

## HUMAN PAPILOMAVIRUS: A CROSS-SECTIONAL SURVEY ON KNOWLEDGE AND ATTITUDES AMONG STUDENTS OF UNDERGRADUATE HEALTH STUDIES

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The study aimed to assess the knowledge and attitudes of future healthcare professionals in Bosnia and Herzegovina (BIH) regarding the nature of human papillomavirus (HPV), HPV testing, and vaccination.

This descriptive-analytical, prospective, cross-sectional survey was conducted using a standardized questionnaire among students in the first and third year of undergraduate studies considering different study programs at the Faculty of Health Studies, University of Sarajevo.

The research resulted in 110 fully completed questionnaires. The percentage of students who had heard about HPV was 88.9% in the first year and 92.3% in the third year of health studies. Third-year students had better general knowledge of HPV ( $p = 0.007$ ) and attitudes toward HPV testing ( $p = 0.009$ ). Significant differences were in general knowledge of HPV among students of all study programs ( $p < 0.001$ ) and in the knowledge of HPV testing ( $p = 0.001$ ) and vaccination ( $p = 0.001$ ). Health Care and Physiotherapy students had more knowledge and better attitudes when compared with other study programs.

The level of knowledge about HPV infection among students in BIH is low regardless of study year and program. Targeted interventions in health education could have a positive impact on spreading knowledge about HPV and adopting preventive methods in the future.

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(HPV) infection requires control due to its high association with cervical cancer. HPV also plays a significant role in different cancers in both genders (2–5).

The virus is present in sexually active populations infecting more than 80% of women of reproductive age. However, 80% of infections are transient and eliminated by the immune system without consequences. The remaining 20% of them can lead to the formation of genital cancer precursors (6). Increased risk for HPV infection can be associated with a range of sexual partners and sexual intercourse at an early age. The higher the number of partners, the higher the risk of exposure to HPV, and the greater the exposure to the virus, the higher the chance of infection, which can lead to cervical cancer (7, 8).

High-risk types of HPV are the most common causes of cervical cancer. Cervical cancer is the third most common type of cancer in women and a common cause of death in women between the age of 15 and 44 (9). In 2018, 570 000 new cases of cervical cancer were registered worldwide, and 311 000 women died. Almost 85% of cancer cases are being reported in less

### Introduction

Papillomaviruses belong to the *Papillomaviridae* family and represent a group of small non-enveloped viruses with a double-stranded circular DNA genome (1). According to the Global Health Strategy for Sexually Transmitted Infections (2016–2021) of the World Health Organization (WHO), human papillomavirus

developed countries (9). The most common high-risk types are HPV16 and 18 (10). In addition to other sexually transmitted agents, HPV infection is also prevalent among men who have sex with men (MSM population). HPV infection is associated with several cancers in men, including anal, penile, and oral cancers (11).

The natural flow of HPV infection and the long-term development of precancerous changes in the cervix make cervical cancer preventable at the primary, secondary and tertiary levels. Primary prevention includes health education and vaccination against HPV. Secondary prevention involves screening (early detection of asymptomatic forms of the disease). Lastly, tertiary prevention implies the treatment of precancerous lesions, thereby preventing their progression to invasive cervical cancer (12). Vaccination and mass screening of women using validated diagnostic HPV tests and/or Pap smear test (Papanicolaou cytological test) are the main preventive measures against cervical cancer worldwide (13, 14). Local studies based on vaccine-targeted HPV types are of great importance for the secondary prevention of cervical cancer (15, 16).

Currently, three HPV vaccines are available, namely Cervarix bivalent (GlaxoSmithKline Biologicals, Rixensart, Belgium), Gardasil tetravalent (Merck & Co., New Jersey, USA), and Gardasil9 - nonavalent (Merck & Co., New Jersey, USA) (17). Vaccination is recommended for individuals who have not been in contact with the HPV types covered by the vaccines. For this reason, vaccination during adolescence before sexual intercourse and potential exposure to the virus is desirable (18). In 2015, the WHO recommended a 2-dose vaccination program for girls aged 9 to 15 and a 3-dose program for girls over 15 years (17).

In Bosnia and Herzegovina (BIH) an organized cervical cancer screening program has not been established yet. Annually, about 30% of women of reproductive age in BIH become infected with high-risk HPV (15). Previous studies on the high school population and undergraduate medical student's knowledge and behavioural risks have suggested that insufficient sexual education and inadequate knowledge about the prevention of sexually transmitted diseases, casual sex partners, and unprotected sex may affect the prevalence of HPV and other sexually transmitted infections (STIs) (19, 20). Moreover, belief in adverse effects of vaccines without medical knowledge and social and cultural attitudes are the main reason for the low interest in vaccination against HPV (21).

