

DETERMINANTS OF THE HUMAN PAPILLOMAVIRUS (HPV) VACCINATION INTENTION AMONG STUDENTS

Marijana Milošević Gačević¹, Sandra Petrović¹

¹ Medicinska škola „Dr Andra Jovanović“, Šabac, Srbija

¹ Secondary Medical School Dr Andra Jovanović, Šabac, Serbia

SAŽETAK

Uvod: Humani papiloma virus (HPV) je virus koji je najčešće povezan sa karcinomima. Karcinom grlića materice predstavlja jedan od vodećih problema javnog zdravlja, naročito u zemljama u razvoju. U Republici Srbiji, rak grlića materice je u ženskoj populaciji po učestalosti na petom mestu u odnosu na sve maligne bolesti, a infekcija HPV-om je najvažniji faktor rizika za nastanak ove bolesti. Cilj ove studije je bilo utvrđivanje determinanti namere vakcinisanja protiv HPV virusa kod adolescenata.

Materijali i metode: Istraživanje je sprovedeno kao studija preseka u kojoj je učestvovalo ukupno 748 učenika uzrasta 12 – 19 godina, iz jedne srednje i dve osnovne škole u Šapcu. Instrument istraživanja je bio upitnik, posebno sastavljen za potrebe ovog istraživanja. Da bi se ispitao prediktivni model u objašnjavanju namere vakcinisanja protiv HPV-a kod mladih, primenjena je multipla linearna regresija.

Rezultati: Predloženi model objašnjava 66% namere vakcinisanja protiv HPV-a kod mladih. Najjači prediktor namere vakcinisanja protiv HPV-a kod mladih se odnosi na subjektivnu normu, odnosno društveni pritisak vršnjaka i drugih osoba koje su za njih značajne. Nepoverenje u korisnost vakcinacije, zabrinutost zbog komercijalnog profiterstva i uverenja o zaveri o vakcinama, imaju značajno manji, ali statistički važan doprinos u objašnjavanju namere naših mladih u vezi sa vakcinacijom protiv HPV-a.

Zaključak: Sve veći društveni pritisak da se vakcinišu, kao i promena određenih stavova i uverenja o vakcinama uopšte, može dovesti do povećanja namere mladih da se vakcinišu protiv HPV-a. Sagledavanje ključnih aspekata u odnosu mladih u Srbiji prema HPV vakcinaciji daje mogućnost da se kreiraju javnozdravstvene politike zasnovane na dokazima i planiraju ciljne zdravstveno-vaspitne intervencije usmerene na identifikovane nalaze.

Ključne reči: humani papiloma virus, vakcinacija, adolescenti

ABSTRACT

Introduction: Human papillomavirus (HPV) is the virus that is most often associated with cancers. Cervical cancer is one of the leading public health problems, especially in developing countries. In the Republic of Serbia, cervical cancer is the fifth most common cancer in the female population amongst all malignant diseases, and HPV infection is the most important risk factor for the occurrence of this disease. This study aims to identify the determinants of adolescent HPV vaccination intention.

Materials and methods: The study was conducted as a cross-sectional study including a total of 748 students, aged 12 –19 years, from one high school and two elementary schools in Šabac. The research instrument was a questionnaire, particularly constructed for this study. Multiple regression analysis was applied to examine the predictive model for explaining the HPV vaccination intention in young people.

Results: The proposed model explains 66% of HPV vaccination intention in young people. The strongest predictor of HPV vaccination intention in young people relates to the subjective norm, i.e., social pressure from peers and other people who are important to them. Distrust of the benefit of vaccination, concern about commercial profiteering, and belief in a “vaccine conspiracy” have a significantly smaller but statistically significant contribution in explaining HPV vaccination intention amongst our youth.

Conclusion: Increasing social pressure to get vaccinated, as well as changing certain attitudes and beliefs about vaccines in general, may lead to an increase in the intention of young people to get vaccinated against HPV. Understanding the key aspects of the attitudes of young people in Serbia towards HPV vaccination opens the possibility of creating evidence-based public health policies and planning targeted health-educational interventions directed at the identified findings.

Keywords: human papillomavirus, vaccination, adolescents

Autor za korespondenciju:
Marijana Milošević Gačević
Medicinska škola „Dr Andra Jovanović“
Cara Dušana 9, 15000 Šabac, Srbija
Elektronska adresa: m.milosevicgacevic@gmail.com

Corresponding author:
Marijana Milošević Gačević
Secondary Medical School Dr Andra Jovanović
9 Cara Dušana Street, 15000 Šabac, Serbia
E-mail: m.milosevicgacevic@gmail.com

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UVOD

Humani papiloma virus (HPV) predstavlja jedan od najčešćih virusa koji je povezan sa karcinomima (čak 690.000 novih slučajeva tokom 2018. godine) [1]. Postoji više od 200 tipova HPV-a i podeljeni su na tipove niskog i visokog onkogenog rizika [2,3]. Najznačajniji predstavnici HPV virusa niskog onkogenog rizika su 6, 11, 42, 43 i 44 a najznačajniji tipovi visokog onkogenog rizika su 16, 18, 31, 33, 34, 35, 39, 45, 51, 52, 56, 58, 59, 66, 68 i 70 [4]. Najveći broj infekcija uzrokovanih HPV virusom može proći spontano, bez ikakvih posledica, dok će određeni broj infekcija izazvati pojavu karcinoma grlića materice, vulve, vagine, anusa, penisa, orofarinksa, i dr.

Karcinom grlića materice predstavlja jedan od vodećih problema javnog zdravlja, naročito u zemljama u razvoju [5,6]. Globalno gledano, karcinom grlića materice se nalazi na četvrtom mestu među karcinomima kod žena, dok se kod žena uzrasta 15 – 44 godine nalazi na drugom mestu [7]. U Republici Srbiji, rak grlića materice je po učestalosti na petom mestu, a njegov potencijalni uzročnik je u najvećem broju slučajeva upravo HPV virus (najonkogeniji su tipovi 16 i 18 koji uzrokuju preko 70% slučajeva). Posmatrajući populaciju starosti od 15 do 44 godine, karcinom grlića materice je na visokom drugom mestu [8]. Važno je naglasiti da, prema dostupnim podacima, rak grlića materice čini 6% smrtnih slučajeva kod žena u Srbiji, te se u tome i ogleda važnost prevencije zaražavanja ovim tipom virusa [9].

Kao najsavremeniji vid primarne prevencije zaražavanja ovim tipom virusa izdvaja se HPV vakcina. Ovaj tip vakcine sprečava razvoj infekcije koja je uzrokovana onim sojevima virusa od kojih je sama vakcina napravljena [10]. Kvadrivalentnu vakcinu (protiv sojeva 6, 11, 16, 18) je odobrila Američka uprava za hranu i lekove (engl. *U.S. Food and Drug Administration – FDA*), 2006. godine, dok je bivalentna (protiv sojeva 16, 18) odobrena 2009. godine i obe se primenjuju za uzrast od 9 do 26 godina, zavisno od države. Sjedinjene Američke Države (SAD) su, 2006. godine, uvele ove vakcine u nacionalni program imunizacije [11] i dokazana je efikasnost i smanjenje prevalencije za tipove 6, 11, 16, 18, u 89 % vakcinisanih slučajeva kod seksualno aktivnih žena uzrasta 14 – 24 godine [12]. Do 2020. godine, vakcina protiv HPV virusa je uvedena u programe imunizacije u 55% (107) država sveta [13].

