Među obolelima od kovid-19 bolesti najviše je bilo penzionera (22%), a zatim radnika uslužnih delatnosti (6,2%) i zdravstvenih radnika (3,0%). Međutim, 68,8% obolelih su pripadali različitim drugim delatnostima. Blagu kliničku sliku je imalo 90,2% obolelih od kovid-19, 8% tešku, a 1,8% nije imalo simptome bolesti.

Najveći broj obolelih (77,2%) je bilo bez komorbiditeta, a 17,3% sa jednim, 4,5% sa dva, 0,9% sa tri, a 0,1% sa više od tri. Najčešći komorbiditi su bili hipertenzija (62,1%), druge hronične bolesti ili stanja (12,6%), dijabetes (11,4%), gojaznost (4,8%), hronična plućna bolest (4,8%), kardiovaskularna (3,4%) i maligna bolest (0,9%).

Prema vodećim simptomima bolesti, febrilnost je bila prisutna kod 73,6% obolelih od SARS-CoV-2 infekcije, kašalj kod 54,4%, malaksalost 56,4%, bolovi u mišićima 24,7%, bolovi u zglobovima 18%, bol u grlu 15,9%, curenje iz nosa 15,9%, gubitak ukusa 7,6%, gubitak mirisa 9,3%, zapušenost nosa 3,2% i proliv 2,9%. Pneumoniju je imalo 2% obolelih od kovid-19 bolesti, a 5,7% je bilo hospitalizovano.

Među obolelima od kovid-19 je bilo 82,1% neimunizovanih, a 17,9% bilo je potpuno imunizovano. Od svih potpuno imunizovanih 69,9% je primilo Sinopharm vakcinu, 16% PfizerBiontek, 10,9% Sputnik V i Astra Zeneku 3,2%.

## Diskusija

U kratkom periodu, nakon svoje pojave, kovid-19 se brzo proširio na ceo svet. Ovo oboljenje i danas, skoro četiri godine nakon što je virus identifikovan, predstavlja veliki javnozdravstveni problem. Još od pojave španske groznice 1918/19 godine, nije u mirnodopskim uslovima bilo događaja koji je jače od ove pandemije uzdrmao čovečanstvo. Pored ogromnih zdravstvenih, ekonomskih i društvenih posledica koje je za sobom ostavila, pandemija je istovremeno pokazala i na koji način se savremeni svet „snašao“ u borbi da kontroliše i zaustavi kovid 19 bolest. Zbog opšte osetljivosti čitave svetske populacije, koja se prvi put susrela sa virusom, brzog širenja virusa koje je doveo do velikog broja obolelih u kratkom vremenskom periodu, velikog opterećenja zdravstvenog sistema na svim nivoima, jasno je bilo da će borba sa virusom biti neizvesna, a tok pandemije na samom njenom početku nepredvidiv.

Prvi potvrđen slučaj zaraznog oboljenja izazvan novim SARS-CoV-2 virusom u našoj zemlji prijavljen je 6. marta 2020. godine, a u Južnobanats-

kom okrugu, četiri dana kasnije, 10. marta 2020. godine. Epidemija kovida 19 je u Republici Srbiji proglašena 19. marta 2020. godine.

Prema podacima SZO do danas je u svetu prijavljeno preko 770 miliona obolelih od kovida 19, a u Evropi 267 miliona (16). U svetu je najveći broj obolelih prijavljen u Sjedinjenim Američkim Državama (103.436.829), a u Evropi, u Francuskoj (38.997.490), Nemačkoj (38.437.756) i Italiji (26.007.789) (16). U Republici Srbiji oboljenje je potvrđeno kod preko 2,5 miliona stanovnika (16). Prema nepublikovanim podacima Zavoda za javno zdravlje Pančevo do sada je u Južnobanatskom okrugu evidentirano oko 97.000 obolelih od SARS-CoV-2 infekcije.

U Srbiji je početak pandemije kovida 19 obeležio originalni soj virusa iz Vuhana, koji je bio dominantan gotovo do kraja 2020. godine. Naše istraživanje je obuhvatilo 2021. godinu kada je na početku godine dominirao alfa soj virusa. Krajem zime i početkom proleća 2021. alfa soj je potisnuo delta soj, koji je bio odgovoran za petiepidemijski talas, tokom jeseni i na početku zime 2021. godine.

