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PRIHVATANJE KOVID-19 VAKCINA MEĐU STUDENTIMA MEDICINE PRETKLINIČKE I KLINIČKE NASTAVE

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SAŽETAK

Uvod/Cilj: Zdravstveni radnici i studenti medicine su imali važnu ulogu u pandemiji virusa KOVID-19, pa su njihova odgovornost, znanje i stavovi o vakcinaciji bili veoma značajni. Cilj ovog istraživanja bio je da ispita šta utiče na prihvatanje KOVID-19 vakcina među studentima medicine prema godini studija.
Metod: U ovoj studiji preseka učestvovalo je 730 studenata Medicinskog fakulteta Univerziteta u Beogradu, od kojih su 332 studenti na trećoj godini koji pohađaju nastavu na pretkliničkim predmetima (45,5%) i 398 (54,5%) studenti na šestoj godini koji pohađaju nastavu na kliničkim predmetima. Studija je sprovedena u periodu od 1. decembra 2022. godine do 31. januara 2023. godine. U istraživanju je korišćen posebno dizajniran upitnik koji su studenti popunjavali anonimno i na dobrovoljnoj bazi.
Rezultati: Najveći broj studenata se izjasnio da nikada nisu bili zaraženi KOVID-19 (63,0%). Studenti šeste godine su bili značajno više vakcinisani (94,5% vs 87,3%, p=0,001). Kao najčešći razlog za vakcinaciju studenti navode želju da zaštite ljude oko sebe (64% pretklinički i 71% klinički, p=0,594), dostupnost vakcine (27% pretklinički i 33% klinički, p=0,407) i preporuke zdravstvenih radnika (30% pretklinički i 27% klinički p=0,111). Najčešći razlog za odbijanje vakcine navode sumnju da vakcine nisu dovoljno ispitane (52% pretklinički i 59% klinički, p=0,792) i strah od neželjenih efekata vakcine (26% and 50%, p=0,059). Studenti koji su pohađali nastavu na kliničkim predmetima su značajno češće redovno pratili informacije o KOVID-19 vakcinama i informisali se putem interneta u odnosu na studente koji su pohađali nastavu na pretkliničim predmetima.
Zaključak: Dobijeni rezultati pokazuju visok obuhvat vakcinacijom među studentima obe ispitivane grupe. Pravovremeno i tačno informisanje putem medija i društvenih mreža može doprineti sprečavanju dezinformacija i i sprovođenju javnozdravstvenih kampanja.

Ključne reči: KOVID-19, studenti medicine, vakcine

Uvod

Nakon otkrivanja pneumonije nepoznate etiologije, Svetska zdravstvena organizacija (SZO) je 11. marta 2020. godine proglasila pandemiju Kovida-19 koja je postala ozbiljna pretnja javnom zdravlju, pre svega zbog visoke zaraznosti i virulencije virusa (1). Dramatičan porast slučajeva bolesti i smrti doveo je do zatvaranja škola, fakulteta i ograničenja slobode kretanja. Mere prevencije i zaštite poput dezinfekcije , socijalne distance i nošenja maski bile su jedini način da se uspori infekcija da bi se zaštitilo stanovništvo i sačuvao preopterećeni zdravstveni sistem (2). Sve ove promene predstavljale su novinu i otežavajući faktor u nastavi i za studente i za nastavno osoblje u mnogim zemljama (3).

Studenti predstavljaju visoko obrazovanu populaciju, koja je uz to veoma informisana i vrlo aktivna po pitanju kretanja, migracija i slično, što zasigurno doprinosi lakšem širenju virusa. Studije medicine na Medicinskom fakultetu u Beogradu su koncipirane tako da se tokom prve tri godine

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COVID-19 VACCINATION ACCEPTANCE AMONG PRECLINICAL AND CLINICAL MEDICAL STUDENTS

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SUMMARY

Introduction/Aim: Health workers and medical students played an important role in the COVID-19 pandemic, so their responsibility, knowledge and attitudes towards vaccination were very important in the pandemic. The aim of this study was to examine COVID-19 vaccination acceptance among medical students according to their year of study.
Methods: In this cross sectional study730 students of the Faculty of Medicine of the University of Belgrade participated, of which 332 were preclinical students (45.5%) and 398 (54.5%) clinical students. The study was conducted between December 1, 2022 and January 31, 2023 based on a specially designed questionnaire, which the students filled out anonymously and on a voluntary basis.
Results: The largest number of students declared that they have never been infected with COVID-19 (63.0%). Clinical students were significantly more vaccinated (94.5% vs 87.3%, p=0.001). As the most common reasons for vaccination, students state the desire to protect the people around them (64% preclinical and 71% clinical, p=0.594), availability of vaccine (27% preclinical and 33% clinical, p=0.407) and recommendation by healthcare workers (30% preclinical and 27% clinical, p=0.111). The most common reasons for not receiving the vaccine were the suspicion that the vaccines have not been tested enough (52% preclinical and 59% clinical, p=0.407) and the fear of side effects (26% and 50%, p=0.059). Clinical medical students significantly more often regularly followed information about COVID-19 vaccine and received information from the Internet in comparison with preclinical students.
Conclusion: The obtained results show a high coverage of vaccination among preclinical and clinical medical students. Timely and accurate information through the media and social networks can contribute to preventing misinformation and help the public health system in future challenges and campaigns.