Vakcinacija HPV vakcinom se preporučuje za adolescente uzrasta 11 ili 12 godina ali se može započeti već sa 9 godina. Ukoliko nije ranije izvršena, vakcinacija se može sprovesti do 26. godine života. Nakon 26. godine, ovaj tip vakcine se ne preporučuje, jer je u najvećem broju slučajeva osoba već bila izložena HPV virusu, te vakcina neće biti dovoljno efikasna. Sama vakcinacija se obavlja u dve ili tri doze, što zavisi od uzrasta i vak-

INTRODUCTION

Human papillomavirus (HPV) is one of the most common viruses associated with cancers (as many as 690,000 new cases in 2018) [1]. There are more than 200 types of HPV, and they are divided into low and high oncogenic risk types [2,3]. The most important types of HPV with low oncogenic risk are 6, 11, 42, 43, and 44, while the most important types of HPV with high oncogenic risk are 16, 18, 31, 33, 34, 35, 39, 45, 51, 52, 56, 58, 59, 66, 68, and 70 [4]. The majority of infections caused by HPV can clear spontaneously, without any consequences, while a certain number of infections will cause cancer of the cervix, vulva, vagina, anus, penis, oropharynx, etc.

Cervical cancer is one of the leading public health problems, especially in developing countries [5,6]. Globally, cervical cancer ranks fourth among cancers in women, while among women aged 15 – 44 years, it ranks second [7]. In the Republic of Serbia, cervical cancer ranks fifth in frequency, and its potential cause, in most cases, is the HPV virus (the most oncogenic are types 16 and 18, which cause over 70% of cases). As to the population aged 15 – 44 years, cervical cancer ranks second [8]. It is important to emphasize that, according to the available data, cervical cancer accounts for 6% of deaths among women in Serbia. This statistic reflects the importance of preventing infection with this type of virus [9].

The HPV vaccine stands out as the most modern form of primary prevention of this type of viral infection. This type of vaccine prevents the development of an infection caused by those strains of the virus from which the vaccine itself is made [10]. The quadrivalent vaccine (against strains 6, 11, 16, and 18) was approved by the U.S. Food and Drug Administration (FDA) in 2006, while the bivalent vaccine (against strains 16 and 18) was approved in 2009. Both are administered between ages 9 and 26, depending on the country. In 2006, the United States of America (USA) introduced these vaccines into the national immunization program [11] and the effectiveness and reduction of prevalence for types 6, 11, 16, and 18 was proven in 89% of vaccinated cases in sexually active women aged 14 – 24 years [12]. By the year 2020, the HPV vaccine had been introduced into immunization programs in 55% (107) of countries worldwide [13].

Vaccination with the HPV vaccine is recommended for adolescents aged 11 or 12, but it can be started as early as 9 years old. If it has not been done before, vaccination can be carried out until the age of 26. After the age of 26, this type of vaccine is not recommended, because in most cases the person has already been exposed to the HPV virus, and the vaccine will not be effective enough. The vaccination itself is administered in two or three doses, which depends on the age and

cinalnog statusa osobe koja se vakciniše [14]. Brojnim istraživanjima je dokazano da oba tipa HPV vakcina stimulišu odgovarajući imuni odgovor i kod žena i kod muškaraca [15,16].

Strateška savetodavna grupa eksperata za imunizaciju Svetske Zdravstvene Organizacije (engl. *Strategic Advisory Group of Experts on Immunization, World Health Organization*) je u aprilu 2022. godine izrazila veliku zabrinutost zbog niskog broja potpuno imunizovanih osoba (2020. godine procenjena globalna pokrivenost drugom dozom kod devojčica iznosila je 13%). Uočena je niska pokrivenost imunizacijom, veoma mali broj novovakcinisanih osoba, visoka stopa prekidanja imunizacije nakon primljene jedne doze vakcine, kao i štetan uticaj pandemije KOVID-19 oboljenja [17].

U Republici Srbiji su registrovane sledeće tri vakcine protiv HPV virusa: *Cervarix*[®], *Gardasil*[®], *Gardasil*[®]9 [18], ali nisu uvedene u kalendar obavezne imunizacije [19], te je i stopa vakcinisanih veoma niska. Jedno od istraživanja koje se bavi problemom imunizacije HPV vakcinom u Republici Srbiji je sprovedeno u Jugoistočnoj Srbiji. U istraživanju je učestvovalo 615 ispitanika, od čega je 499 ispitanika primilo prvu dozu, a 116 drugu dozu. U uzrasnim grupama 9 – 14 godina i 15 – 19 godina je vakcinisano 3,1 puta više devojčica nego dečaka. S obzirom da su roditelji izuzetno važna karika u odobravanju imunizacije, ovim tipom vakcine je vršeno i ispitivanje sociodemografskih karakteristika roditelja gde je utvrđeno da su u 90,2% slučajeva roditelji bili iz urbanih (gradskih) sredina, dok je ostatak bio sa seoskog područja. Takođe je utvrđeno i da su u 59,9% slučajeva roditelji posedovali medicinsko obrazovanje [20].

Na osnovu izveštaja o sprovedenoj imunizaciji na teritoriji Republike Srbije, koji je podneo Institut za javno zdravlje Srbije „Dr Milan Jovanović Batut“, zaključno sa 31. 12. 2022. godine, dato je ukupno 20.130 doza vakcine *Gardasil*[®]9. U periodu jun – decembar 2022. godine, na celokupnoj teritoriji Republike Srbije je od predviđenih 41.152 doza vakcine *Gardasil* 9 aplikovano 20.130 doza [21]. Uzimajući u obzir da je imunizaciji podvrgnut mali deo ciljane populacije, 2023. godine je započeta nacionalna kampanja „Zajedno protiv raka grlića materice – HPV NE“ [22].

U Evropskoj uniji su sprovedena brojna istraživanja sa željom da se utvrdi nivo znanja koje poseduju roditelji i adolescenti o HPV virusu i HPV vakcini, a sve sa ciljem poboljšanja procenta vakcinisanih adolescenata [23-26], dok je u Republici Srbiji sprovedeno istraživanje o znanjima, stavovima roditelja i praksi u vezi sa vakcinacijom HPV vakcinom [27].

Cilj ovog istraživanja je bilo utvrđivanje determinanti namere vakcinisanja protiv HPV-a kod adolescenata.

vaccination status of the person being vaccinated [14]. Numerous studies have proven that both types of HPV vaccines stimulate an appropriate immune response in both women and men [15,16].

In April 2022, the Strategic Advisory Group of Experts on Immunization of the World Health Organization expressed great concern about the low number of fully immunized persons (the 2020 estimated global coverage of the second dose in girls was 13%). Low immunization coverage, a very small number of newly vaccinated persons, a high rate of discontinuation of immunization after receiving one dose of the vaccine, as well as the harmful impact of the COVID-19 pandemic were registered [17].

In the Republic of Serbia, the following three vaccines against HPV have been registered: *Cervarix*[®], *Gardasil*[®], and *Gardasil*[®]9 [18], but they have not been introduced into the mandatory immunization schedule [19], and the rate of vaccination is very low. One of the studies dealing with the problem of HPV vaccine immunization in the Republic of Serbia was conducted in Southeast Serbia. A total of 615 subjects participated in the research, of which 499 subjects received the first dose, and 116 the second dose. In the age groups 9 – 14 years and 15 – 19 years, 3.1 times more girls than boys were vaccinated. Given that parents are an extremely important link in the approval of immunization, this type of vaccine was used to examine the socio-demographic characteristics of parents, where it was determined that in 90.2% of cases, the parents were from urban (city) areas, while the rest were from rural areas. It was also determined that in 59.9% of cases, the parents had medical training [20].

Based on the report on immunization carried out in the territory of the Republic of Serbia, submitted by the Institute of Public Health of Serbia Dr Milan Jovanović Batut, as of December 31, 2022, a total of 20,130 doses of *Gardasil*[®]9 vaccine was administered. In the period June – December 2022, 20,130 doses of the planned 41,152 doses of the *Gardasil* 9 vaccine were administered throughout the territory of the Republic of Serbia [21]. As it was established that a small part of the target population was immunized, the national campaign “Together against cervical cancer - HPV NO” was launched in 2023 [22].

In the European Union, numerous studies were conducted with the aim of determining the level of knowledge that the parents and adolescents have about HPV and the HPV vaccine, all with the aim of improving the percentage of vaccinated adolescents [23-26], while in the Republic of Serbia, a study was conducted on knowledge, parental attitudes, and practices regarding HPV vaccination [27].

