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KNOWLEDGE AND AWARENESS OF NURSING STUDENTS REGARDING HUMAN PAPILLOMAVIRUSES INFECTION AND VACCINATION

ZNANJE I SVEST STUDENTA SESTRINSTVA O INFEKCIJI VIRUSOM HUMANOG PAPILOMA I CEPLJENJU

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Abstract

Background/Aim: Human papillomaviruses (HPV) is the most common sexually transmitted infection. Most HPV infections are transient and asymptomatic. Routine vaccination against HPV is the best prophylaxis against HPV infection. The aim of present study was to determine knowledge and risk factors about HPV infection, and the attitudes towards vaccination against HPV infection among nursing students. Methods: This cross-sectional study was conducted in a random sample of 175 nursing students. For statistical data analysis was done with t-test for and Mann-Whitney U test. Results: Most respondents (93.1%) knew that HPV infection may cause cervical cancer, and that it is a sexually transmitted infection (80.0%). Only 31.4% were aware that HPV may cause head and neck cancer and only 22.9% were aware that smoking is a risk factor for HPV infection. Male respondents (p=<0.05) and third-year respondents (p=<0.05) were significantly aware that men can be infected with HPV. Third-year respondents were significantly aware that early sexual intercourse increases the risk of HPV infection (p=<0.05), that HPV infection can be asymptomatic (p=<0.05). Respondents below 26 years (p=<0.05) and first-year respondents (p=<0.05) were significantly aware that men can also be vaccinated against HPV infection. Conclusion: The present study found that the respondents emphasised the importance of health education by nurses and vaccination against HPV infection. 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: nursing students, knowledge, human papillomavirus, vaccination

Apstrakt

Uvod/Cilj: Humani papiloma virusi (HPV) je najčešća spoljno prenosiva infekcija. Većina HPV infekcija je prolazna i asimptomatska. Rutinsko cepljenje protiv HPV-a najbolja je profilaksa protiv HPV infekcije. Cilj ove studije bio je utvrđivanje znanja o HPV infekciji, faktorima rizika i stava prema cepljenju protiv HPV infekcije među studentima sestrinstva. Metode: Ova studija preseka provedena je na slučajnom uzorku od 175 studenata
sestrinstva. Za statističku obradu korišćeni so testovi t-test i Mann-Whitney U test. **Rezultati:** Većina ispitanika znala je da HPV infekcija može izazvati rak grlića materice (93,1%) i da je riječ o seksualno prenosivoj infekciji (80,0%). Samo 31,4% zna da HPV može izazvati rak glave i vrata, a samo 22,9% da je pušenje čimbenik rizika za infekciju HPV-om. Muški ispitanici (p = <0,05) i ispitanici treće godine studija (p = <0,05) obično znaju da muškarci mogu biti zarazeni HPV-om. Ispitanici treće godine studija obično znaju da rani seksualni odnos povećava rizik od infekcije HPV-om (p = <0,05), da HPV infekcija može biti asimptomatska (p = <0,05). Ispitanici mladi od 26 godina (p = <0,05) i ispitanici iz prve godine studija (p = <0,05) obično znaju da se i muškarci mogu cijepani protiv HPV infekcije. **Zaključak:** Naš rad pokazuje da ispitanici su naglasili važnost zdravstveno-obrazovnog rada medicinskih sestara i cepljenja protiv HPV infekcije. Zbog lošeg obuhvata stanovništva cepljenjem potrebne su preventivne mere za podizanje sijesti javnosti o vakcinaciji protiv HPV-a, za što su odgovorne i medicinske sestre.