Keywords: COVID-19, medical students, vaccine

Introduction

After the discovery of pneumonia of unknown etiology, the World Health Organization (WHO) declared a pandemic of COVID-19 on March 11, 2020 which has become a serious threat to public health, primarily due to the high contagiousness and virulence of the virus (1). The dramatic increase in illness and death cases led to the closing of schools, colleges, and restrictions on freedom of movement. Prevention and protection measures such as disinfection, social distancing and wearing masks were the only way to slow down the infection in order to protect the population and preserve the overburdened health system (2). All these changes were a novelty and a difficult teaching factor for both students and teaching staff in many countries (3).

Students represent a highly educated population that is, in addition, very informed and very active in terms of movement, migration, etc. which certainly contributes to the easier spread

studija stiču znanja iz osnovnih, pretkliničkih predmeta, a od četvrte godine studija studenti pohađaju nastavu na kliničkim predmetima, što uključuje obilaženje bolnica i rad sa pacijentima. Dosadašnje studije su uglavnom ispitivale obuhvat vakcinacijom, znanje i stavove studenata o vakcinama uopšte, dok je mali broj studija upoređivao studente u odnosu na godinu studija, naročito na Medicinskom fakultetu (4,5). Visoka učestalost i mortalitet zahtevali su uključivanje dodatnog medicinskog osoblja i studenata u zdravstveni sistem dok vakcina nije pronađena i isporučena. Čak i pre početka pandemije, SZO je odbijanje vakcinacije svrstala među deset najvažnijih problema javnog zdravlja (6).

Na početku vakcinacije u Srbiji odobrena je upotreba četiri vakcine: Fajzer Biontek, Oksford-AstraZeneka, Sputnjik V i Sinofarm. Vakcina proizvođača Moderna je uvedena kasnije, u novembru 2021. godine. Najveći broj studija bavio se proučavanjem faktora rizika koji dovode do bolesti i načina prenošenja, kao i kliničkim manifestacijama, odnosno povezanošću sa težinom bolesti (7,8), dok je manji broj studija u svetu pratio stavove i prihvatanje vakcine među studentima medicine i zdravstvenim radnicima uopšte.

Cilj ove studije bio je da se ispitaju faktori koji utiču na prihvatanje vakcinacije protiv Kovida-19 među studentima medicine prema godini studija.

Metode

Ovom studijom preseka obuhvaćeno je 730 studenata Medicinskog fakulteta Univerziteta u Beogradu, od kojih su 332 (45,5%) studenti koji su pohađali nastavu na pretkliničkim predmetima (treća godina studija), a 398 (54,5%) studenti koji su pohađali nastavu na kliničkim predmetima (šesta godina studija). Studija je sprovedena tokom decembra 2022. i januara 2023. godine.

U ovom istraživanju je korišćen posebno dizajniran upitnik koji su studenti popunjavali anonimno i na dobrovoljnoj bazi. Pre popunjavanja upitnika obavešteni su o svrsi istraživanja. Epidemiološki upitnik, kao instrument merenja, sadržao je 12 pitanja koja se odnose na stavove i ponašanje studenata medicine u vezi sa vakcinacijom protiv Kovida-19. Pored sociodemografskih pitanja vezanih za pol, starost i mesto stanovanja, upitnik je sadržao pitanja koja su se odnosila na vakcinalni status, razloge za/protiv vakcinacije, izbor vakcine, buduće planove vakcinacije, mišljenje o tome za koje stanovništvo vakcina protiv Kovida-19 treba da bude obavezna, da li su oboleli i kako su dobijali informacije o vakcinama protiv Kovida-19.

U statističkoj analizi podataka korišćen je hi kvadrat test. Vrednosti $p < 0,05$ smatrane su statistički značajnom razlikom. Svi podaci su analizirani uz pomoć programa SPSS, verzija 23.

Rezultati

Prosečna starost učesnika studije bila je 23,00+1,85 godine, a 502 (68,8%) su bile žene. Najveći broj studenata izjasnio se da nikada nisu bili zaraženi Kovidom-19 (63,0%) (Tabela 1). Otprilike polovina učesnika bili su studenti šeste godine medicine.

Studenti koji su pohađali nastavu na kliničkim predmetima bili su vakcinisani u značajno vecem

Tabela 1. Demografske karakteristike studenata medicine i njihov KOVID-19 status

Karakteristike	**N = 730** **x±SD / N (%)**
Godine (opseg 20-35) (x±SD)	23,00±1,85
Pol, N (%)	
Muški	228 (31,2)
Ženski	502 (68,8)
Trenutna godina, N (%)	
Preklinički	332 (45,5)
Klinički	398 (54,5)
Da li ste ikada bili zaraženi Kovid-19? N (%)	
Da	123 (37,0)
Ne	209 (63,0)

of the virus. Medical studies at the Faculty of Medicine in Belgrade are designed so that in the first three years, knowledge is acquired from basic, pre-clinical subjects, so that from the fourth year of study students attend clinical subjects that include circulating in hospitals and working with patients. Previous studies have mainly examined the vaccination rate, knowledge and attitudes of students about vaccines in general, while a small number of studies have compared students in relation to years of study, especially at the Faculty of Medicine (4,5). The high frequency and mortality required the inclusion of additional medical staff and students in the health system until a vaccine was found and delivered. Even before the start of the pandemic, the WHO classified vaccination refusal as one of the ten most important public health problems (6).

The use of four vaccines: Pfizer-BioNTech, Oxford-AstraZeneca, Sputnik V and Sinopharm were approved in Serbia at the beginning of the vaccine roll-out. Moderna vaccine was introduced later, in November 2021. The largest number of studies dealt with the study of risk factors that lead to the disease and ways of transmission as well as clinical manifestations, i.e. the relationship with the severity of the disease (7,8), while smaller number of studies in the world followed attitudes and vaccine acceptance among medical students and health workers in general.

The aim of this study was to examine factors impacting COVID-19 vaccination acceptance among medical students according to their year of study.

