

Knowledge and awareness of nursing students regarding human papillomaviruses infection and vaccination

Znanje i svest studenata sestriinstva o infekciji humanim papiloma virusom i vakcinaciji

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Abstract

Background/Aim. Human papillomaviruses (HPV) are the most common cause of sexually transmitted infections. Most HPV infections are transient and asymptomatic. Routine vaccination against HPV is the best prophylaxis against HPV infection. The aim of the study was to determine knowledge and risk factors about HPV infection and the attitudes towards vaccination against HPV among nursing students. **Methods.** This cross-sectional study was conducted on a random sample of 175 nursing students. The students were divided into categories according to their year of studying. Statistical data analysis was done using the *t*-test and Mann-Whitney *U* test. **Results.** Most (93.1%) respondents knew that HPV infection might cause cervical cancer and that it was a sexually transmitted infection (80.0%). Only 31.4% were aware that HPV might cause head and neck cancer, and 22.9% were aware that smoking was a risk factor for HPV infection. Male respondents ($p < 0.05$) and third-year respondents ($p < 0.05$) were significantly aware that men could also be infected with HPV. Third-year respondents were significantly aware that early sexual intercourse increased the risk of HPV infection ($p < 0.05$) and that HPV infection could be asymptomatic ($p < 0.05$). Respondents under 26 years of age ($p < 0.05$) and first-year respondents ($p < 0.05$) were significantly aware that men could as well be vaccinated against HPV. **Conclusion.** The present study found that the respondents emphasized the importance of health education by nurses and vaccination against HPV. Due to the low vaccination rate of the population, preventive measures are needed to increase public awareness about vaccination against HPV, for which nurses are also responsible.

Key words:

attitude to health; humans; knowledge; nursing care; papillomavirus; slovenia; students; vaccinatons.

Apstrakt

Uvod/Cilj. Humani papiloma virusi (HPV) su najčešći uzrok polno prenosivih infekcija. Većina infekcija HPV je prolazna i asimptomatska. Rutinska vakcinacija protiv HPV je najbolja profilaksa od ove infekcije. Cilj studije bio je da se utvrdi znanje o HPV infekciji, faktori rizika i stav prema vakcinaciji protiv HPV među studentima sestriinstva. **Metode.** Studija preseka sprovedena je na slučajnom uzorku od 175 studenata sestriinstva. Studenti su svrstani u grupe prema godini studija koju pohađaju. Za statističku obradu korišćeni su testovi *t*-test i Mann-Whitney *U* test. **Rezultati.** Većina ispitanika (93,1%) znala je da HPV infekcija može izazvati rak grlića materice i da je to seksualno prenosiva infekcija (80,0%). Samo 31,4% ispitanika znalo je da HPV može izazvati rak glave i vrata, a 22,9% ispitanika je znalo da je pušenje faktor rizika od infekcije HPV. Ispitanici muškog pola ($p < 0,05$) i ispitanici treće godine studija ($p < 0,05$) bili su značajno svesniji da i muškarci mogu biti zaraženi HPV. Ispitanici treće godine studija su imali značajno veću svest o tome da rani seksualni odnos povećava rizik od infekcije HPV ($p < 0,05$) i da infekcija HPV može biti asimptomatska ($p < 0,05$). Ispitanici mlađi od 26 godina ($p < 0,05$) i ispitanici prve godine studija ($p < 0,05$) su imali svest o tome da se i muškarci mogu vakcinisati protiv HPV. **Zaključak.** Ispitanici su naglasili važnost zdravstvene edukacije medicinskih sestara i vakcinacije protiv HPV. Zbog lošeg obuhvata stanovništva vakcinacijom potrebne su preventivne mere za podizanje svesti javnosti o vakcinaciji protiv HPV, za šta su odgovorne i medicinske sestre.

Ključne reči:

stav prema zdravlju; ljudi; znanje; nega bolesnika; slovenija; studenti; vakcinacija.