**Ključne reči:** studenti sestrinstva, znanje, humani papiloma virus, cepljenje

**Introduction**

Papillomaviruses from the group of genotypes relevant for human medicine are called human papillomaviruses (HPV). HPV is the most common sexually transmitted infection\(^1\). The virus is transmitted via close contact with the skin or mucosa of an infected person, such as contact of the genital area, vaginal, anal or oral sex between heterosexual or homosexual partners. Routine use of condoms does not fully protect against HPV infection. HPV infection is very common after sexual activity starts, 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 partner\(^2\). Thus, a second, milder increase of HPV infections is noticed in women around the age of 55\(^3\). Risk factors for HPV infection include 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, gonorrhoea, HIV), low socioeconomic status\(^4,5\).
Most HPV infections are transient and asymptomatic, and do not cause any clinical problems\textsuperscript{6}. 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\textsuperscript{7,8}. Rarely, oncogenic HPV types remain present (10\%), causing a persistent infection. The persistence of the infection is associated with oncogenesis\textsuperscript{5}. After several years (7-10 years), persistent HPV infection may progress to precancerous lesions or cervical cancer and other anogenital and/or oropharyngeal cancers\textsuperscript{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 immunisation programmes in all EU countries, except Poland, between 2006 in 2018\textsuperscript{10}. The primary target group are youths between 9 and 14 years old previously not exposed to HPV infection or who have not been sexually active. This is due to the fact that the vaccine is more immunogenic in people younger than 26 years. Also, vaccination against HPV is most effective before potential exposure to HPV infection, i.e. before the first sexual contact. Protection following vaccination against HPV infection lasts for at least 10 years, and is expected to be long-lasting\textsuperscript{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\textsuperscript{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 vaccination\textsuperscript{15}. In 2015, the Advisory Committee on Immunization 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 vaccinated\textsuperscript{6}. Catch-up immunisation programmes have been established in 10 countries\textsuperscript{16}. Anti-HPV antibodies persist several years after vaccination at levels significantly higher than those following the natural course of infection\textsuperscript{14}. 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 4239 Danish males between 9 and 26 years were vaccinated\textsuperscript{17}. Since 2013, Australia has provided free vaccination for boys up to the age of 15\textsuperscript{18}. During HPV infection, seroconversion in men is
lower, so vaccination against HPV is the most reliable method for immunoprotection against HPV infection and 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 men\textsuperscript{19}.

In Slovenia, a 2-valent vaccine has been available since 2007, 4-valent since 2006 and 9-valent since 2016. Girls are vaccinated routinely, under compulsory health insurance, in the 6\textsuperscript{th} grade of primary school. The vaccination rate of girls with the second dose against HPV increased by 10\% (from 49.5\% in 2017/18 to 59.3\% in 2018/19). Vaccination for boys is covered by self-payment, but an extension of the Vaccination Programme including vaccination against HPV for boys has been proposed\textsuperscript{20}. In 2017, coverage with \geq1 dose of vaccine against HPV in the USA was 65.5\% in adults between the ages of 13 and 17\textsuperscript{21}.

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 infections\textsuperscript{22} through health education and preventive programmes\textsuperscript{23}. In doing this, they should be focused on the younger population, which is particularly at risk, also due to poor awareness\textsuperscript{24}. The aim of present study was to determine knowledge and risk factors about HPV infection, and the attitudes towards vaccination against HPV infection among nursing students.

\textbf{Methods}

All of 214 nursing students who attended a 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 in total 175 nursing students 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 hours). The study was conducted from December 2017 to January 2018.

This study was reviewed and approved by the institutional review board at an institution. A written explanation of the study’s procedure was given to the participants. It
also was explained about the autonomy of participating and the right to stop and withdraw from the study at any time. The questionnaires were distributed during lecture hours. The respondents were explained the content of the study. 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 purpose. The nursing students participated on a voluntary basis and were reassured of data confidentiality, as well as anonymity.

The questionnaire was constructed on the basis of the literature review. A questionnaire was specially designed for purposes of this study. A pilot study was conducted among 10 first-year nursing students. The reliabilities of the questionnaire according to the Cronbach’s alpha were .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 infection, 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 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 analysed 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), and the mean age was 21.5±4.7. The majority of the sample was female (78.9%), lived in the rural area (60%) and first-year of study 40.6% (Table 1).