Stopa incidencije obolevanja od kovida 19 u Republici Srbiji je u 2021. godini iznosila 9.919,6/100.000, dok je u AP Vojvodini 11.535/100.000. Na području AP Vojvodine tokom 2021. godine najviše stope incidencije kovid 19 bolesti zabeležene su u Južnobanatskom okrugu 13.264,8/100.000, a u Republici Srbiji u Nišavskom okrugu (17.447,7/100.000)(17).

U našem istraživanju, u 2021. godini u Južnobanatskom okrugu je prijavljeno 34.912 obolelih kod kojih je laboratorijski potvrđena SARS-CoV-2 infekcija, sa stopom incidencije 11.885,7/100.000. Zabeležene stope incidencije kovid-19 oboljenja razlikovale su se po opštinama Južnobanatskog okruga. Najviše vrednosti zabeležene su u opštini Kovačica (15.618,7/100.000), Opovo (15.483,9/100.000) i Alibunar (15.329,5/100.000), a najniže u opštini Plandište (9.235,3/100.000). Razlike u učestalosti obolevanja po opštinama delom su rezultat različite organizacije zdravstvene službe i prijavljivanja, a delom rezultat praktikovanja različitih navika (npr. u opštini Kovačica, koju u najvećoj meri čine Slovaci, imaju tendenciju da održe zajedništvo okupljanjem u manjim grupama i dr.).

Broj obolelih i stopa incidencije nisu realne i predstavljaju samo „vrh ledenog brega“ obzirom da je značajan broj slučajeva SARS-CoV-2 infekcija ostao neprijavljen zbog velikog broja osoba koje su

(9,715.1/100,000), and the lowest was in the age group 1-14 years (5,064.9/100,000) (Figure 3).

Women suffered more often from COVID-19 (53.6%) than men (46.4%). The ratio of affected women to men was 1.16:1. Also, in all age groups, women were more likely to suffer from COVID-19 than men, except in the age group 0-14 years where the incidence was similar in relation to gender (Figure 4).

The incidence rates of COVID-19 were higher in women than in men in all age groups, except in the age group 0 to 14 years and 60 and over (Figure 5).

The highest incidence rate of COVID-19 was registered in October 2021 (2759,3/100,000), while the lowest was in July 2021(32,0/100,000) (Figure 6).

The majority of patients were retired persons (22%), followed by healthcare workers (3.0%) and workers in the service industry (6.2%). However, 68.8% of patients belonged to other occupations. 90.2% of patients had a mild clinical picture, 8% severe, while 1.8% had the asymptomatic form of the disease.

The largest number of patients (77.2%) was without comorbidities, while 17.3% were with one, 4.5% with two, 0.9% with three, and 0.1% with more than three comorbidities. The most frequent comorbidity was hypertension (62.1%), other chronic diseases or conditions (12.6%), diabetes (11.4%), obesity (4.8%), chronic lung disease (4.8%), cardiovascular (3.4%) and malignant disease (0.9%).

As far as the leading symptoms of disease are concerned, fever was present in 73.6% of cases of SARS CoV-2 infection, cough in 54.4%, malaise in 56.4%, muscle pain in 24.7%, joint pain in 18%, sore throat in 15.9%, rhinorrhea in 15.9%, loss of taste in 7.6%, loss of smell in 9.3%, nasal congestion in 3.2% and diarrhea in 2.9%. Pneumonia was present in 2% of cases of COVID-19, while 5.7% were hospitalized.

Among the patients affected by COVID-19, 82.1% were not immunized, while 17.9% were completely immunized. Of all the immunized persons, 69.9% received Sinopharm vaccine, 16% Pfizer Biontek, 10.9% Sputnik V and Astra Zeneca 3.2%.