Introduction

Papillomaviruses from the group of genotypes relevant to human medicine are called human papillomaviruses (HPV). HPV infection is the most common sexually transmitted infection¹. The virus is transmitted via close contact with the skin or mucosa of an infected person, such as contact of the vaginal, anal, or oral area between heterosexual or homosexual partners. Routine use of condoms does not fully protect against HPV infection. HPV infection is very common after the start of sexual activity, between the ages of 20 and 24. Infection may occur during the first months after the first sexual activity. Even though the majority of sexually active adults have been exposed to HPV, new HPV infections may develop with a new sexual partner². Thus, a second, milder increase of HPV infections is noticed in women around the age of 55³. Risk factors for HPV infection include the early start of sexual activity (before the age of 15), numerous sexual partners (7 or more), unprotected sex, HPV oncogenicity, smoking, long-term use of oral contraceptives (progesterone), other sexually transmitted infections and diseases [herpes simplex, chlamydia, gonorrhea, human immunodeficiency virus (HIV) infections], low socioeconomic status, etc.^{4,5}.

Most HPV infections are transient and asymptomatic and do not cause any clinical problems⁶. Due to cell-mediated immunity, infection is usually transient and mostly (80–90%) resolves by itself within one to two years. Since a person is often unaware of their infection, HPV can be rapidly transmitted between sexual partners^{7,8}. Rarely do oncogenic HPV types remain present (10%), causing persistent infection. The persistence of the infection is associated with oncogenesis⁵. After several years (7–10 years), persistent HPV infection may progress to precancerous lesions or cervical cancer and other anogenital and/or oropharyngeal cancers^{4,9}.

Routine vaccination against HPV is the best prophylaxis against HPV infection and HPV-associated diseases, including some cancers; therefore, it was introduced into national immunization programs in all EU countries, except Poland, between 2006 and 2018¹⁰. The primary target groups are youths between 9 and 14 years old previously not exposed to HPV infection or those who have not been sexually active. This is due to the fact that the vaccine is more immunogenic in people younger than 26 years. Furthermore, vaccination against HPV is most effective before potential exposure to HPV infection, i.e., before the first sexual contact. Protection following vaccination against HPV lasts for at least 10 years and is expected to be long-lasting^{11,12}. There are currently three licensed prophylactic vaccines against HPV. The vaccination scheme for all three vaccines depends on the age of the recipient. For those below 15 years, two doses are recommended (at 0, 6 months), and three doses (at 0, 2, 6 months) for those above 15 years^{13,14}. Vaccination is also effective after the start of sexual activity, but the person is only protected against those virus genotypes with which they have not been infected at the time of vaccination¹⁵. In 2015, the Advisory Committee on Immuniza-

tion Practices introduced a catch-up vaccination for young women (between 13 and 26 years) and young men (between 13 and 21 years, and 26 years for high-risk men) who have not previously been vaccinated⁶. Catch-up immunization programs have been established in 10 countries¹⁶. Anti-HPV antibodies persist several years after vaccination at levels significantly higher than those following the natural course of infection¹⁴. Vaccination efficacy is high, preventing up to 90% of cervical cancer cases. In addition to girls, some countries around the world also vaccinate boys. This option has been available in Denmark since 2006. Until 2014, only 4,239 Danish males between 9 and 26 years were vaccinated¹⁷. Since 2013, Australia has provided free vaccination for boys up to the age of 15¹⁸. During HPV infection, seroconversion in men is lower, so vaccination against HPV is the most reliable method for immunoprotection against HPV infection and the risk of cancer. The proportion of HPV infections in young men is equal to that in young women; however, the proportion of infections in women considerably declines with age, which is not the case seen in older men¹⁹.

In Slovenia, a 2-valent vaccine has been available since 2007, 4-valent since 2006, and 9-valent since 2016. Girls are vaccinated routinely in the 6th grade of primary school. The vaccination rate of girls with the second dose against HPV increased by 10% (from 49.5% in 2017/2018 to 59.3% in 2018/2019). Vaccination for boys is covered by self-payment, but an extension of the Vaccination Program, including vaccination against HPV for boys, has been proposed²⁰. In 2017, coverage with ≥ 1 dose of vaccine against HPV in the USA was 65.5% in adults between the ages of 13 and 17²¹.

Due to the low vaccination rate of the population, preventive measures to increase public awareness about vaccination against HPV are needed. Healthcare professionals need evidence-based expertise since their task is to make efforts to reduce the number of HPV infected people²² through health education and preventive programs²³. In doing this, they should be focused on the younger population, which is particularly at risk, also due to poor awareness²⁴. The aim of the study was to determine knowledge and risk factors about HPV infection and the attitudes towards vaccination against HPV among nursing students.