Methods

This cross sectional studyincluded 730 students of the Faculty of Medicine of the University of Belgrade, of which 332 (45.5%) were preclinical students (third year of study), and 398 (54.5%) clinical students (sixth year of study). The study was conducted during December 2022 and January 2023.

In the research, a specially designed questionnaire was used, which the students filled out anonymously and on a voluntary basis. Before filling in, they were informed about the purpose of the research. The epidemiological questionnaire, as a measurement instrument, contained 12 questions related to the attitudes and behavior of medical students regarding vaccination against COVID-19. In addition to sociodemographic questions related to gender, age and place of residence, the questionnaire also contained questions related to vaccination status, reasons for/against vaccination, choice of vaccine, future vaccination plans, opinion for which population COVID -19 vaccine was supposed to be mandatory, did they suffer from COVID-19 and how did they get information about COVID-19 vaccines.

Chi square test was used in data analysis. A statistically significant difference was considered at the $p < 0.05$ level. All data were analyzed using SPSS version 23.

Results

The average age of study participants was 23.00±1.85 years, and 502 (68.8%) were women. The largest number of students declared that they

Table 1. Demographic characteristic of medical students and their COVID-19 infection status

Karakteristike	N = 730 x±SD / N (%)
Age (range 20-35) (x±SD)	23.00±1.85
Gender, N (%)	
Male	228 (31.2)
Female	502 (68.8)
Current year, N (%)	
Preclinical	332 (45.5)
Clinical	398 (54.5)
Have you ever been infected with COVID-19? N (%)	
Yes	123 (37.0)
No	209 (63.0)

Tabela 2. Stavovi studenata medicine o vakcinaciji protiv KOVID-19 u odnosu na godinu studija

Karakteristike ispitanika	Preklinički N=332 N (%)	Klinički N=398 N (%)	P vrednost
Vakcinisani protiv Kovida-19:			
Nisam primio vakcinu	42 (12,7)	22 (5,5)	<0,001
Fajzer-Biontek	179 (53,9)	174 (46,3)	
Oksford-AstraZeneka	1 (0,3)	3 (0,8)	
Sputnik V	13 (3,9)	34 (9,0)	
Sinofarm	71 (21,4)	106 (28,2)	
Sinofarm+Fajzer Biontek	21 (6,3)	54 (14,4)	
Sputnik+Fajzer Biontek	5 (1,5)	5 (1,3)	
Verujem lekarima i drugim zdravstvenim radnicima kada preporučuju vakcinu protiv Kovida-19	185 (73,4)	286 (75,3)	0,641
Verujem Vladi i Ministarstvu zdravlja kada preporučuju vakcinu protiv KOVID-19	228 (68,7)	270 (67,8)	0,873
Verujem poznatim ličnostima kada preporučuju vakcinu protiv KOVID-19	38 (11,5)	44 (11,1)	0,906
Verujem profesorima na Medicinskom fakultetu kada preporučuju vakcinu protiv KOVID-19	281 (84,9)	326 (81,9)	0,319
Redovno pratim informacije o vakcinama protiv KOVID-19	110 (33,1)	161 (40,5)	0,046
Verujem da je vakcina najbolja mera prevencije za KOVID-19	246 (74,5)	278 (69,8)	0,185
Verujem da je vakcina protiv KOVID-19 sigurna	225 (68,4)	265 (66,6)	0,634
Verujem da nisam u opasnosti od teškog oblika KOVID-19	231 (69,6)	270 (70,1)	0,935
Mislim da vakcine protiv KOVID-19 nisu testirane dovoljno dugo vremena	105 (31,7)	153 (38,4)	0,062
Vakcinacija protiv KOVID-19 treba da bude obavezna za sve zdravstvene radnike	273 (82,7)	315 (80,2)	0,390
Vakcinacija protiv KOVID-19 treba da bude obavezna za studente medicine	238 (72,3)	291 (73,9)	0,674
Vakcina protiv KOVID-19 treba da bude obavezna za opštu populaciju	183 (56,0)	218 (55,3)	0,881

p vrednost za hi kvadrat test

procentu (94,5% vs 87,3%, p=0,001). Najveći broj studenata primio je vakcinu Fajzer/Biontek, od kojih je 53,9% bilo na trećoj godini studija, a 46,3% na šestoj godini studija. Studenti kliničke nastave su značajno češće pratili redovno informacije o vakcini protiv Kovida-19. Stavovi studenata u vezi sa vakcinacijom nisu se razlikovali u odnosu na godinu studija (Tabela 2).

Kao najčešći razlog za vakcinaciju, studenti su navodili nameru da zaštite ljude oko sebe (64% studenata pretkliničkih predmeta i 71% studenata kliničkih predmeta, p=0,594) (Grafikon 1). Najčešći razlog za neprimanje vakcine bila je sumnja da vakcine nisu dovoljno ispitane (52% studenata pretkliničke i 59% studenata kliničke nastave, p=0,792), kao i strah od neželjenih reakcija na vakcinu (26% i 50%, p=0,059) (Grafikon 2).

Studenti koji su pohađali nastavu na kliničkim predmetima su značajno češće dobijali informacijje sa Interneta u odnosu na studente pretkliničke nastave (59% vs 41%, p=0,001) (Grafikon 3).