Table 1

Socio-demographic characteristics

|          | N  | %  |
|----------|----|----|
| **Age**  |    |    |
| 19-26    | 159| 90.9|
| >26      | 16 | 9.1 |
| **Gender** |   |    |
| Male     | 37 | 21.1|
Most respondents (93.1%) knew that HPV infection may cause cervical cancer, that it is a sexually transmitted infection (80.0%), that oral contraceptives do not protect against HPV infection (90.9%) and that HPV infection cannot be cured with antibiotics (81.7%). Only 31.4% were aware that HPV may cause head and neck cancer and only 22.9% were aware that smoking is a risk factor for HPV infection. The men can be infected with HPV; there were statistically significant differences (t=2.649; \( p \leq 0.05 \)) in the male respondents, between female and (\( Z = -1.987, p \leq 0.05 \)) in the third-year respondents, between respondents of other years of the study. Similarly, the HPV is transmitted through vaginal, oral and anal sex; there were statistically significant differences (t=2.070; \( p \leq 0.05 \)) in the male respondents, between female and (\( Z = -1.875, p \leq 0.05 \)) in the third-year respondents, between respondents of other years of the study. Early sexual intercourse increases the risk of HPV infection (\( Z = -1.728, p \leq 0.05 \)), that HPV infection can be asymptomatic (\( Z = -2.720, p \leq 0.05 \)) and that it can cause genital warts (\( Z = -3.021, p \leq 0.05 \)), there were statistically significant differences between respondents who had third-year and those who had of other years of the study. That HPV infection does not cause herpes, there was a statistically significant differences (\( Z = -2.288; p \leq 0.05 \)), between respondents above 26 years and respondents >26 years (Table 2).

Table 2

| Knowledge claims                                      | Correct | \( p \)-value |
|-------------------------------------------------------|---------|---------------|
| HPV infection can cause cervical cancer (T)            | 163     | 93.1          | Ns          |
| HPV infection is sexually transmitted (T)              | 140     | 80.0          | Ns          |
| Statement                                                                 | Value | Percentage | p-value |
|---------------------------------------------------------------------------|-------|------------|---------|
| Men can also be infected with HPV (T)                                     | 102   | 58.3       | 0.0010* |
| 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‡  |
| HPV infection can be transmitted through vaginal, oral and anal sex (T)    | 138   | 78.9       | 0.042*  |
| 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 = $p<.05$, statistical significance determined by the t-test; † Age difference = $p<.05$, statistical significance determined by the Mann-Whitney U test; ‡ Year of study difference = $p<.05$, statistical significance determined by the Mann-Whitney U test.

Most respondents knew that vaccination against HPV infection in Slovenia is optional (84.6%), that a person should get vaccinated even if they have 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 can also be vaccinated (52.6%) and that vaccination prevents genital warts (46.3%). The men can also be vaccinated against HPV infection; there were statistically significant differences ($Z=-2.635; p=<0.05$) in the respondents below 26 years, between >26 years’ and ($Z=-2.359; p=<0.05$) in the first-year respondents, between respondents of other years of the study. Vaccination against HPV infection in Slovenia is not mandatory, there was a statistically significant differences ($Z=-2.144; p=<0.05$), between respondents who had third-year and those who had of other years of the study. The same, vaccination against HPV infection can be performed after the first
sexual intercourse, there was a statistically significant difference (Z=-1.987; p=<0.05), between respondents who had until the age of 26 and >26 years’ (Table 3).

Table 3
Knowledge regarding vaccination against HPV infection

| Vaccination claims                                                                 | Correct       | p-value   |
|-----------------------------------------------------------------------------------|---------------|-----------|
|                                                                                   | N  | %    |          |
| Vaccination against HPV infection 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 infection (T)                               | 92  | 52.6 | 0.008‡   |
|                                                                                   |                 |          |
| Vaccination against HPV infection can prevent the development of genital warts (T)| 81  | 46.3 | ns       |
| There are several types of vaccine 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 infection 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 infection if a person has only one sexual partner (F) | 145 | 82.9 | ns       |
| A person vaccinated against HPV infection can still develop various cancers caused by HPV (T) | 130 | 74.3 | ns       |

HPV - human papillomavirus; T - true; F – false; ‡ Age difference = p<.05, statistical significance determined by the t-test; † Year of study difference = p<.05, statistical significance determined by the Mann-Whitney U test.

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 infection in the media. 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 had third-year and those who had of other years of the study. Nurses emphasise the importance of vaccination against HPV infection, there was a
statistically significant differences ($Z=-1.963; p<0.05$), between first-year and of other years of the study respondents. Those living in rural areas agree that they are insufficiently aware of HPV infection ($Z=-2.044; p<0.05$), and those living in urban areas agree that they do not know enough about vaccination against HPV infection ($Z=-2.045; p<0.05$). Third-year respondents believe that Vaccination against HPV infection is effective and would thus recommend it, there was a statistically significant differences ($Z=-2.658; p<0.05$), between respondents who had third-year and those who had of other years of the study.