Methods

All 214 nursing students who attended the 3-year undergraduate nursing program at the Faculty of Health Sciences in Slovenia were invited to participate in the research. This cross-sectional study included 175 nursing students in total who completed the questionnaire. The response rate was 82%. First and second-year nursing students did not have theoretical and clinical education about women's health nursing. Third-year nursing students received women's health nursing theoretical content (45 hrs). The study was conducted from December 2017 to January 2018.

This study was reviewed and approved by the institutional review board at the Faculty of Health Sciences, University of Ljubljana. A written explanation of the study's

procedure was given to the participants. The autonomy of participating and the right to stop and withdraw from the study at any time were also explained. The questionnaires were distributed during lecture hours. The content of the study was explained to the respondents. The questionnaires were returned directly to the researchers in a closed envelope. Instructions on how to complete the survey were included as well as a cover letter indicating the study's purpose. The nursing students participated voluntarily and were reassured of data confidentiality, as well as anonymity.

The questionnaire was constructed on the basis of the literature review²⁵⁻²⁹. A questionnaire was specially designed for the purposes of this study. A pilot study was conducted among 10 first-year nursing students. The reliability of the questionnaire, according to Cronbach's alpha, was 0.74. The questionnaire contained questions concerning demographic data (age, gender, place of residence, year of study) as well as 15 claims of risk factors for HPV infection, 9 claims regarding vaccination against HPV, and 9 attitudes on preventive awareness-raising about infection and vaccination against HPV in Slovenia.

Descriptive statistics were derived and expressed as frequency and percent. Categorical data were compared using the *t*-test for independent samples for between-group differences by gender and the Mann-Whitney *U* test for between-group differences by age, year of study, and place of residence. A *p*-value < 0.05 was considered statistically significant. Data were analyzed by SPSS IBM v. 23 for Windows (IBM Corporation).

Results

The sample included 175 nursing students. The median age among all respondents was 20 (range 19–43 years), and the mean age was 21.5 ± 4.7 years. The majority of the sample was female (78.9 %) who lived in the rural area (60%) and were in their first year of study (40.6 %) (Table 1).

Most respondents (93.1%) knew that HPV infection might cause cervical cancer, that it was a sexually transmit-

ted infection (80.0%), that oral contraceptives did not protect against HPV infection (90.9%), and that HPV infection could not be cured with antibiotics (81.7%). Only 31.4% were aware that HPV might cause head and neck cancer, and only 22.9% were aware that smoking was a risk factor for HPV infection. Majority (58.3%) of respondents knew that men could be infected with HPV; there were statistically significant differences ($t = 2.649$; $p < 0.05$) between the male and female respondents and between the third-year respondents and respondents of other years of the study ($Z = -1.987$, $p < 0.05$). Similarly, regarding awareness that HPV is transmitted through vaginal, oral, and anal sex there were statistically significant differences ($t = 2.070$; $p < 0.05$) between the male and female respondents, female and between the third-year respondents and respondents of other years of the study ($Z = -1.875$, $p < 0.05$). Regarding awareness that sexual intercourse increases the risk of HPV infection, that HPV infection can be asymptomatic, and that it can cause genital warts, there were statistically significant differences between respondents who were in the third year and those who were in other years of the study ($Z = -1.728$, $p < 0.05$; $Z = -2.720$, $p < 0.05$; $Z = -3.021$, $p < 0.05$; respectively). That HPV infection does not cause herpes, there was a statistically significant difference ($Z = -2.288$; $p < 0.05$) between respondents over 26 years and respondents below 26 years of age (Table 2).

Most respondents knew that vaccination against HPV in Slovenia was optional (84.6%), that a person should get vaccinated even if they had only one sexual partner (82.9%), and that vaccination should be performed before the first sexual intercourse (77.1%). They were less aware that men could also be vaccinated (52.6%) and that vaccination prevented genital warts (46.3%). The men can also be vaccinated against HPV; there were statistically significant differences between the respondents below 26 years and those > 26 years ($Z = -2.635$; $p < 0.05$) and between the first-year respondents and those in other years of the study ($Z = -2.359$; $p < 0.05$). Vaccination against HPV in Slovenia is not mandatory; there was a

Table 1
Socio-demographic characteristics
of the study participants

Parameters	Participants n (%)
Age (years)	
19–26	159 (90.9)
> 26	16 (9.1)
Gender	
male	37 (21.1)
female	138 (78.9)
Place of residence	
rural	105 (60.0)
urban	70 (40.0)
Year of study	
first	71 (40.6)
second	63 (36.0)
third	41 (23.4)

statistically significant difference ($Z = -2.144$; $p < 0.05$) between respondents who were in the third year and those in other years of the study. Furthermore, vaccination against HPV can be performed after the first sexual intercourse; there was a statistically significant difference ($Z = -1.987$; $p < 0.05$) between respondents who were below 26 and those over 26 years of age (Table 3).