MATERIJALI I METODE

Tip studije i izbor ispitanika

Studija preseka sprovedena je u okviru jedne srednje i dve osnovne škole u Šapcu, u decembru 2022. godine. Uzorak je obuhvatio 748 mladih iz Srbije, uzrasta od 12 do 19 godina. U istraživanju su učestvovali učenici viših razreda osnovnih škola i učenici od prvog do četvrtog razreda srednje medicinske škole. Upitnici su podeljeni u grupnom okruženju tokom nastave, koristeći format papira i olovke. Svi učesnici su potpisali formular za informisani pristanak i nisu dobili nikakvu nadoknadu za svoje učešće u studiji.

Instrumenti istraživanja

Kao instrument istraživanja korišćen je upitnik koji se sastojao iz nekoliko delova. Prvi deo upitnika obuhvatio je pitanja o sociodemografskim podacima ispitanika (pol, starost, mesto stanovanja, i sl.). U nastavku upitnika korišćene su validirane skale: *Skala za ispitivanje stava o vakcinaciji* (VAKS) [28], *Skala uverenja o zaveri o vakcinama* (VCBS) [29], *Skala znanja o vakcinaciji* (VKS) [30], kao i posebno konstruisani delovi upitnika koji sadrže pitanja o nameri vakcinisanja protiv HPV-a kod ispitanika, subjektivnim normama, i percipiranom kontrolom ponašanja.

Skala za ispitivanje stava o vakcinaciji (VAKS); (engl. *Vaccination Attitudes Examination Scale – VAX*) jeste upitnik od 12 stavki koji procenjuje ukupne stavove o vakcinama. VAKS ima četiri podskale, svaka sa tri stavke: nepoverenje u korisnost vakcinacije (npr. „Osećam se sigurnije nakon vakcinacije“), zabrinutost zbog neočekivanih budućih efekata (npr. „Vakcine mogu izazvati neočekivane probleme kod dece“), zabrinutost zbog komercijalnog profiterstva (npr. „Vakcine zarađuju mnogo novca za farmaceutske kompanije, ali malo za obične ljude“), i davanje prednosti prirodnom imunitetu (npr. „Prirodni imunitet traje duže od vakcinacije“). Svaka stavka se ocenjuje na skali od 6 tačaka, pri čemu 1 znači: „U potpunosti se ne slažem“, a 6 znači: „U potpunosti se slažem“ [28].

Skala uverenja o zaveri o vakcinama (engl. *Vaccine Conspiracy Beliefs Scale – VCBS*) se sastoji od sedam stavki koje mere verovanje u zaveru specifičnu za vakcinu (npr. farmaceutske kompanije prikrivaju opasnosti od vakcine). Svaka stavka je ocenjena na skali od 7 tačaka, pri čemu 1 znači: „U potpunosti se ne slažem“, a 7 znači: „U potpunosti se slažem“ [29].

Skala znanja o vakcinaciji (engl. *Vaccination Knowledge Scale – VKS*) se sastoji od devet stavki o (ne) efikasnosti vakcinacije, opasnostima, i potrebi. Učesnici biraju da li je svaka od tvrdnji tačna ili netačna, a dostupna je i opcija: „Ne znam“. Ukupan broj tačnih

This study aims to define the determinants of adolescent HPV vaccination intention.

MATERIALS AND METHODS

Study type and selection of respondents

This cross-sectional study was conducted in one secondary and two elementary schools in Šabac, Serbia, in December 2022. The sample included 748 young people from Serbia, aged 12 to 19 years. Students of senior grades of the two elementary schools and students of years one to four in the secondary medical school participated in the study. Questionnaires were distributed in a group setting during class, using a paper and pencil format. All participants signed an informed consent form and received no compensation for their participation in the study.

Research instruments

A questionnaire consisting of several segments was used as a research instrument. The first segment included questions about the respondents' sociodemographic data (gender, age, place of residence, etc.). In the remaining segments of the questionnaire, validated scales were used: the *Vaccination Attitudes Examination Scale* (VAX) [28], the *Vaccine Conspiracy Beliefs Scale* (VCBS) [29], the *Vaccination Knowledge Scale* (VKS) [30], as well as specially constructed segments of the questionnaire containing questions about respondents' intentions regarding HPV vaccination, subjective norms, and perceived behavioral control.

The *Vaccination Attitudes Examination Scale* (VAX) is a 12-item questionnaire that assesses overall attitudes about vaccines. The VAX has four subscales, each with three items: mistrust of vaccination benefits (e.g., „I feel safer after vaccination“), concerns regarding unforeseen future effects (e.g., „Vaccines can cause unexpected problems in children“), concerns regarding commercial profiteering (e.g., „Vaccines make a lot of money for pharmaceutical companies but little for ordinary people“), and favoring natural immunity (e.g., „Natural immunity lasts longer than vaccination“). Each item is rated on a 6-point scale, where 1 indicates: „Strongly disagree“ and 6 indicates: „Strongly agree“ [28].

The *Vaccine Conspiracy Beliefs Scale* (VCBS) consists of seven items that measure the belief in a vaccine-specific conspiracy (e.g., pharmaceutical companies cover up vaccine hazards). Each item is rated on a 7-point scale, where 1 indicates: „Strongly disagree“ and 7 indicates: „Strongly agree“ [29].

The *Vaccination Knowledge Scale* (VKS) consists of nine items on the (in)effectiveness of vaccination, dangers, and necessity. Participants choose whether

odgovora (tačan = 1, netačan = 0, ne zna = 0) koristi se za određivanje ocene znanja. Skala ima dobru pouzdanost test-retest ($r = 0,70$) kao i visoku Mokensovu procenu pouzdanosti (0,80) [30].

Namera vakcinisanja protiv HPV-a merena je korišćenjem sledeće tri stavke: „Nameravam da se vakcinišem protiv HPV-a“; „Očekujem da ću se vakcinisati protiv HPV-a“; i „Velika je verovatnoća da ću se vakcinisati protiv HPV-a“. Stavke se boduju na skali od 7 poena, pri čemu je 1 znači: „Apsolutno netačno“, a 7 znači: „Potpuno istinito“.

Subjektivne norme su procenjivane korišćenjem četiri stavke: dve za merenje injunktivnih normativnih uverenja („Većina ljudi koja mi nešto znači smatralo bi da je veoma dobro da dobijem HPV vakcinu“; „Većina ljudi čije mišljenje mi je važno očekuje da se vakcinišem protiv HPV-a“), i dve za merenje deskriptivnih normativnih uverenja („Većina ljudi poput mene će dobiti HPV vakcinu“; „Većina ljudi do čijeg mišljenja mi je stalo dobiće HPV vakcinu“). Učesnici su ocenili svoje slaganje sa svakom tvrdnjom na skali od 7 tačaka, pri čemu je 1 označavalo: „Apsolutno netačno“, a 7 je značilo: „Potpuno istinito“.

Percipirana kontrola ponašanja je merena korišćenjem sledeće dve stavke: „Da li ću biti vakcinisan protiv HPV-a biće u potpunosti moja odluka“; i „Da li ću se vakcinisati protiv HPV-a zavisice u potpunosti od mene“, ocenjeno na skali od 7 poena, pri čemu je 1 označavalo: „Potpuno netačno“, a 7 je označavalo: „Potpuno tačno“.

Analiza podataka

Za određivanje determinanti namere vakcinisanja protiv HPV-a u ovoj studiji, osim deskriptivne statistike i korelacione analize, korišćena je i multipla linearna regresija, u softverskom programu SPSS, verzija 26. Zavisna varijabla u okviru ovog istraživanja bila je namera vakcinisanja protiv HPV-a kod ispitanika, dok su nezavisne varijable bile stavovi o vakcinama, uverenja o zaveri o vakcinama, znanje o vakcinama, subjektivne norme, te percipirana kontrola ponašanja. Za utvrđivanje povezanosti između navedenih nezavisnih varijabli (stavovi o vakcinama, uverenja o zaveri o vakcinama, znanje o vakcinama, subjektivne norme, percipirana kontrola ponašanja), i zavisne varijable (namera vakcinisanja protiv

HPV-a kod ispitanika), korišćena je multipla linearna regresija sa nivoom značajnosti od $p < 0,05$.