### Table 4
**Attitudes on preventive awareness-raising about infection and vaccination against HPV in Slovenia**

| Awareness-raising attitudes                                                                 | N  | %   | p-value   |
|-------------------------------------------------------------------------------------------|----|-----|-----------|
| Healthcare personnel do not raise sufficient awareness among the young population regarding risk factors for HPV infection | 156 | 89.1 | 0.010*    |
| There is insufficient health education focused on preventive protection against HPV infection | 160 | 91.4 | Ns        |
| I am insufficiently aware of HPV infection                                                | 50  | 28.6 | 0.041§    |
| I was instructed about protection against HPV infection during systematic health check-ups | 77  | 44.0 | Ns        |
| Nurses should place more emphasis on the importance of vaccination against HPV infection  | 149 | 85.1 | Ns        |
| Nurses encourage the young to be vaccinated against HPV infection                          | 103 | 58.9 | 0.050‡    |
| I believe I do not know enough about the vaccine and vaccination against HPV infection    | 142 | 81.1 | 0.041§    |
| I have heard a lot about vaccination against HPV infection in the media                  | 40  | 22.9 | Ns        |
| I believe that the vaccine against HPV infection is effective and would thus recommend vaccination | 114 | 65.1 | 0.008‡    |

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 = $p<.05$, 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 knew that HPV infection is sexually transmitted (80%), that it can cause cervical cancer (93.1%) and that HPV infection can be protect with condom use (77.1%). Among Italian students, 84.7% knew that HPV infection can cause cervical cancer, 54.1% of Pakistani students, and 90.4% of nurses in the UK. In Turkey, 88.7% of female students did not know how HPV infection is transmitted, as much as 90.9% of female students were not aware of what constitutes adequate protection against such infection and only 8.7% were aware of the vaccine against HPV. In our study, 77.1% of respondents knew that condoms do not provide complete protection against HPV infection, and 35.2% among male US students.

In our study, 77.1% of respondents knew that HPV genotypes are not found in urine, blood or saliva, and only 45.1% knew that HPV infection does not cause herpes. Lower awareness was found among English women (19-26 years) only 10% of whom were aware that HPV is not transmitted through the exchange of body fluids, and 13% that it does not cause herpes. As many as 62.2% of US students believed that HPV infection could cause herpes. Our respondents know known mode of HPV infection, its consequences and effective protection against HPV, because they received general information several times during adolescence and during education. However, our respondents know too little about the link between HPV infection and head cancer and smoking.

This study, it was found that only 74.3% of respondents knew that HPV infection can be asymptomatic and 69.1% knew that it can cause genital warts. However, only 46.3% knew that these could be prevented by vaccination. For third-year students, it was statistically significant that they were aware of the association between HPV infection and genital warts. Among Pakistani students, 40% knew that HPV infection can cause genital warts. 29.9% of Italian nursing students and 78.7% of nurses in the UK knew that HPV can cause genital warts. HPV infection is visible and particularly recognisable when genital warts develop, which are clinical indicators of active HPV replication in the anogenital area. Our respondents in the third year of the study know that there is a link
between genital warts and HPV infection, which may mean that they have deepened their knowledge during nursing education.

In our study, it was found that only 58.3% of respondents knew that men can also get infected with HPV. It is positive that male respondents are statistically significantly aware that men can also get infected with HPV and that infection is transmitted via sexual intercourse. Among Italian nursing students, 85.6% knew that men and women can develop disease following HPV infection. Among Pakistani students, 55% knew that men and women can get infected with HPV. By contrast, American Indian graduate students are 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, and not men. Similarly, among Hungarian men aged 18 and older, as many as 82.8% believed that HPV infection was irrelevant for them. Similar poor awareness was observed in young Moroccan women (18-30 years), only 45% of whom agreed that men can get infected with HPV. In the USA, it was found that among men and women aged between 14 and 69, the prevalence of HPV infection is higher in men. Male respondents know that they too can become infected with HPV, which can be explained by the more successful promotion of vaccination against HPV infection for boys as well.