Diskusija

Većina studenata je vakcinisana protiv Kovida-19 (87,3% pretkliničkih i 94,5% kliničkih). Najveći broj studenata je primio Fajzer/Biontek vakcinu. Moguće je da se većina studenata opredelila za ovu vakcinu da bi mogli da putuju u inostranstvo jer Sputnjik V i Sinofarm nisu dobili odobrenje Evropske agencije za lekove. Iako je obuhvat vakci-

Table 2. Attitudes of medical students regarding the COVID-19 vaccination in relation to the year of study

Karakteristike ispitanika	Preclinical N=332 N (%)	Clinical N=398 N (%)	P value
Vaccinated against COVID-19:			
I did not receive vaccine	42 (12.7)	22 (5.5)	<0.001
Pfizer/BioNTech	179 (53.9)	174 (46.3)	
Oxford-AstraZeneca	1 (0.3)	3 (0.8)	
Sputnik V	13 (3.9)	34 (9.0)	
Sinopharm	71 (21.4)	106 (28.2)	
Sinopharm+Phizer/BioNTech	21 (6.3)	54 (14.4)	
Sputnik+Pfizer/BioNTech	5 (1.5)	5 (1.3)	
I trust doctors and other healthcare workers when they recommend COVID-19 vaccine	185 (73.4)	286 (75.3)	0.641
I trust Government and Ministry of Health when they recommend COVID-19 vaccine	228 (68.7)	270 (67.8)	0.873
I trust celebrities when they recommend COVID-19 vaccine	38 (11.5)	44 (11.1)	0.906
I trust university teachers at the Faculty of Medicine when they recommend the COVID-19 vaccine	281 (84.9)	326 (81.9)	0.319
I regularly follow information about COVID-19 vaccine	110 (33.1)	161 (40.5)	0.046
I believe that the best preventive measure for COVID-19 is getting vaccinated	246 (74.5)	278 (69.8)	0.185
I believe that COVID-19 vaccines are safe	225 (68.4)	265 (66.6)	0.634
I believe that I am not at risk for severe COVID-19	231 (69.6)	270 (70.1)	0.935
I think that the COVID-19 vaccines were not tested for enough time	105 (31.7)	153 (38.4)	0.062
COVID-19 vaccination should be mandatory for all healthcare providers	273 (82.7)	315 (80.2)	0.390
COVID-19 vaccination should be mandatory for medical students	238 (72.3)	291 (73.9)	0.674
COVID-19 vaccination should be mandatory for the general population	183 (56.0)	218 (55.3)	0.881

p value for chi square test

have never been infected with COVID-19 (63.0%) (Table 1). About half of participants were sixth-year medical students.

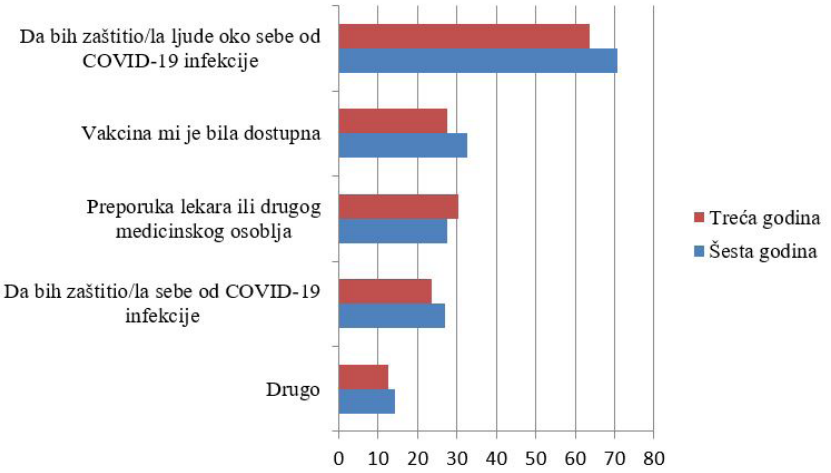
Clinical students were vaccinated at a significantly higher rate (94.5% vs. 87.3%, p= 0.001). The largest number of students received the Pfizer/BioNTech vaccine, of which 53.9% in the third-year and 46.3% in the sixth-year. Clinical studies students significantly more often followed regularly information about COVID-19 vaccine. The attitudes of students in relation to vaccination did not differ in relation to the year of study (Table 2).

As the most common reasons for vaccination, students state the intention to protect the people around them (64% preclinical and 71% clinical, p=0.594) (Figure 1). The most common reason for not receiving the vaccine were the suspicion that the vaccines have not been tested enough (52% preclinical and 59% clinical, p=0.792), and the fear of side effects of the vaccine (26% and 50%, p=0.059) (Figure 2).

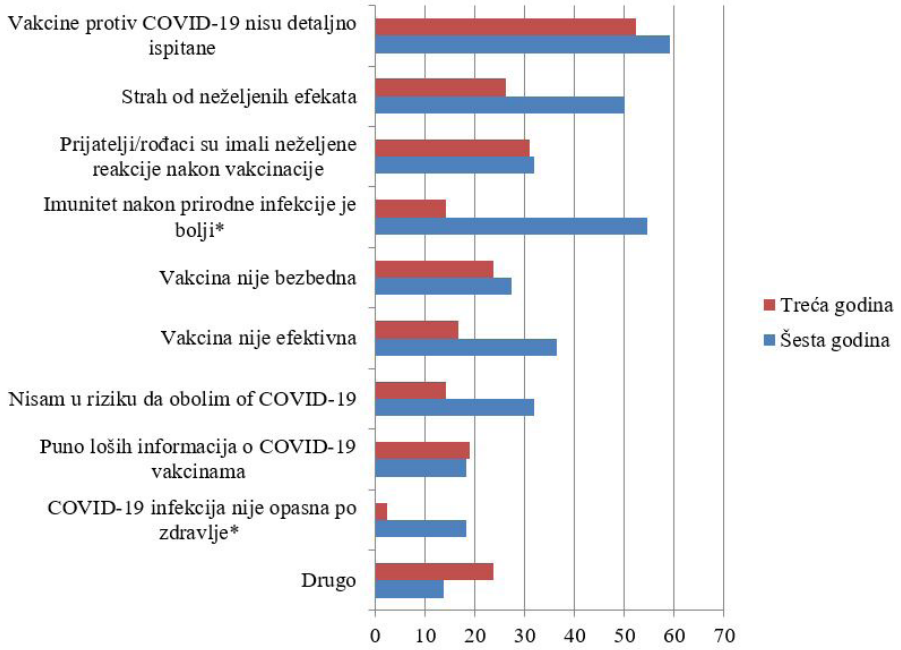
Clinical students significantly more often received information from the Internet in comparison with preclinical medical students (59% vs 41%, p=0.001) (Figure 3).