Table 4 shows that respondents believe there is insufficient health education focused on preventive protection against HPV infection. Only 44% of respondents received information on protection against HPV infection at systematic health check-ups, and only 22.9% had heard of vaccination against HPV in the media. Regarding knowledge that healthcare personnel do not raise sufficient awareness among the youth regarding the risk factors for HPV infection, there was a statistically significant

difference ($t = 2.620$; $p < 0.05$) between male and female respondents who were in the third year and those who were in other years of the study. Nurses emphasized the importance of vaccination against HPV; there was a statistically significant difference ($Z = -1.963$; $p < 0.05$) between first-year respondents and those in other years of the study. Those living in rural areas agreed that they are insufficiently aware of HPV infection ($Z = -2.044$; $p < 0.05$), and those living in urban areas agreed that they do not know enough about vaccination against HPV ($Z = -2.045$; $p < 0.05$). Regarding the attitude that the third-year respondents believe that vaccination against HPV infection is effective and would thus recommend it, there was a statistically significant difference ($Z = -2.658$; $p < 0.05$) between respondents in the third year and those who were in other years of the study.

Table 2

Knowledge regarding risk factors and HPV infection

Knowledge claims	Correct answer n (%)	p-value
HPV infection can cause cervical cancer (T)	163 (93.1)	ns
HPV infection is sexually transmitted (T)	140 (80.0)	ns
Men can also be infected with HPV (T)	102 (58.3)	0.010* 0.047‡
HPV infection can be cured with antibiotics (F)	143 (81.7)	ns
HPV infection can be asymptomatic (T)	130 (74.3)	0.007‡
HPV infection can cause herpes (F)	79 (45.1)	0.022‡
HPV is a strong risk factor for head and neck cancer (T)	55 (31.4)	ns
HPV infection can cause genital warts (T)	121 (69.1)	0.003‡
HPV is transmitted via blood and saliva (F)	98 (56.0)	ns
Contraception pills can protect against HPV infection (F)	159 (90.9)	ns
We cannot get infected if we have a single sexual partner (F)	130 (74.3)	ns
Early sexual intercourse can increase the likelihood of HPV infection (T)	100 (57.1)	0.050‡ 0.042*
HPV infection can be transmitted through vaginal, oral, and anal sex (T)	138 (78.9)	0.048‡
Condom protects against HPV infection, but not 100% (T)	135 (77.1)	ns
Smoking can be a strong risk factor for HPV infection (T)	40 (22.9)	ns

HPV – human papillomavirus; T – true; F – false; *Gender difference – $p < 0.05$, statistical significance determined by the t -test; †Age difference – $p < 0.05$, statistical significance determined by the Mann-Whitney U test; ‡Year of study difference – $p < 0.05$, statistical significance determined by the Mann-Whitney U test.

Table 3

Knowledge regarding vaccination against HPV

Knowledge claims	Correct answer n (%)	p-value
Vaccination against HPV in Slovenia is optional (T)	148 (84.6)	0.032‡
Vaccination cannot protect us against all HPV genotypes (T)	115 (65.7)	ns
Men can also be vaccinated against HPV (T)	92 (52.6)	0.008‡ 0.018‡
Vaccination against HPV can prevent the development of genital warts (T)	81 (46.3)	ns
There are several types of vaccines for different HPV genotypes (T)	99 (56.6)	ns
Vaccination against HPV is recommended before the first sexual intercourse (T)	135 (77.1)	ns
Women and men can be vaccinated against HPV even after the first sexual intercourse until the age of 26 (T)	102 (58.3)	0.047‡
There is no need to be vaccinated against HPV if a person has only one sexual partner (F)	145 (82.9)	ns
A person vaccinated against HPV can still develop various cancers caused by HPV (T)	130 (74.3)	ns

HPV – human papillomavirus; T – true; F – false; ‡Year of study difference – $p < 0.05$, statistical significance determined by the Mann-Whitney U test.