REZULTATI

U istraživanju je učestvovalo 748 učenika iz jedne srednje i dve osnovne škole u Šapcu, uzrasta od 12 do 19

each statement is true or false, and the option: “I don’t know” is also available. The total number of correct answers (correct = 1, incorrect = 0, don’t know = 0) is used to determine the knowledge score. The scale has good test-retest reliability ($r = 0.70$) as well as a high Moken’s reliability estimate (0.80) [30].

HPV vaccination intention was measured using the following three items: “I intend to get the HPV vaccination”; “I expect to be vaccinated against HPV”; and “I am very likely to get the HPV vaccine”. Items are scored on a 7-point scale, where 1 means: “Absolutely false” and 7 means: “Completely true”.

Subjective norms were assessed using four items: two items measuring injunctive normative beliefs (“Most people who mean something to me would think it very good that I get the HPV vaccine”; “Most people whose opinions are important to me expect me to get the HPV vaccine”), and two items measuring descriptive normative beliefs (“Most people like me will get the HPV vaccine”; “Most people whose opinions I care about will get the HPV vaccine”). Participants rated their agreement with each statement on a 7-point scale, with 1 indicating: “Absolutely false” and 7 indicating: “Completely true.”

Perceived behavioral control was measured using the following two items: “Whether I get vaccinated against HPV will be entirely my decision”; and “Whether I get vaccinated against HPV will depend entirely on me,” rated on a 7-point scale, where 1 indicated: “Completely false” and 7 indicated: “Completely true.”

Data analysis

To identify the determinants of vaccination intention in this study, apart from descriptive statistics and correlation analysis, multiple linear regression was also applied using the SPSS, Version 26 software. The dependent variable in this study was the HPV vaccination intention of the respondents, while the independent variables were the following: vaccination attitudes, vaccine conspiracy beliefs, vaccination knowledge, subjective norms, and perceived behavioral control. To determine the relationship between the abovementioned independent variables (vaccination attitudes, vaccine conspiracy beliefs, vaccination knowledge, subjective norms, perceived behavioral control) and the dependent variable (HPV vaccination intention of the respondents), multiple linear regression was used with a significance level of $p < 0.05$.

RESULTS

In total, 748 students from one high school and two elementary schools in Šabac, aged 12 to 19, participated in the study (71.3% girls; mean age = 15.78, SD = 1.50).

godina (71,3% devojaka; srednja starost = 15,78, SD = 1,50). Za pojam HPV vakcine znalo je 84,9% naših ispitanika, a kada je u pitanju saznanje o postojanju vakcine 35,5% je saznalo u školi, 23,1% od roditelja, 17,1% u medijima, 16,4% na neki drugi način i samo 2,7% od lekara.

Rezultati pokazuju da se od ukupnog broja ispitanika, jednom dozom vakcinisalo 4,3%, sa dve doze 5%, a sa više od dve doze samo 2%, dok se 83,3% učenika nije vakcinisalo. Namera vakcinisanja protiv HPV-a kod ispitanika je merena uz pomoć sledeće tri stavke: „Nameravam da se vakcinišem protiv HPV-a“; „Očekujem da ću se vakcinisati protiv HPV-a“; i „Velika je verovatnoća da ću se vakcinisati protiv HPV-a“. Unutrašnja konzistentnost ove skale bila je visoka ($\alpha = 0,949$).

Skala koja je ispitivala stavove ispitanika o vakcinaciji (VAKS) pokazala je da kod ispitanika postoji nepoverenje u korisnost vakcinacije, kao i zabrinutost zbog komercijalnog profiterstva. Takođe, ispitanici su pokazali statistički značajno uverenje o postojanju zavere o vakcinama, a u okviru našeg istraživanja, unutrašnja konzistencija Skale uverenja o zaveri o vakcinama (VCBS) je bila jaka u ovom uzorku ($\alpha = 0,923$).

Subjektivne norme su procenjivane korišćenjem četiri stavke: dve za merenje injunktivnih normativnih uverenja („Većina ljudi koja mi nešto znači smatralo bi da je veoma dobro da dobijem HPV vakcinu“; „Većina ljudi čije mišljenje mi je važno očekuje da se vakcinišem protiv HPV-a“), i dve za merenje deskriptivnih normativnih uverenja („Većina ljudi poput mene će dobiti HPV vakcinu“; „Većina ljudi do čijeg mišljenja mi je stalo dobiće HPV vakcinu“). Pouzdanost unutrašnje konzistentnosti bila je zadovoljavajuća u trenutnom uzorku ($\alpha = 0,870$).

Percepivana kontrola ponašanja je merena korišćenjem sledeće dve stavke: „Da li ću biti vakcinisan protiv HPV-a biće u potpunosti moja odluka“; i „Da li ću se vakcinisati protiv HPV-a zavisice u potpunosti od mene“. Korelacija između ove dve stavke je bila prilično jaka i pozitivna ($r = 0,796$), a Spirman-Braunov koeficijent pouzdanosti je bio 0,886. Procenat podataka koji su nedostajali je bio minimalan (3,45%), a nedostajući podaci su adresirani pristupom višestruke imputacije. Korišćen je *G*Power* softver za procenu statističke moći *post hoc*, a njena vrednost je bila 1,00.

Deskriptivna statistika i korelacije među varijablama studije prikazane su u **Tabeli 1**. Subjektivne norme i nepoverenje u korisnost vakcinacije imali su najveću pozitivnu korelaciju sa namerom vakcinisanja protiv HPV-a, dok uverenja o zaveri o vakcinaciji imaju najveću negativnu korelaciju. Varijable: namera vakcinisanja protiv HPV-a, subjektivne norme, kontrola ponašanja, nepoverenje u korisnost vakcine i zabrinutost za nepredviđene buduće posledice imale su prosečne vred-

In all, 84.9% of our respondents knew about the term HPV vaccine, and as to the way they learned about the existence of the vaccine, 35.5% learned about it at school, 23.1% from their parents, 17.1% from the media, 16.4% in some other way, while only 2.7% of the respondents found out about the vaccine from doctors.

The results show that of the total number of respondents, 4.3% were vaccinated with one dose, 5% with two doses, and only 2% with more than two doses, while 83.3% of students were not vaccinated. Respondent HPV vaccination intention was measured with the help of the following three items: “I intend to get the HPV vaccination”; “I expect to be vaccinated against HPV”; and “I am very likely to get the HPV vaccine”. The internal consistency of this scale was high ($\alpha = 0.949$).

The scale that examined respondent vaccination attitudes (VAX) showed that there was a mistrust of the benefits of vaccination among the respondents, as well as concern regarding commercial profiteering. Also, respondents showed a statistically significant belief in the existence of a vaccine conspiracy, and in our study, the internal consistency of the Vaccine Conspiracy Beliefs Scale (VCBS) was strong in this sample ($\alpha = 0.923$).

Subjective norms were assessed using four items: two measuring injunctive normative beliefs (“Most people who mean something to me would think it very good that I get the HPV vaccine”; “Most people whose opinions are important to me expect me to get the HPV vaccine”), and two to measuring descriptive normative beliefs (“Most people like me will get the HPV vaccine”; “Most people whose opinions I care about will get the HPV vaccine”). Internal consistency reliability was satisfactory in the current sample ($\alpha = 0.870$).

Perceived behavioral control was measured using the following two items: “Whether I get vaccinated against HPV will be entirely my decision”; and “Whether I get the HPV vaccine will be entirely up to me”. The correlation between these two items was quite strong and positive ($r = 0.796$), and the Spearman-Brown reliability coefficient was 0.886. The percentage of missing data was minimal (3.45%), and the missing data were addressed using a multiple imputation approach. *G*Power* software was used to assess statistical power *post hoc*, and its value was 1.00.