Our study, showing that only 31.4% of respondents knew that HPV infection is a risk factor for developing head and neck cancer, and only 22.9% knew that smoking is a risk factor for HPV infection. Among men in the USA, it was found that only 31.5% knew that HPV in men can cause oropharyngeal cancer. 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 infection is recommended before the first sexual intercourse. Only 52.6% of respondents knew that men could be vaccinated against HPV infection; male respondents and under the age of 26 were statistically significantly more aware of this. Only 58.3% of respondents knew that both men and women can get vaccinated until the age of 26, 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 can get infected with HPV and vaccinated against HPV infection. In the USA, it was found that only 50% of men had heard of HPV, of which 53% were unaware that they can get vaccinated against HPV. Insufficient knowledge was also observed in India among medical students, only 18.8% of whom were knew that men and women could be vaccinated up to the age of 26. As many as 65% of Swedish girls with a mean age of 18 years were vaccinated against HPV after their first sexual intercourse. 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 vaccination against HPV infection. An important finding of our study is that male respondents, both under 26 years of age and third-year respondents have knowledge of vaccination against HPV infection, which could be explained by better preventive action with young people. However, this result could be related to the direction of the nursing study. Thus, some municipalities in Slovenia already allow boys free vaccinations.

Our study showed that 65.7% of respondents knew that the vaccine against HPV infection does not protect against all genotypes, only 65.1% would recommend vaccination against HPV infection; only 44% were instructed about protection against HPV infection at systematic healthcare check-ups; 83% believe that nurses should emphasise the importance of vaccination against HPV infection; 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 professionals. Healthcare personnel can significantly contribute to the decision on vaccination. In the UK, almost all (98.9%) nurses recommend vaccination against HPV, and most of them (88%) believe that vaccine should be offered to boys as well. In the USA too, healthcare personnel encouraged 83% of homosexual persons (aged 18-26) to get vaccinated against HPV infection. 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 decade. In particular, they should encourage the youth to get vaccinated and inform them about the consequences of (too) early, high-risk and unprotected sex. Collective immunity can only be achieved
through vaccination of girls and boys against HPV infection. One would expect that nursing students, being future healthcare professionals, trust the efficacy of the vaccine.

This study has the limitation of being a single-centre study with a small sample size. The survey was conducted on only one geographical area. Thus, the results cannot be generalised 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 the respondents emphasised the importance of health education by nurses.

Conclusion

The present study found there was insufficient knowledge among nursing students regarding risk factors and vaccination against HPV infection. The respondents emphasised 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 about vaccination against HPV infection, allowing them to act preventively. Improvement of 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, it is important for young people to trust healthcare professionals whose expertise contributes to increased awareness encouraging them to get vaccinated against HPV.

REFERENCES

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(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; 41:660–4.
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; 214:665–75.
4. Szaboova V, Svirova V, Hudeckova V. Selected risk factors for cervical cancer and barriers to cervical cancer screening. Acta Medica Martiana 2014; 14(2):25–32.
5. Schiller JT, Lowy DR. Understanding and learning from the success of prophylactic human papillomavirus vaccines. Nat Rev Microbiol 2012; 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. Morb Mortal Wkly Rep 2019; 68:698–702.

7. Doorbar J, Egawa N, Griffin H, Kranjec C, Murakami I. Human papillomavirus molecular biology and disease association. Rev Med Viro 2015; 25: 2–23.

8. Rajkumar R. Introductory chapter: cervical cancer - screening, treatment and prevention. IntechOpen 2018.

9. Wang JW, Roden RBS. L2, the minor capsid protein of papillomavirus. Virology 2013: 450(0): 175–86.

10. Bruni L, Diaz M, Barrionuevo-Rosas L, Herrero R, Bray F, Xavier F, 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. Abdullah 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; 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; 6;36:4792-4799.

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. **NIJZ – National Institute of Public Health.** 20. - 26. January 2020: European Cervical Cancer Prevention Week 2020. (Slovene)

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. 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, Niccolai 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 papilloma virus 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 Mens Health 2011;1;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, Buksh MA, Rehman IU, Saleem A. Knowledge, attitudes, and perception towards human papillomavirus among university students in Pakistan. Papillomavirus Res 2016; 2:122–27.

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, Pčolkina 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; 137:138–44.

30. Koç Z, Çinarli 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 2017; 5(1):1–9.

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, Kahle 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, Geneus CJ, Schootman 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; 35:2661–7.

37. Mattebo M, Grün N, Rosenblad A, Larsson M, Häggström-Nordin E, Dalianis 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; e8(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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