## Discussion

Shortly after its appearance, SARS-CoV-2 quickly spread to the whole world. Today, almost

four years after the virus was identified, this disease is still a major public health problem. Ever since the outbreaks of Spanish fever, there have been no events in the conditions of peace that shook humanity more than this pandemic. In addition to the huge health, economic, and social consequences that it left behind, the pandemic at the same time showed how the modern world "managed" in the fight to control and stop COVID-19. Due to the general susceptibility of the whole world population, which encountered the virus for the first time, the rapid spread of the virus which caused the large number of cases in a short period of time, and the heavy burden on the health system at all levels, it was clear that the fight against the virus would be uncertain, and that the course of the pandemic would be unpredictable at its very beginning.

The first confirmed case of an infectious disease caused by the new SARS-CoV-2 virus in our country was reported on the 6<sup>th</sup> of March, 2020 and four days later, on the 10<sup>th</sup> of March, 2020 in the South Banat District. The epidemic of COVID-19 was declared in the Republic of Serbia on the 19<sup>th</sup> of March, 2020.

According to the WHO data, more than 770 million cases of COVID-19 have been reported worldwide so far, while 267 million cases have been reported in Europe (16). In the world, the largest number of cases was reported in the United States of America (103,436,829), then in Europe, in France (38,997,490), Germany (38,437,756) and Italy (26,007,789) (16). In the Republic of Serbia, the disease has been confirmed in over 2.5 million inhabitants (16). According to the unpublished data of the Public Health Institute of Pančevo, about 97,000 cases of SARS-CoV-2 have been recorded in the South Banat District so far.

In Serbia, the beginning of the COVID-19 pandemic was marked by the original strain of the virus from Wuhan, which was dominant almost until the end of 2020. Our study covered the year 2021, when the alpha strain was dominant. In the late winter and early spring of 2021, the alpha strain was suppressed by delta strain, which was responsible for the fifth epidemic wave, during the fall and early winter of 2021.

In 2021, the incidence rate of COVID-19 in the Republic of Serbia was 9,919.6/100,000, while in the Autonomous Province of Vojvodina it was 11,535/100,000. In the territory of AP Vojvodina

imale blagu kliničku sliku ili asimptomatsku bolest i nisu se javljale zdravstvenom sistemu. Tome u prilog govore istraživanja o seroprevalenciji u Sjedinjenim Američkim Državama i Evropi koja ukazuju da stvarna stopa incidencije premašuje incidenciju prijavljenih slučajeva za približno 10 ili više puta (2-4).

Najviša uzrasno-specifična stopa incidencije u 2021. godini u Republici Srbiji zabeležena je u uzrastu 15-19 godina i iznosila je 12.121,1/100.000 stanovnika, dok je u AP Vojvodini bila u uzrastu 40-49 godina i iznosila je 15.236,9/100.000 stanovnika. U našem istraživanju najviše uzrasno-specifične stope incidencije kovid-19 zabeležene su u uzrastu 40-49 godina (16.040,9/100.000). Dobijene vrednosti incidencije bile su više 3,2 puta od najnižih registrovanih u uzrastu 0-14 godina (5.064,9/100.000). Uzrast u kojem su zabeležene najviše stope incidencije odgovara radno aktivnom stanovništvu koje je ostvarilo najveći broj kontakata kako na putu do posla tako i na samom poslu odakle sledi i najveći broj obolelih.

U Južnobanatskom okrugu žene su 1,2 puta češće obolele nego muškarci, a u Republici Srbiji 1,1 puta češće (17). Zašto više obolevaju žene do 60 godina od kovid 19 bolesti u odnosu na muškrace još uvek nije jasno. Može se pretpostaviti da se žene češće javljaju zdravstvenom sistemu, a takođe u zdravstvu i drugim javnim institucijama veći je broj zaposlenih žena u odnosu na muškarce, pa to može biti razlog i njihove veće izloženosti. Ovi rezultati su slični drugim istraživanjima sprovedenim u Evropi (18,19).

Najviše stope incidencije kovid-19 bolesti, u našoj studiji, odgovaraju jesenjem periodu (septembar, oktobar i novembar), a najmanje u julu 2021. Sve ovo ukazuje na činjenicu da će kovid 19, najverovatnije biti oboljenje sa sezonskim karakterom, tokom hladnijih meseci što odgovara učestalosti pojavljivanja virusa koji se prenose respiratornim putem.