Descriptive statistics and correlations among study variables are shown in **Table 1**. Subjective norms and mistrust of vaccination benefits had the highest positive correlation with HPV vaccination intention, while vaccination conspiracy beliefs had the highest negative correlation. The following variables: HPV vaccination intention, subjective norms, behavioral control, mistrust of vaccine benefits, and concern about unforeseen future effects had mean values higher than

Tabela 1. Deskriptivna statistika i korelacije između proučavanih varijabli

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Namera vakcinisanja protiv HPV-a / HPV vaccination intention	1								
2. Subjektivne norme / Subjective norms	0.76*	1							
3. Percipirana kontrola ponašanja / Perceived behavioral control	0.29*	0.30*	1						
4. Nepoverenje u korisnost vakcinacije / Mistrust of vaccination benefits	0.60*	0.51*	0.28*	1					
5. Zabrinutost zbog nepredviđenih budućih posledica / Concerns regarding unforeseen future effects	-0.06	0.01	0.12*	-0.03	1				
6. Zabrinutost zbog komercijalnog profiterstva / Concerns regarding commercial profiteering	-0.29*	-0.15*	-0.11*	-0.30*	0.47*	1			
7. Davanje prednosti prirodnom imunitetu / Preference for natural immunity	-0.12*	-0.01	-0.05	-0.15*	0.37*	0.60*	1		
8. Uverenja o zaveri o vakcinama / Vaccine conspiracy beliefs	-0.35*	-0.23*	-0.15*	-0.38*	0.38*	0.56*	0.39*	1	
9. Znanje o vakcinaciji / Knowledge about vaccination	0.16*	0.12*	0.16*	0.15*	-0.05	-0.15*	-0.04	-0.13*	1
M	4.80	4.38	5.59	4.21	4.28	3.01	3.08	3.52	3.37
SD	1.91	1.57	1.77	1.35	1.25	1.36	1.37	1.50	2.09

* $p < .005$

nosti veće od teoretskog proseka, dok su preostale varijable imale prosečne vrednosti koje su blizu teoretskog proseka.

Višestruka regresiona analiza

Da bi se ispitaio prediktivni model u objašnjanju namere vakcinisanja protiv HPV-a kod mladih, primenjena je multipla linearna regresija (Tabela 2). Model objašnjava 66% namere mladih u vezi sa vakcinacijom. Najjači prediktor namere vakcinisanja protiv HPV-a kod mladih su subjektivne norme ($\beta = 0,605, p < 0,001$), odnosno društveni pritisak vršnjaka i drugih osoba značajnih za ispitanke. Nepoverenje u korisnost vakcinacije ($\beta = -0,235, p < 0,001$), zabrinutost zbog komercijalnog profiterstva ($\beta = -0,080, p < 0,05$) i uverenja o zaveri o vakcinama ($\beta = -0,077, p < 0,01$) imali su značajno manji, ali statistički značajan doprinos u objašnjanju namere vakcinisanja.

Tabela 2. Višestruka regresiona analiza

	B	SE	β	t	P
Subjektivne norme / Subjective norms	0.739	0.031	0.605	23.668	0.001
Percipirana kontrola ponašanja / Perceived behavioral control	0.015	0.025	0.014	0.611	0.541
Nepoverenje u korisnost vakcinacije / Mistrust of vaccination benefits	-0.332	0.038	-0.235	-8.736	0.001
Zabrinutost zbog budućih nepredviđenih posledica / Concerns regarding unforeseen future effects	0.019	0.039	0.012	0.476	0.634
Zabrinutost zbog komercijalnog profiterstva / Concerns regarding commercial profiteering	-0.114	0.045	-0.080	-2.541	0.011
Davanje prednosti prirodnom imunitetu / Preference for natural immunity	-0.006	0.038	-0.004	-0.149	0.881
Uverenja o zaveri o vakcinama / Vaccine conspiracy beliefs	-0.098	0.035	-0.077	-2.784	0.005
Znanje o vakcinaciji / Knowledge about vaccination	0.025	0.020	0.027	1.244	0.214

Table 1. Descriptive statistics and correlation among study variables

the theoretical mean, while the remaining variables had mean values close to the theoretical mean.

Multiple regression analysis

To examine the predictive model in explaining young people's HPV vaccination intention, multiple linear regression was applied (Table 2). The model explains 66% of youth HPV vaccination intentions. The strongest predictor of young people's intention to get vaccinated against HPV are subjective norms ($\beta = 0.605, p < 0.001$), i.e., social pressure from peers and other persons significant to the respondents. Mistrust of the benefits of vaccination ($\beta = -0.235, p < 0.001$), concern about commercial profiteering ($\beta = -0.080, p < 0.05$), and vaccine conspiracy beliefs ($\beta = -0.077, p < 0.01$) had a significantly smaller but statistically significant contribution in explaining vaccination intention.

Table 2. Multiple regression analysis

DISKUSIJA

U ovoj studiji smo ispitali determinante namere vakcinisanja protiv HPV-a u populaciji učenika. Ispitivanje stavova je važan korak u predviđanju ponašanja mladih u odnosu na planove za vakcinisanje protiv HPV virusa, koji prema istraživanjima može biti uzročnik karcinoma različite lokalizacije [1], te predstavlja jedan od vodećih problema javnog zdravlja, naročito u zemljama u razvoju [5,6].

Od 2006. godine, vakcine protiv humanog papiloma virusa (HPV), dostupne su i u Evropi, ali obuhvat njihove primene razlikuje se među zemljama [31]. Studija koja je ispitala spremnost da se postignu ciljevi globalne strategije Svetske zdravstvene organizacije (SZO) za vakcinaciju protiv HPV-a i skrining grlića materice (engl. *Global Strategy to Accelerate the Elimination of Cervical Cancer as a Public Health Problem*), u osamnaest istočnoevropskih i centralnoazijskih zemalja, navodi podatak da su samo Turkmenistan i Uzbekistan uspeli da dostignu cilj koji je postavila SZO, a to je 90% kompletno vakcinisanih devojčica do 15. godine života [31].

Istraživanja potvrđuju kliničku efikasnost protiv određenih tipova ovog virusa odgovornih za invazivni kancer grlića materice (peti po učestalosti oblik karcinoma u Republici Srbiji) [8], te za cervikalni, vulvovaginalni i analni prekancer [32]. I pored dokaza o efikasnosti vakcina protiv HPV-a, procenat obuhvata HPV vakcinom u pojedinim zemljama nije optimalan, što je slučaj i u našoj zemlji. Prema preporukama Nacionalnog programa obavezne i preporučene imunizacije Srbije, vakcina protiv infekcije humanim papiloma virusom (HPV) predviđena za decu i adolescente uzrasta 9 – 19 godina, nije uvedena u kalendar obavezne imunizacije [19], i prema nalazima nedavnog istraživanja, nije u dovoljnoj meri promovisana [30], što može biti jedan od razloga koji utiču na nisku stopu vakcinisanih.

U okviru našeg istraživanja, subjektivne norme i nepoverenje u korisnost vakcinacije izdvojili su se kao najznačajniji prediktori namere vakcinisanja HPV vakcinom. Ispitanici u okviru naše studije potvrđuju da osobe čije mišljenje vrednuju utiču na njihove stavove i namere da se vakcinišu protiv HPV-a. Slične rezultate pokazuje i studija sprovedena u SAD, koja ističe da društveni uticaji, posebno uticaj vršnjaka, u velikoj meri može generisati stavove prema HPV vakcini. Pomenuta studija ukazuje na to da su ispitanici čiji su se prijatelji vakcinisali HPV vakcinom izrazili dva puta veću nameru vakcinisanja. Takođe, mišljenje roditelja se u okviru američkog istraživanja pokazalo kao veoma značajno, jer su ispitanici koji su dobili preporuku roditelja izrazili dvostruko veću nameru vakcinisanja HPV vakcinom [33].