Table 4

Attitudes on preventive awareness-raising about infection and vaccination against HPV in Slovenia

Awareness-raising attitudes	Correct answer n (%)	<i>p</i> -value
Healthcare personnel do not raise sufficient awareness among the young population regarding risk factors for HPV infection	156 (89.1)	
There is insufficient health education focused on preventive protection against HPV infection	160 (91.4)	0.010*
I am insufficiently aware of HPV infection	50 (28.6)	ns
I was instructed about protection against HPV infection during systematic health check-ups	77 (44.0)	0.041 [§]
Nurses should place more emphasis on the importance of vaccination against HPV	149 (85.1)	ns
Nurses encourage the young to be vaccinated against HPV	103 (58.9)	ns
I believe I do not know enough about the vaccine and vaccination against HPV	142 (81.1)	0.050 [‡]
I have heard a lot about vaccination against HPV in the media	40 (22.9)	0.041 [§]
I believe that the vaccine against HPV is effective and would thus recommend vaccination	114 (65.1)	ns

HPV – human papillomavirus; *Gender difference – $p < 0.05$, statistical significance determined by the *t*-test; [‡]Year of study difference – $p < 0.05$, statistical significance determined by the Mann-Whitney *U* test; [§]Place of residence difference – $p < 0.05$, statistical significance determined by the Mann-Whitney *U* test.

Discussion

Our study showed there is insufficient knowledge regarding HPV infection among nursing students. Most respondents (80%) knew that HPV infection was sexually transmitted, that it could cause cervical cancer (93.1%) and that HPV infection could be protected with condom use (77.1%). Among Italian students, 84.7% knew that HPV infection could cause cervical cancer²⁸, 54.1% of Pakistani students²⁷, and 90.4% of nurses in the UK²⁹. In Turkey, 88.7% of female students did not know how HPV infection was transmitted, as much as 90.9% of female students were not aware of what constituted adequate protection against such infection, and only 8.7% were aware of the vaccine against HPV³⁰. In our study, 77.1% of respondents knew that condoms did not provide complete protection against HPV infection in comparison with 35.2% among male USA students²⁵. Only 56% of respondents in our study knew that HPV genotypes were not found in urine, blood, or saliva, and only 45.1% knew that HPV did not cause herpes. Lower awareness was found among English women (19–26 years); only 10% were aware that HPV was not transmitted through the exchange of body fluids, and 13% that it did not cause herpes¹⁶. As many as 62.2% of USA students believed that HPV could cause herpes²⁶. Our respondents knew more about HPV infection, its consequences, and effective protection against HPV because they received general information several times during adolescence and education. However, our respondents knew too little about the link between HPV infection and head cancer and smoking.

In our study, it was found that only 58.3% of respondents knew that men could also get infected with HPV. It is positive that male respondents were statistically significantly aware that men could also get infected with HPV and that infection was transmitted via sexual intercourse. Among Italian nursing students, 85.6% knew that men and women could develop disease following HPV infection²⁸. Among Pakistani students, 55% knew that men and women could get infected with HPV²⁷. By contrast, American Indian graduate

male students were aware of their insufficient knowledge about HPV; unlike women, they believed they were not endangered by HPV infection. Most men said that women were the ones who should be aware of the risk of HPV infection, while women believed that they were solely responsible for the prevention of HPV infection, not men³¹. Similarly, among Hungarian men aged 18 and above, as many as 82.8% believed that HPV infection was irrelevant for them³². Similar poor awareness was observed in young Moroccan women (18–30 years); only 45% agreed that men could get infected with HPV³³. In the USA, it was found that among men and women aged between 14 and 69, the prevalence of HPV infection was higher in men³⁴. Male respondents knew that they too could become infected with HPV, which could be explained by the more successful promotion of vaccination against HPV for boys as well.

Our study showed that only 31.4% of respondents knew that HPV infection was a risk factor for developing head and neck cancer, and only 22.9% knew that smoking was a risk factor for HPV infection. Among men in the USA, it was found that only 31.5% knew that HPV in men could cause oropharyngeal cancer³⁵. The lack of knowledge about the link between HPV infection and head cancer among respondents suggests the need to place greater emphasis on these links during education.