Podaci iz 2020. godine pokazali su da je većina simptomatskih pacijenata razvija samo blagu ili umerenu bolest (80%), tešku bolest sa pneumonijom i kiseoničnom podrškom 15%, a kritičnu sa komplikacijama kao što su respiratorna insuficijencija, ARDS (Akutni respiratorni distres sindrom), sepsa, septični šok, tromboembolija i/ili zatajenje više organa uključujući akutnu renalnu i srčanu insuficijenciju 5% (20). U našem istraživanju blagu kliničku sliku imalo 90,2% obolelih, 8% tešku, a 1,8% nije imalo simptome bolesti.

Prema podacima SZO najčešći simptomi bolesti koji se mogu javiti 5-6 dana nakon izloženosti su: povišena telesna temperatura, kašalj, umor i malaksalost, glavobolja, bolovi u mišićima, gubitak mirisa i ukusa, zapuštenost nosa. Teška klinička slika manifestuje se pneumonijom sa otežanim disanjem ili kratakim dahom, konfuzijom i bolovima u grudima i može se komplikovati respiratornom slabošću koja zahteva nadoknadu kiseonika ili mehaničku ventilaciju (21). Treba imati u vidu da ovo nije konačan spisak simptoma kovida i on zavisi od varijante virusa i vakcinalnog statusa pacijenta. Dostupni podaci ukazuju da se povišena telesna temperatura javlja kod 85-90% obolelih, suvi kašalj je prisutan kod dve trećine obolelih. U 15 - 40 % obolelih javljaju se bolovi u mišićima, zglobovima i glavobolja. Proliv, mučnina i povraćanje javljaju se kod 12 % obolelih, dok se gubitak ukusa i mirisa javlja kod 10% obolelih (22). U našem istraživanju, kao i kod drugih istraživanja, febrilnost je bila prisutna kod 73,6% obolelih, malaksalost 56,4%, kašalj kod 54,4%, bolovi u mišićima 24,7%, bolovi u zglobovima 18%, bol u grlu 15,9%, curenje iz nosa 15,9%, gubitak mirisa 9,3%, gubitak ukusa 7,6%, zapuštenost nosa 3,2% i proliv 2,9%.

Prema podacima Evropskog centra za prevenciju i kontrolu bolesti rizik od teške bolesti raste sa starenjem i prisustvom komorbiditeta (23,24). Veliki broj stanja je povezan sa teškim kliničkim ishodima u smislu prijema u bolnicu, jedinicu intenzivne nege i mortalitetom. U faktore rizika spadaju hipertenzija, dijabetes, hronična bolest bubrega, koronarna srčana bolest, hronična opstruktivna bolest pluća, cerebrovaskularna bolest i hronična bolest jetre, imunosupresivna terapija, aritmija, ishemijska bolest srca, srčana insuficijencija, rak i gojaznost (25,26). Naše istraživanje je pokazalo da je skoro ¼ obolelih od kovid-19 imalo bar jedan komorbiditet. Najčešći komorbiditeti su bili hipertenzija (62,1%), druge hronične bolesti ili stanja (12,6%), dijabetes (11,4%), gojaznost (4,8%), hronična plućna bolest (4,8%), kardiovaskularna bolest (3,4%) i maligna bolest (0,9%).

Prema nepublikovanim podacima Zavoda za javno zdravlje Pančevo, obuhvat imunizacijom koja podrazumeva najmanje dve doze vakcine protiv kovid-19 u Južnobanatskom okrugu je iznosio 48,4% krajem 2021. godine. Prema podacima Evropskog centra za prevenciju i kontrolu bolesti (ECDC) obuhvat imunizacijom vakcinama protiv kovida 19 razlikovao se značajno od zemlje do



in 2021, the highest incidence rates were recorded in the South Banat District (13,264.8/100,000), and in the Republic of Serbia in the Nišava District (17,447.7/100,000) (17).