Osim mišljenja vršnjaka i roditelja, značajan uticaj na formiranje stava o vakcinisanju ima vakcinalni sta-

DISCUSSION

In this study, we examined the determinants of HPV vaccination intention in a student population. Examining attitudes is an important step in predicting young people's behavior regarding their plans for vaccination against HPV, which according to research can be the cause of cancers of various localizations [1] and represents one of the leading public health problems, especially in developing countries [5,6].

Since 2006, vaccines against human papillomavirus (HPV) have been available in Europe, but the coverage of their application varies amongst countries [31]. A study examining the preparedness to achieve the goals of the World Health Organization (WHO) global strategy for HPV vaccination and cervical screening (*Global Strategy to Accelerate the Elimination of Cervical Cancer as a Public Health Problem*) in eighteen Eastern European and Central Asian countries found that only Turkmenistan and Uzbekistan managed to reach the goal set by WHO, which is 90% of fully vaccinated girls by the age of 15 years [31].

Research has confirmed the clinical effectiveness of the vaccine against certain types of this virus responsible for invasive cervical cancer (the fifth most frequent form of cancer in the Republic of Serbia) [8], as well as for cervical, vulvovaginal, and anal precancer [32]. Despite the evidence of the effectiveness of HPV vaccines, the percentage of HPV vaccine coverage in certain countries is not optimal, which is also the case in our country. According to the recommendations of the National Program of Mandatory and Recommended Immunization of Serbia, the vaccine against human papillomavirus (HPV) infection, intended for children and adolescents aged 9 – 19 years, was not included in the mandatory immunization schedule [19], and according to the findings of a recent study, it is not being sufficiently promoted [30], which may be one of the reasons affecting the low rate of vaccinated subjects.

In our study, subjective norms and mistrust of the benefits of vaccination were singled out as the most significant predictors of the HPV vaccination intention. Respondents in our study confirm that people whose opinions they value influence their attitudes and intentions to get vaccinated against HPV. Similar results were reported by a study conducted in the USA, which points out that social influence, especially the influence of peers, can largely generate attitudes towards the HPV vaccine. The abovementioned study indicates that respondents whose friends were vaccinated with the HPV vaccine expressed a two times higher intention to get vaccinated. Also, the opinion of parents in the American research proved to be very important, because the respondents who were advised by their

tus partnera, što potvrđuje studija sprovedena među mladima u Kentakiju [34]. Pomenuta studija je ukazala na to da je preferencija da partner ispitanika bude vakcinisan protiv HPV-a predviđala pozitivne stavove i prihvatanje vakcine, dok je nedostatak preferencije partnera za vakcinaciju rezultirao negativnim stavom i namerom vakcinisanja [34]. S obzirom da živimo u vreme koje se u velikoj meri oslanja na digitalne medije, nisu iznenađujući rezultati nedavno sprovedenog istraživanja u Sloveniji, koje je ispitivalo stavove studenata medicine u vezi sa HPV vakcinom, gde većina ispitanika smatra da u najvećoj meri informacije dobijene na internetu utiču na nameru vakcinisanja [35]. Identifikovanje pomenutih činilaca se u velikoj meri može iskoristiti u kreiranju budućih intervencija koje će pomoći u formiranju stavova prema HPV imunizaciji.

Rezultati našeg istraživanja, kao drugi značajan prediktivni faktor, ističu nepoverenje adolescenata u korisnost vakcinacije, što se slaže sa nalazima istraživanja koje je sprovedeno u Italiji, a koje ukazuje na to da 38,1 % ispitanika sumnja u korisnost vakcine [36]. Suprotno tome, rezultati studije sprovedene u Turskoj ukazuje na to da skoro polovina ispitanika smatra da je vakcina korisna i pruža zaštitu od karcinoma, ali i pored toga samo 4,3% ispitanika u okviru pomenutog istraživanja je primilo vakcinu protiv humanog papiloma virusa [37]. Razlike u stavovima mogu biti posledica toga što je istraživanje u Turskoj obuhvatilo starije starosne kategorije, dok je naša studija ispitivala stavove adolescenata. Sličnost se ogleda u tome što se u okviru našeg istraživanja samo 2% ispitanika vakcinisalo sa više od dve doze vakcine.

Osim nepoverenja u korisnost vakcine, statistički značajan doprinos u objašnjavanju namere vakcinisanja protiv HPV-a u okviru naše studije leži u tome da ispitanici navode i zabrinutost zbog komercijalnog profiterstva, kao i uverenja o zaveri o vakcinama. Ranija istraživanja potvrđuju naše rezultate ukazujući na postojanje složenih činilaca, najčešće psihičke ili psihosocijalne prirode, koji mogu doprineti nameri osobe da se vakciniše [38], na primer, generalno nepoverenje u vakcine, konspirativna uverenja o vakcinaciji, i slično [39]. Na ovakve stavove u velikoj meri je uticala i nedavna epidemija KOVID-19 oboljenja, gde smo u kontinuitetu bili izloženi različitim neproverenim informacijama u vezi sa vakcinama, koje su se plasirale javnosti putem interneta i različitih društvenih mreža, dajući mogućnost protivnicima vakcinacije (tzv. antivakserima) da budu aktivniji [35,38,39,40].

Nedostatak blagovremenih i jasnih informacija, kao i korišćenje nepouzdanih izvora, u velikoj meri mogu uticati na namere adolescenata u vezi sa vakcinisanjem HPV vakcinom. U okviru naše studije, i pored

parents to get vaccinated expressed a two times higher intention to get vaccinated with the HPV vaccine [33].

Apart from the opinion of peers and parents, the vaccination status of the partner has a significant influence on attitudes about vaccination, as confirmed by a study conducted among young people in Kentucky [34]. The abovementioned study indicated that the preference for the respondent's partner to be vaccinated against HPV predicted positive attitudes and acceptance of the vaccine, while the partner's lack of preference for vaccination resulted in a negative attitude and intention to get vaccinated [34]. Considering that we live in a time that relies heavily on digital media, it is not surprising that the results of a recent survey conducted in Slovenia, which examined the attitudes of medical students regarding the HPV vaccine, indicate that the majority of respondents believe that information obtained on the Internet has the greatest influence on vaccination intention [35]. Identifying the mentioned factors can be used largely in the creation of future interventions that will help in the formation of attitudes toward HPV immunization.

The results of our study highlight, as another significant predictive factor, the mistrust of adolescents in the benefits of vaccination, which agrees with the findings of a study conducted in Italy that indicates that 38.1% of respondents doubt the usefulness of the vaccine [36]. In contrast, the results of a study conducted in Turkey indicate that almost half of the respondents believe that the vaccine is beneficial and provides protection against cancer, but even so, only 4.3% of the respondents in the aforementioned study received the vaccine against human papillomavirus [37]. The differences in attitudes may stem from the fact that the study in Turkey included older age groups, while our study examined the attitudes of adolescents. The similarity is reflected in the fact that in our study only 2% of respondents were vaccinated with more than two doses of the vaccine.

In addition to mistrust of the benefits of the vaccine, a statistically significant contribution to explaining the HPV vaccination intention in our study lies in the fact that respondents also reported concerns about commercial profiteering, as well as beliefs about a vaccine conspiracy. Previous studies confirm our results indicating the existence of complex factors, most often psychological or psychosocial in nature, that can contribute to a person's intention to get vaccinated [38], for example, general mistrust of vaccines, conspiratorial beliefs about vaccination, and the like [39]. Such attitudes were greatly influenced by the recent epidemic of COVID-19, when we were continuously exposed to various unverified information regarding

toga što za pojam HPV vakcine zna 84,9% ispitanika, informacije o postojanju vakcina je 35,5% njih dobilo u školi, 17,1% u medijima, 16,4% na neki drugi način i samo 2,7% od lekara. Slične podatke prijavljuju i rezultati drugih studija [33,35,37]. S obzirom na dokaze da preporuke lekara i drugih zdravstvenih radnika, kao pružaoca usluga, mogu pozitivno uticati na stavove o HPV imunizaciji [20,41,42], buduće intervencije treba da budu usmerene na povećano angažovanje zdravstvenih radnika u edukaciji javnosti o značaju prevencije malignih bolesti izazvanih HPV virusom, kao i u podizanju svesti o efikasnosti HPV vakcine.