Discussion

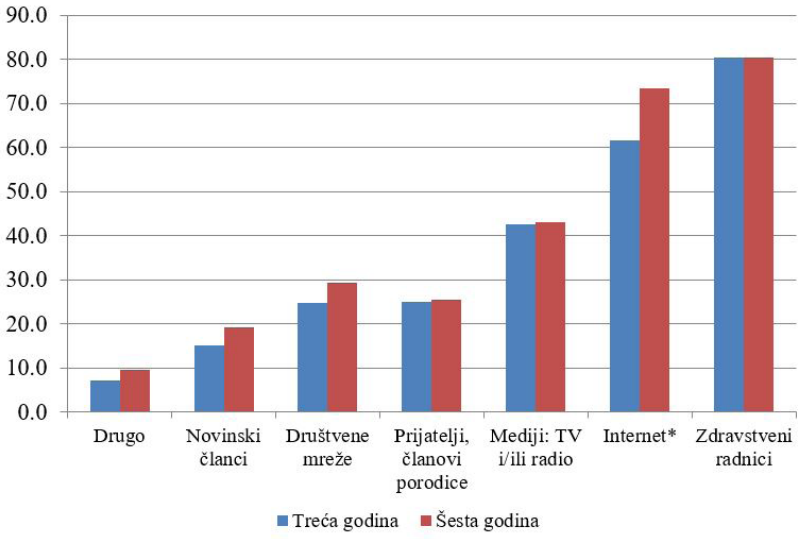
The majority of students were vaccinated against COVID-19 (87.3% preclinical and 94.5%