In our study, in 2021, 34,912 cases of laboratory-confirmed SARS-CoV-2 infection were reported in the South Banat District, with the incidence rate of 11,885.7/100,000. Recorded incidence rates of COVID-19 differed by municipalities of South Banat District. The highest values were recorded in the municipalities of Kovačica (15,618.7/100,000), Opovo (15,483.9/100,000) and Alibunar (15,329.5/100,000), and the lowest were in the municipality of Plandište (9,235.3/100,000). These differences in incidence are partly the result of different organization of health service and reporting, and partly the result of different habits (e.g. in the municipality of Kovačica, which is mostly made up of Slovaks, they tend to maintain unity by gathering in smaller groups, etc.).

The number of cases and the incidence rates are not realistic and they are only “the tip of the iceberg”, considering that the significant number of SARS-CoV-2 infections remained unreported due to the large number of people who had a mild clinical picture or asymptomatic disease and they were not registered in the health system. This is supported by research on seroprevalence in the United States of America and Europe, which indicates that the incidence rate exceeds the incidence of reported cases by approximately 10 or more times (2-4).

The highest age-specific incidence rate in the Republic of Serbia in 2021 was recorded in the age group 15-19 years and it amounted to 12,121.1/100,000, while in the AP Vojvodina it was in the age group 40-49 years and amounted to 15,236.9/100,000. In our study, the highest age-specific incidence rates of COVID-19 were registered in the age group 40-49 years (16,040.9/100,000). The obtained incidence values were 3.2 times higher than the lowest ones registered in the age group 0-14 years (5,064.9/100,000). The age with the highest incidence rates was among the working population that had the largest number of contacts on the way to work and at work, and therefore there were most cases among this population.

In the South Banat District, women fell ill 1.2 times more often than men, and in the Republic of Serbia, 1.1 times more often (17). It is still not clear why women up to the age of 60 get COVID-19 more

often than men. It can be assumed that women report to the health care system more often, and also more women are employed in health care and other public institutions in comparison to men, and therefore, it may be the reason for their greater exposure. These results are similar to the results of other studies conducted in Europe (18,19).

In our study, the highest incidence rates of COVID-19 were recorded in the autumn months (September, October, November), while the lowest rates were in July 2021. All this indicates that COVID-19 will probably be a disease with a seasonal character, which corresponds to the frequency of appearance of respiratory viruses during colder months.

Data from 2020 showed that the majority of symptomatic patients had only mild or moderate disease (80%), while 15% had a severe form of disease with pneumonia and oxygen support, and 5% had a critical form of disease with complications such as respiratory failure, acute respiratory distress syndrome (ARDS), sepsis, septic shock, thromboembolism, and/or multiple organ failure, including renal and heart failure (20). In our study, 90.2% of patients had a mild clinical presentation, 8% severe and 1.8% had no symptoms of disease.

According to the WHO data, the most common symptoms that can occur 5-6 days after exposure are the following: elevated body temperature, cough, fatigue and weakness, headache, muscle pain, loss of smell and taste, nasal congestion. The severe clinical presentation is manifested by pneumonia with dyspnea or shortness of breath, confusion and chest pain and it can be complicated by respiratory failure that requires oxygen therapy or mechanical ventilation (21). It should be born in mind that this is not the final list of COVID-19 symptoms and it depends on the variant of the virus and the vaccination status of the patient. Available data indicate that elevated body temperature occurs in 85-90% of patients, while dry cough is present in two thirds of patients. Pain in muscles, joints and headache occur in 15-40% of patients. Diarrhea, nausea and vomiting occur in 12% of patients, while loss of taste and smell appears in 10% of patients (22). In our study, as in other studies, fever was present in 73.6% of patients, malaise in 56.4%, pain in muscles in 24.7%, pain in joints in 18%, sore throat in 15.9%, rhinorrhea in 15.9%, loss of smell in 9.3%, loss of taste in 7.6%, nasal congestion in 3.2% and diarrhea in 2.9%.