ZAKLJUČAK

I pored činjenice da ova studija ima određena ograničenja, u smislu korišćenja prigodnog uzorka, kao i da postoji mogućnost da su ispitanici davali poželjne odgovore, istraživanje je identifikovalo ključne aspekte nepoverenja prema HPV imunizaciji. Najdominantniji su sumnja u korisnost vakcine, zatim konspirativna uverenja o vakcinama, ali i postojanje zabrinutosti u vezi sa komercijalnim profiterstvom. Sagledavanje ključnih aspekata nepoverenja prema vakcinaciji daje mogućnost planiranja edukativnih zdravstvenih intervencija i njihovo usmeravanje na identifikovane oblasti. Studija takođe daje uvid u važne činjenice, da su mladi podložni uticajima okruženja i da subjektivne norme imaju važnu ulogu u formiranju stavova o vakcinaciji protiv HPV virusa, koje se mogu iskoristiti u kreiranju kampanja u budućnosti.

Izjava autora o originalnosti rada

Ovaj rad nije delimično niti u celini objavljen, poslat ili prihvaćen za štampu u drugom časopisu.

Sukob interesa: Nije prijavljen.

LITERATURA / REFERENCES

1. de Martel C, Georges D, Bray F, Ferlay J, Clifford GM. Global burden of cancer attributable to infections in 2018: a worldwide incidence analysis. *Lancet Glob Health*. 2020 Feb;8(2):e180-e190. doi: 10.1016/S2214-109X(19)30488-7.
2. Ferenczy A, Franco E. Persistent human papillomavirus infection and cervical neoplasia. *Lancet Oncol*. 2002 Jan;3(1):11-6. doi: 10.1016/S1473-2045(01)00617-9.
3. Doorbar J. Host control of human papillomavirus infection and disease. *Best Pract Res Clin Obstet Gynaecol*. 2018 Feb;47:27-41. doi: 10.1016/j.bpobgyn.2017.08.001.
4. Burd EM. Human papillomavirus and cervical cancer. *Clin Microbiol Rev*. 2003 Jan;16(1):1-17. doi: 10.1128/CMR.16.1.1-17.2003.
5. Crosbie EJ, Einstein MH, Franceschi S, Kitchener HC. Human papillomavirus and cervical cancer. *Lancet*. 2013 Sep 7;382(9895):889-99. doi: 10.1016/S0140-6736(13)60022-7.

vaccines, which were marketed to the public via the Internet and various social networks, allowing opponents of vaccination (the so-called anti-vaxxers) to be more active [35,38,39,40].

The lack of timely and clear information, as well as the use of unreliable sources, can greatly influence HPV vaccination intention in adolescents. In our study, although 84.9% of respondents know about the term HPV vaccine, 35.5% of them received information about the existence of the vaccine at school, 17.1% got the information from the media, 16.4% found it in some other way, and only 2.7% obtained this information from doctors. Similar data are reported by the results of other studies [33,35,37]. Considering the evidence that the recommendations of doctors and other health workers, as service providers, can positively influence attitudes about HPV immunization [20,41,42], future interventions should be aimed at increased involvement of health workers in educating the public about the importance of preventing malignant diseases caused by the HPV virus, as well as in raising awareness about the effectiveness of the HPV vaccine.

CONCLUSION

Although this study has certain limitations, in terms of the use of a convenience sample, as well as the possibility that respondents gave answers they felt to be desirable, the research identified key aspects of mistrust towards HPV immunization. The most dominant are doubts regarding the benefits of the vaccine, followed by conspiratorial beliefs about vaccines, but also the existence of concerns about commercial profiteering. Identifying the key aspects of mistrust towards vaccination gives the possibility of planning educational health interventions and directing them towards the identified areas. The study also provides insight into the important fact that young people are susceptible to the influence exerted by their environment and that subjective norms play an important role in forming attitudes about vaccination against the HPV virus, which can be used in creating campaigns in the future.

Authors' statement of originality

This study has not been previously published, submitted, or accepted for publishing, in whole or in part, in any other scientific journal.

Conflict of interest: None declared.