Grafikon 1. Razlozi za vakcinaciju protiv KOVID-19



Grafikon 2. Razlozi za nevakcinaciju protiv KOVID-19



Grafikon 3. Izvori informacija o KOVID-19

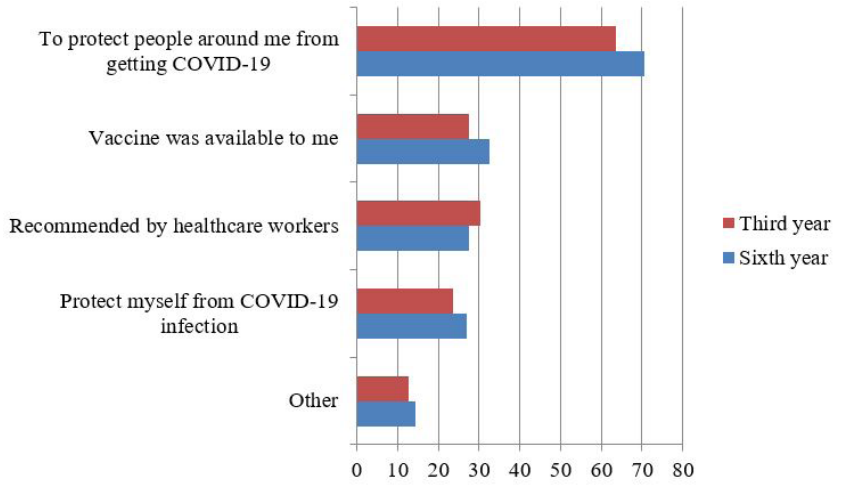


Figure 1. Self-reported reasons for vaccination against COVID-19

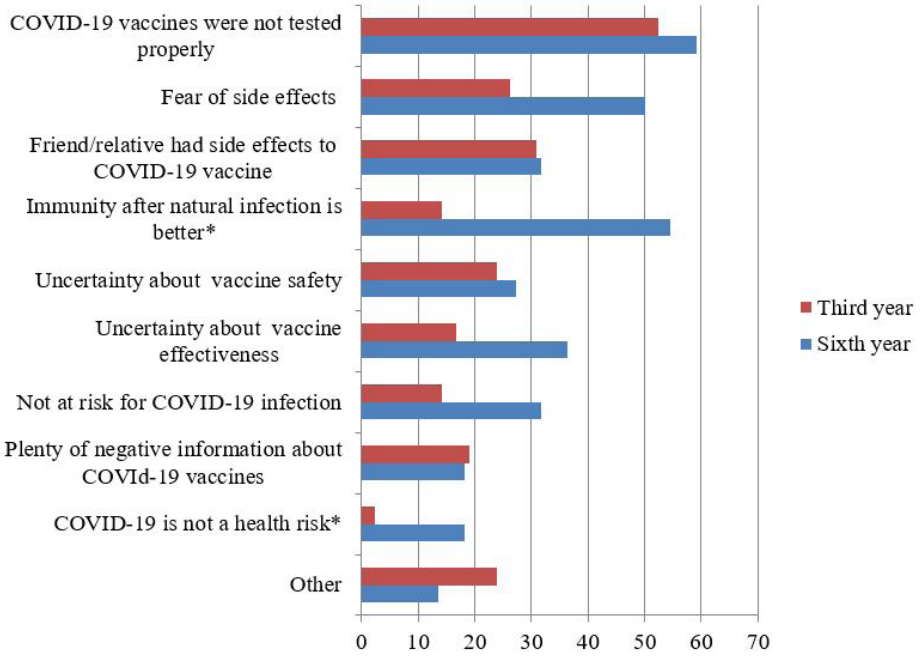


Figure 2. Self-reported reasons for non- vaccination against COVID-19

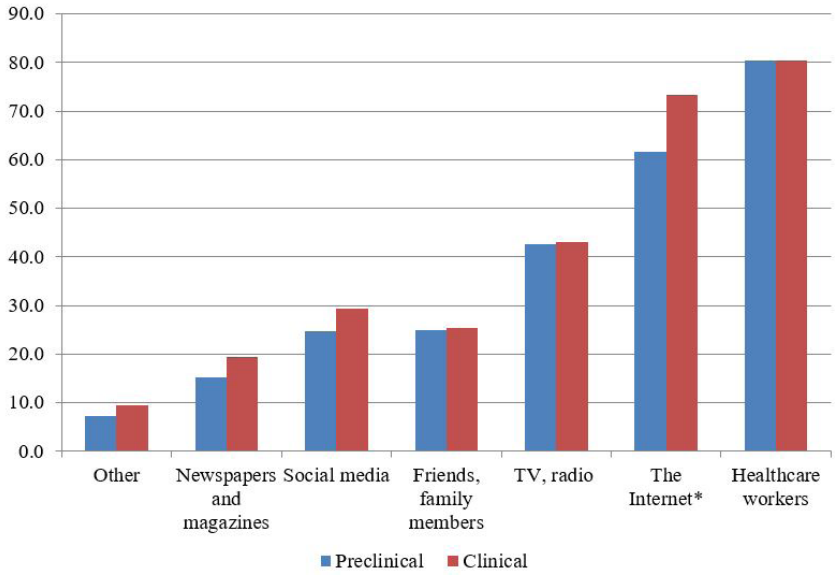


Figure 3. COVID-19 sources of information

nacijom bio visok u obe grupe, studenti kliničke nastave su bili značajno više vakcinisani. Studenti koji su pohađali nastavu na kliničkim predmetima imali su veću stopu vakcinacije zbog boljeg znanja i rada sa pacijentima. Prema SZO, neodlučnost po pitanju vakcinacije definiše se kao odlaganje da se prihvati ili odbije vakcinacija uprkos dostupnosti usluga vakcinacije (9). Stopa vakcinacije među studentima medicine je viša u poređenju sa opštom populacijom (10) i studentima koji ne studiraju medicinu (11). Mnoge studije su pokazale visok obuhvat vakcinacije u populaciji studenata medicine (12-16), što je veoma važno za zaštitu sopstvenog zdravlja i zdravlja pacijenata (17). Nekoliko studija je pokazalo da su stope neodlučnosti da se vakcinišu značajno više kod studenta koji su pohađali nastavu na pretkliničkim predmetima (58,3% do 90%) u poređenju sa studentima koji su pohađali nastavu na kliničkim predmetima (10% do 41,7%) (18,19).

Studenti kliničke nastave su značajno redovnije pratili informacije o vakcini protiv Kovida-19. Obe grupe studenata su verovale zdravstvenim radnicima i zdravstvenim vlastima kada su preporučivali vakcinu protiv Kovida-19 i druge mere. Iako su studenti kliničkih predmeta svojim nastavnim planom i programom bili obavezni da budu vakcinisani, odnosno da dostave potvrdu o prethodnim bolestima radi zaštite pacijenata sa kojima dolaze u kontakt, podaci o visokom stepenu poverenja u proverene i zvanične informacije ukazuju na visok stepen poverenja u zdravstveni sistem i odgovornost. U ovoj situaciji, pokazana je želja za humanošću i nastavkom obrazovanja studenata kliničke i pretkliničke nastave. U studiji Habiba i saradnika, kojom je obuhvaćeno 1445 studenata medicine, došlo se do zaključka da 22,6% studenata nije verovalo informacijama zdravstvenih vlasti o vakcini i da postoji razlika u poverenju u preporuke Ministarstva zdravlja u odnosu na godinu studija, odnosno da su studenti sa pretkliničkih predmeta imali manje poverenja u zdravstvene vlasti (20). Zdravstveni radnici su najvažniji faktor koji utiče na prihvatanje vakcinacije kod ostalih grupa (21).

Većina studenata veruje da je vakcina najbolja preventivna mera za Kovid-19 i da bi trebalo da bude obavezna za sve pružaoce zdravstvenih usluga. Nešto manji broj studenata smatra da bi vakcinacija trebalo da bude obavezna za studente medicine, dok su mišljenja podeljenja kada je u pitanju obavezna vakcinacija za opštu populaciju.