zemlje (npr. Bugarska 33,2%, Rumunija 48,6%, Hrvatska 63,1%, Mađarska 69,9%, Italija 84%) (27). Naši podaci su pokazali da je samo 17,9% obolelih od kovid-19 u Južnobanatskom okrugu 2021. godine bilo imunizovano (primili su dve doze kovid-19 vakcine, a bolest je nastala 14 dana nakon druge doze). Od svih potpuno imunizovanih obolelih pacijenata 69,9% njih je primilo Sinopharm vakcinu, 16% PfizerBiontek, 10,9% Sputnik V i 3,2% Astra Zeneku. Ovako visok procenat zastupljenosti Sinopharm vakcine može se objasniti preporukom Stručnog komiteta za imunizaciju - Nacionalnog tela za imunizaciju (NITAG), na osnovu koga je sačinjeno prvo stručno-metodološko uputstvo za sprovođenje vanredne preporučene imunizacije protiv kovid - 19 (SMU) u Republici Srbiji, početkom 2021. godine, kada se starijim osobama preko 60 godina i osobama sa komorbiditetima preporučivala ova vakcina.

## Zaključak

Rezultati dobijeni u ovom istraživanju su značajni za planiranje preventivnih i protivepidemijskih mera za sprečavanje nastanka i širenja kovid-19 bolesti u Južnobanatskom okrugu u budućnosti, kao i u cilju što bolje organizacije zdravstvene službe, a sve radi redukcije obolevanja od SARS CoV-2 infekcije i hospitalizacije. Neophodno je stalno raditi na edukaciji stanovništva o važnosti imunizacije, a pogotovo osoba koje imaju veći rizik od razvoja teže forme bolesti. Neophodna su dalja istraživanja u ovoj oblasti u cilju definisanja prediktora za nastanak teže forme kovid-19 bolesti.

## Konflikt interesa

Autori su izjavili da nema konflikta interesa.

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According to the data of the European Center for Disease Prevention and Control, the risk of severe disease increases with age and the presence of comorbidities (23,24). A large number of conditions are associated with severe clinical outcomes in terms of admission to hospital, intensive care unit and mortality. Risk factors include hypertension, diabetes, chronic kidney disease, coronary heart disease, chronic obstructive pulmonary disease, cerebrovascular disease and chronic liver disease, immunosuppressive therapy, arrhythmia, ischemic heart disease, heart failure, cancer and obesity (25,26). Our study showed that almost one fourth of patients with COVID-19 had at least one comorbidity. The most common comorbidities were hypertension (62.1%), other chronic diseases or states (12.6%), diabetes (11.4%), obesity (4.8%), chronic lung disease (4.8%), cardiovascular disease (3.4%) and malignant disease (0.9%).

According to the unpublished data of the Public Health Institute Pančevo, immunization coverage, which includes at least two doses of the vaccine against COVID-19, in the South Banat District was 48.4% at the end of 2021. According to data of the European Center for Disease Prevention and Control (ECDC), the coverage of immunization with vaccines against COVID-19 differed significantly from country to country (e.g. Bulgaria 33.2%, Romania 48.6%, Croatia 63.1%, Hungary 69.9%, Italy 84%) (27). Our data showed that only 17.9% of patients in the South Banat District were immunized (they received two doses of COVID-19 vaccine, and the disease occurred 14 days after the second dose). Of all completely immunized patients, 69.9% of them received the Sinopharm vaccine, 16% Pfizer Biontek, 10.9% Sputnik V, and 3.2% Astra Zeneca. Such a high percentage of Sinopharm vaccine can be explained by the recommendation of the Expert Committee for Immunization – National Immunization Technical Advisory Group (NITAG), based on which the first expert methodological instruction for the implementation of the emergency recommended immunization against COVID-19 in the Republic of Serbia at the beginning of 2021, when this vaccine was recommended to people older than 60 and people with comorbidities.

## Conclusion

The results of this study are important for the planning of anti-epidemic measures for the

prevention of occurrence and spreading of COVID-19 in the South Banat District in the future, as well as for the purpose of better organization of health service, which is aimed at reducing the incidence of SARS-Cov-2 infection and hospitalization. It is necessary to constantly work on educating the population about the importance of immunization, especially people who are at increased risk of developing severe forms of disease. Further research in this field is necessary in order to define the predictors for the occurrence of severe forms of COVID-19.

## Competing interests

The authors declared no competing interests.

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