Most respondents (77.1%) from our study were aware that vaccination against HPV was recommended before the first sexual intercourse. Only 52.6% of respondents knew that men could be vaccinated against HPV; male respondents under the age of 26 were statistically significantly more aware of this. Only 58.3% of respondents knew that both men and women could get vaccinated until the age of 26 and also after the first sexual intercourse; third-year respondents were statistically significantly aware of this. Among New Mexico nursing students, it was found that more than half were unaware that men could get infected with HPV and be vaccinated against it²⁶. In the USA, it was found that only 50% of men had heard of HPV, of which 53% were unaware that they could get vaccinated against HPV³⁶. Insufficient

knowledge was also observed in India among medical students, of whom only 18.8% knew that men and women could be vaccinated up to the age of 26²⁴. As many as 65% of Swedish girls with a mean age of 18 years were vaccinated against HPV after their first sexual intercourse³⁷. Since there are no screening tests for men showing the presence of HPV, they are unaware of their infection; it is detected only after the development of a malignant neoplasm. Therefore, their best protection, in addition to safe sex, is vaccination. However, very few men are aware that, during the last decade, they have also had the possibility of being vaccinated against HPV³⁸. An important finding of our study was the fact that male respondents, both under 26 years of age and third-year respondents, knew about vaccination against HPV, which could be explained by better preventive action for young people. However, this result could be related to the direction of the nursing study. Thus, some municipalities in Slovenia already allow free vaccinations for boys.

Our study showed the following: 65.7% of respondents knew that the vaccine against HPV did not protect against all genotypes; only 65.1% would recommend vaccination against HPV; only 44% were instructed about protection against HPV infection at systematic healthcare check-ups; 85.1% believed that nurses should emphasize the importance of vaccination against HPV; 89.1% of respondents believed that healthcare personnel did not do enough to raise awareness of the risk factors for HPV infection among youth. 68% of South Carolina students received information on HPV from healthcare professionals³⁹. Healthcare personnel can significantly contribute to the decision on vaccination. In the UK, almost all nurses (98.9%) recommend vaccination against HPV, and most of them (88%) believe that vaccines should be offered to boys as well²⁹. In the USA, too, healthcare personnel encouraged 83% of homosexual persons (aged 18–26) to get vaccinated against HPV⁴⁰. Healthcare professionals should

provide effective healthcare education in order to increase awareness and reduce the burden of precancerous changes, which have become increasingly common in the last decade⁴¹. In particular, they should encourage the youth to get vaccinated and inform them about the consequences of (too) early, high-risk, and unprotected sex²⁶. Collective immunity can only be achieved through the vaccination of girls and boys against HPV. One would expect that nursing students, being future healthcare professionals, would trust the efficacy of the vaccine.

This study has the limitation of being a single-center study with a small sample size. The survey was conducted in only one geographical area. Thus, the results cannot be generalized to all nursing students. Another important limitation was that we surveyed nursing students of all academic years, with only third-year students completing lectures in oncology and gynecology. The important aspect of this study was to demonstrate to the respondents the emphasized importance of health education for nurses.

Conclusion

The present study found there was insufficient knowledge among nursing students regarding risk factors and vaccination against HPV infection. The respondents emphasized the important role of nurses in raising awareness about HPV. Being future healthcare professionals, they need evidence-based expertise about HPV infection and its consequences and vaccination against HPV, allowing them to act preventively. Improving the knowledge regarding HPV and raising awareness among young girls and boys provides great health benefits by reducing the morbidity and mortality associated with HPV infection and transmission. Similarly, young people need to trust care professionals whose expertise contributes to increased awareness, encouraging them to get vaccinated against HPV.