All aspects of HPV infection and its linkage to cancer development might be adopted at a younger age to prevent the potential consequences later. Therefore, it is necessary to continuously raise awareness of this problem for preventive measures to be fully implemented primarily by health professionals.

This survey aimed to assess the knowledge and attitudes of future health professionals in BIH about the nature of HPV, HPV testing, and vaccination.

## Material and Methods

### Participants

This descriptive-analytical, prospective, cross-sectional survey enrolled undergraduate first and third-year students of different study programs of the Faculty of Health Studies (Health Care, Physiotherapy, Laboratory Technology, Sanitary Engineering, and Radiological Technology) of the University of Sarajevo (FHS UNSA), during the academic year 2019-2020. The research lasted from May to June 2020, and 110 respondents participated.

### Material

The research was conducted using a standardized questionnaire entitled "What do you know about HPV?", developed by Waller et al. (2013) (22). The questionnaire examined knowledge and attitudes about the nature of HPV, HPV testing, and HPV vaccination. The questionnaire consisted of questions that respondents could answer correctly, incorrectly, or "Don't know". The answer "Don't know" was evaluated as an incorrect answer. The respondents received 1 point for each correct and 0 points for an incorrect answer. The total result of the knowledge and attitudes of the survey was the sum of all responses, and the higher the number, the more it was an indicator of the respondent's better knowledge about HPV.

### Statistics

The data were reviewed for accuracy and summation of scores and then analyzed by Microsoft Excel and IBM SPSS software. Results were processed using descriptive statistics expressed by the mean and standard deviation for continuous variables and frequency and percentage for categorical variables. The normality of the data distribution was determined using the Kolmogorov-Smirnov and Shapiro-Wilk tests. The statistics of reliability and consistency of questions were estimated using Cronbach's Alpha indicator  $> 0.7$ . Comparisons of categorical responses used Pearson's Chi-square test of exact probability. A value of  $< 0.05$  was considered statistically significant.

## Results

Considering the entire questionnaire, respondents of the first year of study had 649 (41.2%) correct and 926 (58.8%) incorrect answers, while the respondents of the third year of study answered correctly on 1080 (47.5%)

questions and 1195 (52.5%) incorrectly. Respondents of the third study year had significantly more correct answers,  $p < 0.001$  (Table 1). However, the knowledge of the first and the third year of study respondents was poor (Figure 1/A and B).

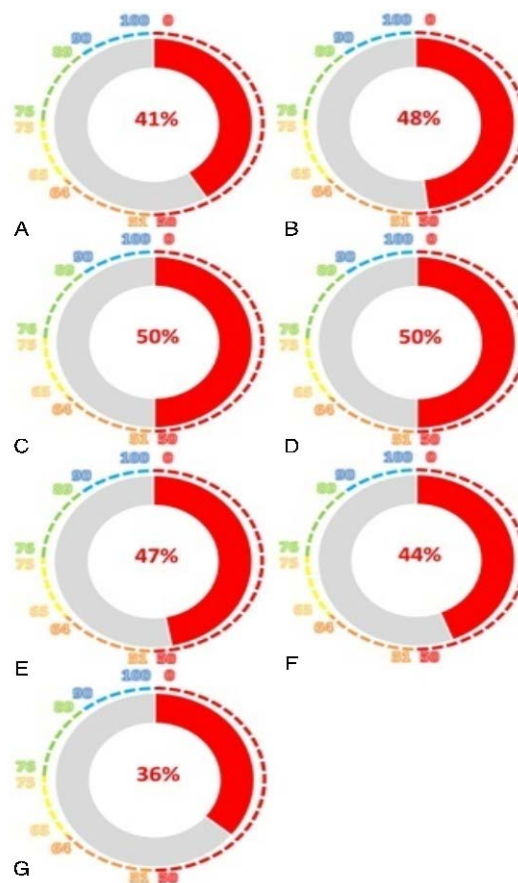
The number of correct answers significantly differed according to the study program,  $p < 0.001$ . The highest number of correct answers was provided by the students of Health Care (50.3%), followed by the students of Physiotherapy (50.2%), Laboratory Technology (46.5%), Sanitary Engineering (43.6%), and students of Radiological Technology (35.7%) (Table 1, Figure 1/C–G). The knowledge was unsatisfactory regardless of the study program.

#### Assessment of general knowledge about HPV

Out of the total population ( $N = 110$ ), 40/45 (88.9%) of respondents attending the first year of study and 60/65 (92.3%) of respondents

attending the third year of study knew about HPV. According to the year of study, no significant difference in the number of respondents who know about HPV was observed,  $p = 0.540$ .