6. LaMontagne DS, Bloem PJN, Brotherton JML, Gallagher KE, Badiane O, Ndiaye C. Progress in HPV vaccination in low- and lower-middle-income countries. *Int J Gynaecol Obstet.* 2017 Jul;138 Suppl 1:7-14. doi: 10.1002/ijgo.12186.
7. Serrano B, Brotons M, Bosch FX, Bruni L. Epidemiology and burden of HPV-related disease. *Best Pract Res Clin Obstet Gynaecol.* 2018 Feb;47:14-26. doi: 10.1016/j.bpobgyn.2017.08.006.
8. HPV Information Centre. Human Papillomavirus and Related Diseases Report Serbia. 2023 March. [Internet]. [Pristupljeno: 25. 8. 2023.] Dostupno na: <https://hpcvcentre.net/statistics/reports/SRB.pdf>
9. Marković T. Prevencija karcinoma grlića materice. *Inspirijum,* 2014 Aug; 10:4-13. [Internet]. Dostupno na: <https://scindeks-clanci.ceon.rs/data/pdf/2217-656X/2014/2217-656X1410004M.pdf>
10. Harper DM, Paavonen J. Age for HPV vaccination. *Vaccine.* 2008 Mar 14;26 Suppl 1:A7-11. doi: 10.1016/j.vaccine.2008.01.013.
11. Markowitz LE, Tsu V, Deeks SL, Cubie H, Wang SA, Vicari AS, et al. Human papillomavirus vaccine introduction--the first five years. *Vaccine.* 2012 Nov 20;30 Suppl 5:F139-48. doi: 10.1016/j.vaccine.2012.05.039.
12. Markowitz LE, Liu G, Hariri S, Steinau M, Dunne EF, Unger ER. Prevalence of HPV After Introduction of the Vaccination Program in the United States. *Pediatrics.* 2016 Mar;137(3):e20151968. doi: 10.1542/peds.2015-1968.
13. Bruni L, Saura-Lázaro A, Montoliu A, Brotons M, Alemany L, Diallo MS, et al. HPV vaccination introduction worldwide and WHO and UNICEF estimates of national HPV immunization coverage 2010-2019. *Prev Med.* 2021 Mar;144:106399. doi: 10.1016/j.ypmed.2020.106399.
14. Centers for Disease Control and Prevention. HPV Vaccination Recommendations, 2021 Nov. [Internet]. [Pristupljeno: 17. 7. 2023.] Dostupno na: <https://www.cdc.gov/vaccines/vpd/hpv/hcp/recommendations.html>
15. Block SL, Nolan T, Sattler C, Barr E, Giacoletti KE, Marchant CD, et al. Protocol 016 Study Group. Comparison of the immunogenicity and reactogenicity of a prophylactic quadrivalent human papillomavirus (types 6, 11, 16, and 18) L1 virus-like particle vaccine in male and female adolescents and young adult women. *Pediatrics.* 2006 Nov;118(5):2135-45. doi: 10.1542/peds.2006-0461.
16. Petäjä T, Keränen H, Karppa T, Kawa A, Lantela S, Siitari-Mattila M, et al. Immunogenicity and safety of human papillomavirus (HPV)-16/18 AS04-adjuvanted vaccine in healthy boys aged 10-18 years. *J Adolesc Health.* 2009 Jan;44(1):33-40. doi: 10.1016/j.jadohealth.2008.10.002.
17. World Health Organization. Meeting of the Strategic Advisory Group of Experts on Immunization, April 2022: conclusions and recommendations, *Weekly Epidemiological Record = Relevé épidémiologique hebdomadaire,* 97 (24): 261 – 276. [Internet]. [Pristupljeno: 17. 7. 2023.] Dostupno na: <https://www.alims.gov.rs/humani-lekovi/pretrazivanje-humanih-lekova/?id=399657>
18. ALIMs. Agencija za lekove i medicinska sredstva Srbije. Pretraživanje humanih lekova, 2019. [Internet]. [Pristupljeno: 25. 8. 2023.] Dostupno na: <https://www.alims.gov.rs/humani-lekovi/pretrazivanje-humanih-lekova/?id=399657>
19. Zakon o zaštiti stanovništva od zaraznih bolesti: 15/2016-31, 68/2020-4, 136/2020-3. [Internet]. [Pristupljeno: 25. 8. 2023.] Dostupno na: <https://www.pravnoinformacionisistem.rs/SIGlasnikPortal/eli/rep/sgrs/skupstina/zakon/2016/15/8/reg>
20. Rancić NK, Miljković PM, Deljanin ZM, Marinkov-Zivković EM, Stamenković BN, Bojanović MR, et al. Knowledge about HPV Infection and the HPV Vaccine among Parents in Southeastern Serbia. *Medicina (Kaunas).* 2022 Nov 22;58(12):1697. doi: 10.3390/medicina58121697.
21. Institut za javno zdravlje Srbije „Dr Milan Jovanović Batut“. Izveštaj o sprovedenoj imunizaciji na teritoriji republike Srbije u 2021. Godini. [Internet]. [Pristupljeno: 26. 10. 2023.] Dostupno na: <https://www.batut.org.rs/download/izvestaji/2022izvestajOSprovedenojImunizaciji.pdf>
22. Institut za javno zdravlje Srbije „Dr Milan Jovanović Batut“. Kancelarija za skrining raka, [Internet]. [Pristupljeno: 26. 10. 2023.] Dostupno na: <https://www.skriningsrbija.rs/>
23. Ailloud J, Branchereau M, Fall E, Juneau C, Partouche H, Bonnay S, et al. How can we improve the acceptability of vaccination against Human Papillomavirus (HPV) in France? An original qualitative study with focus groups comprising parents and school staff, interviewed separately. *Vaccine.* 2023 Jul 12;41(31):4594-4608. <https://doi.org/10.1016/j.vaccine.2023.05.072>
24. Mascaro V, Pileggi C, Currà A, Bianco A, Pavia M. HPV vaccination coverage and willingness to be vaccinated among 18-30-year-old students in Italy. *Vaccine.* 2019 May 31;37(25):3310-3316. doi: 10.1016/j.vaccine.2019.04.081.
25. Pența MA, Crăciun IC, Băban A. The power of anticipated regret: Predictors of HPV vaccination and seasonal influenza vaccination acceptability among young Romanians. *Vaccine.* 2020 Feb 5;38(6):1572-1578. doi: 10.1016/j.vaccine.2019.11.042.
26. Marek E, Dergez T, Rebek-Nagy G, Kricskovics A, Kovacs K, Bozsa S, et al. Adolescents' awareness of HPV infections and attitudes towards HPV vaccination 3 years following the introduction of the HPV vaccine in Hungary. *Vaccine.* 2011 Nov 3;29(47):8591-8. doi: 10.1016/j.vaccine.2011.09.018.
27. Marić G, Birčanin Đ, Kisić V, Dotlić J, Zarić M, Kisić-Tepavčević D, et al. Parental perspective on human papillomavirus (HPV) vaccination in Serbia: Knowledge, attitudes and practice. *Sex Reprod Healthc.* 2018 Jun;16:192-198. doi: 10.1016/j.srhc.2018.04.010.
28. Martin LR, Petrie KJ. Understanding the Dimensions of Anti-Vaccination Attitudes: the Vaccination Attitudes Examination (VAX) Scale. *Ann Behav Med.* 2017 Oct;51(5):652-660. doi: 10.1007/s12160-017-9888-y.
29. Shapiro GK, Holding A, Perez S, Amsel R, Rosberger Z. Validation of the vaccine conspiracy beliefs scale. *Papillomavirus Res.* 2016 Dec;2:167-172. doi: 10.1016/j.pvr.2016.09.001.
30. Zingg A, Siegrist M. Measuring people's knowledge about vaccination: Developing a one-dimensional scale. *Vaccine.* 2012;30:3771-7. doi: 10.1016/j.vaccine.2012.03.014.
31. Davies P, Aluloski I, Aluloski D, Brcanski J, Davidzenka A, Durdyeva A, et al. HPV Vaccination and Cervical Cancer Screening Policies and Practices in 18 Countries, Territories and Entities across Eastern Europe and Central Asia. *Asian Pac J Cancer Prev.* 2023 May 1;24(5):1781-1788. doi: 10.31557/AP-JCP.2023.24.5.1781.
32. Joura EA, Kyrgiou M, Bosch FX, Kesic V, Niemenen P, Redman CW, et al. Human papillomavirus vaccination: The ESGO-EFC position paper of the European society of Gynaecologic Oncology and the European Federation for colposcopy. *Eur J Cancer.* 2019 Jul;116:21-26. doi: 10.1016/j.ejca.2019.04.032.
33. McLendon L, Puckett J, Green C, James J, Head KJ, Yun Lee H, et al. Factors associated with HPV vaccination initiation among United States college students. *Hum Vaccin Immunother.* 2021 Apr 3;17(4):1033-1043. doi:10.1080/21645515.2020.1847583.
34. LaJoie AS, Kerr JC, Clover RD, Harper DM. Influencers and preference predictors of HPV vaccine uptake among US male and female young adult college students. *Papillomavirus Res.* 2018 Jun;5:114-121. doi: 10.1016/j.pvr.2018.03.007.
35. Troha M, Šterbenc A, Mlakar M, Poljak M. Human papillomavirus (HPV) infection and vaccination: knowledge and attitudes among healthcare professionals and the general public in Slovenia. *Acta Dermatovenerol Alp Pannonica Adriat.* 2018 Jun;27(2):59-64. doi: 10.15570/actaapa.2018.14.
36. Pelullo CP, Esposito MR, Di Giuseppe G. Human Papillomavirus Infection and Vaccination: Knowledge and Attitudes among Nursing Students in Italy. *Int J Environ Res Public Health.* 2019 May 19;16(10):1770. doi: 10.3390/ijerph16101770.

37. Aynaci G, Guksu Z. Awareness of HPV and HPV vaccination in undergraduate students in the North West region of Turkey: Near future outlook. *J Infect Dev Ctries*. 2019 Jun 30;13(6):516-525. doi: 10.3855/jidc.11405.
38. Sociopsihološki aspekti vakcinacije protiv COVID-19 kod mladih u Vojvodini. Filozofski fakultet, Univerzitet u Novom Sadu. Jun 2023. [Internet]. Dostupno na: https://www.researchgate.net/publication/371322326_Sociopsiholoski_aspekti_vakcinacije_protiv_COVID-19_kod_mladih_u_Vojvodini#full-TextFileContent
39. Murphy J, Vallières F, Bentall RP, Shevlin M, McBride O, Hartman TK, et al. Psychological characteristics associated with COVID-19 vaccine hesitancy and resistance in Ireland and the United Kingdom. *Nat Commun*. 2021 Jan 4;12(1):29. doi: 10.1038/s41467-020-20226-9.
40. Patel PR, Berenson AB. Sources of HPV vaccine hesitancy in parents. *Hum Vaccin Immunother*. 2013 Dec;9(12):2649-53. doi: 10.4161/hv.26224.
41. Kim HW, Lee EJ, Lee YJ, Kim SY, Jin YJ, Kim Y, et al. Knowledge, attitudes, and perceptions associated with HPV vaccination among female Korean and Chinese university students. *BMC Womens Health*. 2022 Feb 23;22(1):51. doi: 10.1186/s12905-022-01624-1.
42. Sanftenberg L, Roggendorf H, Babucke M, Breckwoldt J, Gaertner B, Hetzer B, et al. Medical students' knowledge and attitudes regarding vaccination against measles, influenza and HPV. An international multicenter study. *J Prev Med Hyg*. 2020 Jul 4;61(2):E181-E185. doi: 10.15167/2421-4248/jpmh2020.61.2.1308.