R E F E R E N C E S

1. Doorbar J, Quint W, Banks L, Bravo IG, Stoler M, Broker TR, et al. The Biology and Life-Cycle of Human Papillomaviruses. *Vaccine* 2012; 30(Suppl 5): F55–F70.
2. Chesson HW, Dunne EF, Hariri S, Markowitz LE. The estimated lifetime probability of acquiring human papillomavirus in the United States. *Sex Transm Dis* 2014; 41(11): 660–4.
3. Winer RL, Hughes JP, Feng Q, Stern JE, Xi LF, Koutsky LA. Incident Detection of High-Risk Human Papillomavirus Infections in a Cohort of High-Risk Women Aged 25–65 Years. *J Infect Dis* 2016; 214(5): 665–75.
4. Szaboova V, Svibrona V, Hudeckova V. Selected risk factors for cervical cancer and barriers to cervical cancer screening. *Acta Medica Martiana* 2014; 14(2): 25–30.
5. Schiller JT, Lony DR. Understanding and learning from the success of prophylactic human papillomavirus vaccines. *Nat Rev Microbiol* 2012; 10(10): 681–92.
6. Meites E, Szilagyi PG, Chesson HW, Unger ER, Romero JR, Markowitz LE. Human papillomavirus vaccination for adults: updated recommendations of the Advisory Committee on Immunization Practices. *MMWR Morb Mortal Wkly Rep* 2019; 68(32): 698–702.
7. Doorbar J, Egawa N, Griffin H, Kranjec C, Murakami I. Human papillomavirus molecular biology and disease association. *Rev Med Viro* 2015; 25(Suppl 1): 2–23.
8. Rajkumar R. Introductory chapter: cervical cancer - screening, treatment and prevention. London, UK: IntechOpen; 2018.
9. Wang JW, Roden RB. L2, the minor capsid protein of papillomavirus. *Virology* 2013; 445(1–2): 175–86.
10. Bruni L, Diaz M, Barrionuevo-Rosas L, Herrero R, Bray F, Bosch FX, et al. Global estimates of human papillomavirus vaccination coverage by region and income level: a pooled analysis. *Lancet Glob Health* 2016; 4(7): e453–63.
11. Abdullab A, Qasim M, Shafiq M, Ijaz M, Parveen S, Murtaza S, et al. Molecular diagnosis and phylogenetic analysis of human papillomavirus type-16 from suspected patients in Pakistan. *Infect Agents Cancer* 2016; 11(1): 1.
12. CDC – Center for Disease Control and Prevention. Sexually Transmitted Disease Surveillance 2016. Atlanta: U.S. Department of Health and Human Services 2017. p. 29–34.
13. de Martel C, Plummer M, Vignat J, Franceschi S. Worldwide burden of cancer attributable to HPV by site, country and HPV type. *Int J Cancer* 2017; 141(4): 664–70.