Iako je vakcinacija bila veća među studentima koji su pohađali nastavu na kliničkim predmetima, oni su izrazili veću bojazan da vakcina nije dovoljno dugo testirana pre upotrebe. Osim toga, studenti kliničkih studija su značajno češće navodili da je prirodno stečen imunitet bolji i da Kovid-19 ne predstavlja ozbiljni rizik po njihovo zdravlje. Ono što je bilo iznenađujuće, ali ne i neočekivano, Srbija je bila jedna od prvih zemalja koje su počele vakcinaciju stanovništva, a sasvim je izvesno da u to vreme nije bilo adekvatnih informacija o vakcinama, i postojala je mogućnost da studenti i celo stanovništvo budu izloženi pritisku i dezinformacijama. Strah od neželjenih efekata vakcinacije uočen je i kod studenata medicine i u opštoj populaciji (17). Rezultati o stavovima o obaveznoj vakcinaciji među zdravstvenim radnicima, studentima medicine i opštom populacijom su kontradiktorni. *Rodger* ovo tumači kao nepoverenje u farmaceutsku industriju i strah od mogućih neželjenih efekata vakcine (22). Sumnje i strahovi su porasli kada su mnoge zemlje odlučile da obustave korišćenje vakcina Oksford/AstraZeneka i Džonson i Džonson zbog niskog rizika od tromboze, dok su mRNK vakcine dovođene u vezu sa blagim slučajevima miokarditisa (23). Sa druge strane, oprezan stav lekara i studenata medicine prema obaveznoj vakcinaciji može da se tumači kao strah od ograničavanja ljudskih prava i sloboda (24). *Politis* i saradnici ukazuju da 50% zdravstvenih radnika ima pozitivan stav prema obaveznoj vakcinaciji opšte populacije, što korelira sa rezultatima naše studije (25). Dodatnu zabunu izazvao je nedostatak svesti o obaveznoj vakcinaciji zdravstvenih radnika u Evropi. Nekoliko evropskih zemalja (na primer, Italija, Nemačka, Grčka, Francuska i Poljska) primenile su obaveznu vakcinaciju protiv Kovida-19, dok druge zemlje (Češka Republika i Ujedinjeno Kraljevstvo) nisu primenile obaveznu vakcinaciju zdravstvenih radnika (26).

Uzimajući u obzir ukupnu situaciju i značaj buduće profesije, 73,8% studenata medicine navelo je kao najvažniji razlog vakcinisanja namera da zaštite ljude oko sebe. U ovoj studiji nisu prikupljani podaci o infekcijama rođaka ili bliskih prijatelja studenata obolelih od Kovida-19, ali je postojanje ovakvog razloga zasigurno doprinelo ovom stavu u vezi sa željom da se vakcinišu studenti medicine. Osim toga, obaveza pohađanja nastave za osobe koje su već narušenog zdravlja zbog mnogih bolesti, ili koje rade direktno u okruženju

clinical). The largest number of students received the Pfizer/BioNTech vaccine. It is possible that the majority of students chose this vaccine in order to be able to travel abroad, because Sputnik V and Sinopharm were not approved by the European Medicines Agency. Although vaccination coverage was high in both groups, clinical students were significantly more vaccinated. Clinical students showed a higher vaccination rate due to their better knowledge and conection with patients. According to the WHO, vaccine hesitancy is defined by delay in acceptance or refusal of vaccination despite availability of vaccination services (9). Vaccination rate among medical students is higher than in the general population (10) and non-medical students (11). Many studies showed high vaccination coverage in the population of medical students (12-16), which is very important for protection of their own health, and health of the patients (17). Several studies showed that rates of vaccine hesitancy were significantly higher in pre-clinical medical students (58.3% to 90%) compared to clinical students (10% to 41.7%) (18,19).

Clinical students were significantly more regularly following information about the COVID-19 vaccine. Both groups of students trusted healthcare workers and health authorities when they recommend COVID-19 vaccine and other measures. Although students in clinical courses were required by their curriculum to be vaccinated, or to present a certificate of past illnesses to protect the patients they come into contact with, the data on the high degree of trust in verified and official information indicates a high degree of trust in the health system and responsibility. In this situation, they are showing a desire for humanity and the continuation of the education of both students in clinical and pre-clinical subjects. In the study by Habib et al., which included 1445 medical students, it was concluded that 22.6% of students did not trust the information of the health authorities about the vaccine and that there is a difference in trust in the recommendations of the Ministry of Health in relation to the years of study, i.e. students of preclinical subjects had less trust in health authorities (20). Healthcare workers are the most important factors that influence the acceptance of vaccination among the others (21).

Most students believe that the vaccine is the best preventive measure for COVID-19, and should be mandatory for all healthcare providers. A slightly smaller number of students considered that vaccine should be mandatory for medical students, while opinions are divided about mandatory vaccination for the general population.

Although vaccination was higher among clinical students, they expressed a greater fear that the vaccine was not tested long enough before use. In addition, clinical students significantly more often stated that immunity after natural infection is better and that COVID-19 is not a severe health risk. That this data is surprising, but not unexpected, Serbia was one of the first countries to start vaccinating the population, and it is quite certain that there was no adequate information about vaccines at that time, and there was a possibility that students and the entire population were exposed to pressure and disinformation. Fear of vaccination side effects was found both in medical students and the general population (17). The results on the attitudes of mandatory vaccination among healthcare workers, medical students and the general population are contradictory. Rodger interprets this as distrust in the pharmaceutical industry and fear of possible vaccine side effects (22). Doubts and fears grew when many countries decided to suspend the Oxford/AstraZeneca and Johnson & Johnson vaccines because of the low risk of blood clots, while the mRNA vaccines were linked to mild cases of myocarditis (23). On the other hand, the cautious attitude of doctors and medical students towards mandatory vaccination can be interpreted as a fear of limiting human rights and freedoms (24). Politis et al. suggest that the attitude of health workers towards mandatory vaccination of the general population is 50%, which correlates with our results (25). Additional confusion was caused by the lack of awareness in Europe regarding the mandatory vaccination of healthcare workers. Several European countries (e.g. Italy, Germany, Greece, France and Poland) implemented mandatory vaccination against COVID-19, while others (e.g. the Czech Republic and United Kingdom) have not implemented compulsory vaccination for health workers (26).