14. *Pinto LA, Dillner J, Beddows S, Unger ER.* Immunogenicity of HPV prophylactic vaccines: serology assays and their use in HPV vaccine evaluation and development. *Vaccine* 2018; 36(32 Pt A): 4792–9.
15. *Markowitz LE, Gee J, Chesson H, Stokley S.* Ten years of human papillomavirus vaccination in the United States. *Acad Pediatr* 2018; 18(2S): S3–S10.
16. *Unger Z, Maitra A, Kohn J, Devaskar S, Stern L, Patel A.* Knowledge of HPV and HPV Vaccine among Women Ages 19 to 26. *Women's Health Issues* 2015; 25(5): 458–62.
17. *Bollerup S, Baldur-Felskov B, Dehlendorff C, Kjaer SK.* Socioeconomic predictors of human papillomavirus vaccination in Danish men - A nationwide study. *Papillomavirus Res* 2017; 3: 18–23.
18. *Ali H, Donovan B, Wand H, Read TRH, Regan DG, Grulich AE,* et al. Genital warts in young Australians five years into national human papillomavirus vaccination programme: national surveillance data. *BMJ* 2013; 346: f2032.
19. *Giuliano AR, Viscidi R, Torres BN, Ingles JD, Sudenga SL, Villa LL,* et al. Seroconversion following anal and genital HPV infection in men: the HIM study. *Papillomavirus Res* 2015; 1: 109–15.
20. *National Institute of Public Health.* European Cervical Cancer Prevention Week, 20 – 26 Jan 2020. Ljubljana: Institute of Public Health of the Republic of Slovenia; 2020. (Slovenian)
21. *Walker TY, Elam-Evans LD, Yankey D, Markowitz LE, Williams CL, Mbaeyi SA,* et al. National, regional, state, and selected local area vaccination coverage among adolescents aged 13–17 years—United States, 2017. *MMWR Morb Mortal Wkly Rep* 2018; 67(33): 909–17.
22. *Brianti P, De Flammineis E, Mercuri SR.* Review of HPV-related diseases and cancers. *New Microbiol* 2017; 40(2): 80–5.
23. *Gu C, Nicolai LM, Yang S, Wang X, Tao L.* Human papillomavirus vaccine acceptability among female undergraduate students in China: the role of knowledge and psychosocial factors. *J Clin Nurs* 2015; 24(19–20): 2765–78.
24. *Kamini S, Bhimarasetty DM.* Awareness about human papillomavirus vaccine among medical students. *Asian J Med Sci* 2016; 7(4): 64–7.
25. *Katz ML, Krieger JL, Roberto AJ.* Human papillomavirus (HPV): college male's knowledge, perceived risk, sources of information, vaccine barriers and communication. *J Men's Health* 2011; 8(3): 175–84.
26. *Schmotzer G, Reding K.* Knowledge and Beliefs Regarding Human Papillomavirus Among College Students at a Minority-Serving Institution. *J Community Health* 2013; 38(6): 1106–14.
27. *Khan TM, Buksb MA, Rehman IU, Saleem A.* Knowledge, attitudes, and perception towards human papillomavirus among university students in Pakistan. *Papillomavirus Res* 2016; 2: 122–7.
28. *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; 16(10): 1770.
29. *Patel H, Pöolkina K, Strazdina K, Viberga I, Sherman SM, Tincello DG,* et al. Awareness of HPV infection and attitudes toward HPV vaccination among Latvian adolescents. *Int J Gynecol Obstet* 2017; 137(2): 138–44.
30. *Koç Z, Çınarlı T.* Cervical Cancer, Human Papillomavirus, and Vaccination: Knowledge, Awareness, and Practices Among Turkish Hospital Nurses. *Nurs Res* 2015; 64(6): 452–65.
31. *Hodge FS, Line-Itty TL, Ellenwood C.* Communication Pathways: HPV Information and Message Barriers Reported among American Indian College Students. *CJHP* 2014; 12(3): 14–23.
32. *Balla BC, Terebessy A, Tóth E, Balázs P.* Young Hungarian Students' Knowledge about HPV and Their Attitude Toward HPV Vaccination. *Vaccines (Basel)* 2016; 5(1): 1.
33. *Zouheir Y, Fechtali T, Elgnaoui N.* Human Papillomavirus Genotyping and p16(INK4a) Expression in Cervical Lesions: A Combined Test to Avoid Cervical Cancer Progression. *J Cancer Prev* 2016; 21(2): 121–5.
34. *Gillison ML, Broutian T, Pickard RKL, Tong Z, Xiao W, Kable L,* et al. Prevalence of oral HPV infection in the United States, 2009–2010. *JAMA* 2012; 307(7): 693–703.
35. *Osazuwa-Peters N, Adjei Boakye E, Mohammed KA, Tobo BB, Genes CJ, Shootman M.* Not just a woman's business! Understanding men and women's knowledge of HPV, the HPV vaccine, and HPV-associated cancers. *Prev Med* 2017; 99: 299–304.
36. *Cooper DL, Hernandez ND, Rollins L, Henry Akintobi T, McAllister C.* HPV vaccine awareness and the association of trust in cancer information from physicians among males. *Vaccine* 2017; 35(20): 2661–7.
37. *Mattebo M, Grün N, Rosenblad A, Larsson M, Håggström-Nordin E, Dalanis T,* et al. Sexual experiences in relation to HPV vaccination status in female high school students in Sweden. *Eur J Contracept Reprod Health Care* 2014; 19(2): 86–92.
38. *Fuller KM, Hinyard L.* Factors Associated with HPV Vaccination in Young Males. *J Community Health* 2017; 42(6): 1127–32.
39. *Kasymova S, Harrison SE, Pascal C.* Knowledge and Awareness of Human Papillomavirus Among College Students in South Carolina. *Infect Dis (Auckl)* 2019; 12: 1178633718825077.
40. *Reiter PL, McRee AL, Katz ML, Paskett ED.* Human papillomavirus vaccination among young adult gay and bisexual men in the United States. *Am J Public Health* 2015; 105(1): 96–102.
41. *Bansal A, Singh MP, Rai B.* Human papillomavirus-associated cancers: A growing global problem. *Int J Appl Basic Med Res* 2016; 6(2): 84–9.

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