Considering the overall situation and the importance of the future profession, 73.8% of medical students cited the intention to protect the people around them as the most important reason. This study did not collect data on the infections of relatives or close friends of students with COVID-19, but the existence of such a reason certainly

obolelih od Kovida-19, kao i zaštita prijatelja sigurno su doprineli ovom stavu i bile su motivišući faktor da se prihvati vakcinacija.

Studenti su kao najčešći razlog za odbijanje vakcinacije naveli sumnju da vakcine nisu dovoljno ispitane (52% studenata pretkliničkih i 59% studenata kliničkih studija), kao i strah od neželjenih reakcija na vakcinu (26% i 50%). S obzirom na dramatičnu situaciju povezanu sa pandemijom, koja je dovela do velikog broja žrtava i paralisala normalno funkcionisanje, uloženi su ogromni napori da se brzo pronađe vakcina. To je dovelo do usporavanja epidemije, ali je, s druge strane, dovelo do opreza, pa čak i sumnje u vakcinu kod određenog broja ljudi, pa čak i medicinskih radnika, posebno što neželjeni efekti nisu odmah uočeni. Kako su počeli da se beleže prvi neželjeni efekti, strah među ljudima i oklevanje postajali su sve češći razlozi za izbegavanje vakcinacije, odnosno revakcinacije (27). Oklevanje da se vakcinišu je takođe primećeno kod studenata medicine, posebno kod mlađih studenata na pretkliničkim predmetima, što se može objasniti nižim stepenom znanja u poređenju sa studentima koji su pohađali nastavu na kliničkim predmetima i manjom izloženošću Kovidu-19.

U odnosu na način informisanja, studenti koji su pohađali nastavu na kliničkim predmetima značajno češće su dobijali informacije sa Interneta. *Ngya* i saradnici (13) su izvestili da je većina studenata dobijala informacije of profesora i doktora (64,6%), zatim iz medija (59,9%) i od prijatelja (48,1%). U jednoj studiji koja je sprovedena u Indiji i kojom je obuhvaćeno 400 studenata medicine, mediji (49,75%) i novine (14,75%) su navedeni kao dominantan izvor informacija (28). Društvene mreže u modernom dobu zbog masovne upotrebe predstavljaju značajan izvor informacija, ali i izvor za širenje dezinformacija i lažnih vesti što može dovesti do nepoverenja u vakcinu.

Studija je imala određena ograničenja, pre svega zbog svog dizajna i samoprijavljenih odgovora koji imaju dozu pristrasnosti. Kao drugo ograničenje moramo pomenuti period anketiranja jer su se mišljenja i stavovi studenata menjali u zavisnosti od talasa pandemije, što je dovelo do straha, panike i brige za sebe i svoje najmilije.

Zaključak

Stavovi studenata medicine o vakcinaciji protiv Kovida-19 bili su pozitivni. Studenti koji su pohađali nastavu na kliničkim predmetima bili su značajno češće vakcinisani, ali su obe grupe studenata pokazale visok nivo društvene i moralne odgovornosti, kao i visok stepen poverenja u lekare i zdravstvene vlasti.

Dostupnost neproverenih informacija, kao i širenje lažnih informacija doprineli su postojanju straha i neodlučnosti kod manjeg broja studenata. Pravovremeno i tačno informisanje putem medija i društvenih mreža može doprineti sprečavanju širenja dezinformacija i pomoći javnom zdravstvenom sistemu u budućim izazovima i kampanjama.

Konflikt interesa

Autori su izjavili da nema konflikta interesa.

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contributed to this attitude regarding the desire to vaccinate medical students. Apart from that, obligation for attending classes for people who are already in poor health due to many diseases, or working directly in the environment of COVID-19 patients, as well as protecting friends, certainly contributed to this attitude and were a motivating factor to accept vaccination.

The students stated that the most common reason for not receiving the vaccine was the suspicion that the vaccines have not been tested enough (52% preclinical and 59% clinical) and the fear of side effects of the vaccine (26% and 50%). Given that the dramatic situation related to the pandemic, which led to a large number of victims and paralyzed normal functioning, enormous efforts were made to quickly find a vaccine. This led to the slowing down of the epidemic, but on the other hand, it led to caution and even suspicion of the vaccine among a certain number of people and even medical workers, especially since side effects were not immediately noted. As the first side effects began to be recorded, fear among people and hesitation became an increasingly common reason for avoiding or hesitating vaccination, or revaccination (27). Vaccine hesitance was also noted among medical students, especially among younger, preclinical students, which can be explained by a lower level of knowledge compared to clinical students, and less exposure to COVID-19.

In relation to the method of information, clinical students significantly more often received information from the Internet. Ngya et al. (13) reported that most of students received information from professors and doctors (64.6%), followed by the media (59.9%) and friends (48.1%). In a study that included 400 medical students in India, social media (49.75%) and newspapers (14.75%) were cited as the dominant source of information (28). Social networks in the modern age with mass use represent a significant source of information, but also for the spread of misinformation and fake news that can lead to mistrust of the vaccine.

The study had certain limitations primarily due to its design and self-reported answers that carry some forms of bias. As another limitation, we must mention is the period of the survey because the opinions and attitudes of the students changed depending on the waves of the pandemic, which led to fears, panic and concern for themselves and their loved ones.

Conclusion

Attitudes of medical students towards COVID-19 vaccination were positive. Clinical medical students were significantly more often vaccinated but both groups showed a high level of social and moral responsibility, as well as a high degree of trust in doctors and health authorities.

The availability of unverified information as well as the spread of false information contributed to the existence of fear and indecision among a smaller number of students. Timely and accurate information through the media and social networks can contribute to preventing misinformation and help the public health system in future challenges and campaigns.

Competing interests

The authors declared no competing interests.

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