However, a significant difference in the percentage of correct answers to the 11th and 13th questions from the first section of the questionnaire, "General knowledge about HPV", between the respondents of different years of study was recorded. Significantly more respondents of the third year of study (53.8%,  $p = 0.034$ ) answered correctly to the 11th question compared to those of the first year of study (33.3%). Similarly, on the 13th question, significantly more respondents from the third year of study (72.3%,  $p = 0.041$ ) answered correctly compared to the first year of study (53.3%). The number of correct answers to other questions from this section was not significantly different between first- and third-year students at the Faculty of Health Studies, University of Sarajevo (Table 2).



**Figure 1.** The level of knowledge and attitudes of the students according to the year of study and study program

The level of knowledge (percentage of correct answers) was assessed according to the scale:  $\leq 50\%$  - unsatisfactory knowledge; 51–64% - satisfactory knowledge; 65–75% - good knowledge; 76–89% - very good knowledge; and  $\geq 90\%$  - excellent knowledge. The level of knowledge of A) the first year of study, and B) the third year of study; C) Health Care, D) Physiotherapy, E) Laboratory Technologies, F) Sanitary Engineering, and G) Radiological Technologies study program

**Table 1.** Differences in the total number of correct answers according to the year of study and study program

			General knowledge and attitudes toward			Entire questionnaire
			HPV	HPV testing	Vaccination against HPV	
Year of study	1st	Correct answers	415 (57.6%)	94 (34.8%)	140 (23.9%)	649 (41.2%)
		Incorrect answers	305 (42.4%)	176 (65.2%)	445 (76.1%)	926 (58.8%)
		Total	720 (100%)	270 (100%)	585 (100%)	1575 (100%)
	Chi-Square		7.353	6.683	3.362	14.770
			<b>p = 0.007</b>	<b>p = 0.009</b>	<b>p = 0.067</b>	<b>p &lt; 0.001</b>
	3rd	Correct answers	666 (64.0%)	175 (44.9%)	239 (28.3%)	1080 (47.5%)
		Incorrect answers	374 (36.0%)	215 (55.1%)	606 (71.7%)	1195 (52.5%)
		Total	1040 (100%)	390 (100%)	845 (100%)	2275 (100%)
	Study program	Laboratory Technologies	Correct answers	295 (63.6%)	74 (42.5%)	103 (27.3%)
Incorrect answers			169 (36.4%)	100 (57.5%)	274 (72.7%)	543 (53.5%)
Total			464 (100%)	174 (100%)	377 (100%)	1015 (100%)
Radiological Technologies		Correct answers	214 (51.4%)	46 (29.5%)	65 (19.2%)	325 (35.7%)
		Incorrect answers	202 (48.6%)	110 (70.5%)	273 (80.8%)	585 (64.3%)
		Total	416 (100%)	156 (100%)	338 (100%)	910 (100%)
Sanitary Engineering		Correct answers	150 (62.5%)	35 (38.9%)	44 (22.6%)	229 (43.6%)
		Incorrect answers	90 (37.5%)	55 (61.1%)	151 (77.4%)	296 (56.4%)
		Total	240 (100%)	90 (100%)	195 (100%)	525 (100%)
Physiotherapy		Correct answers	192 (66.7%)	51 (47.2%)	73 (31.2%)	316 (50.2%)
		Incorrect answers	96 (33.3%)	57 (52.8%)	161 (68.8%)	314 (49.8%)
		Total	288 (100%)	108 (100%)	234 (100%)	630 (100%)
Health Care		Correct answers	230 (65.3%)	63 (47.7%)	94 (32.9%)	387 (50.3%)
		Incorrect answers	122 (34.7%)	69 (52.3%)	192 (67.1%)	383 (49.7%)
		Total	352 (100%)	132 (100%)	286 (100%)	770 (100%)
Chi-Square			241.368 <b>p &lt; 0.001</b>	130.876 <b>p = 0.011</b>	194.523 <b>p = 0.001</b>	48.419 <b>p &lt; 0.001</b>

A p-value of < 0.05 was considered statistically significant (bolded numbers in the Table).

The best knowledge about HPV was shown by the respondents of the study program of Health Care (21/22, 95.5%). They were followed by students of the study programs of Physiotherapy (17/18, 94.4%), Sanitary Engineering (14/15, 93.3%), and Laboratory Technology (27/29, 93.1%), while the lowest knowledge was shown by the respondents of the Radiological Technology study program (21/26, 80.8%).

No significant difference in the number of participants who responded correctly about HPV according to the study program ( $p = 0.363$ ) was observed.

A significant difference among the respondents of different study programs in the percentage of correct answers to questions number 10 and 13 of the first section, "General knowledge about HPV", ( $p = 0.008$  and  $p = 0.014$ ) was seen. The highest number of correct answers to question 10 showed students of Laboratory Technologies (89.7%) and Sanitary Engineering (80.0%), then students of Health Care (63.6%), and Radiological Technologies and Physiotherapy (with 50%),  $p = 0.008$ . The highest number of correct answers to question 13 was provided by students of Health Care (81.8%), followed by students of Physiotherapy

(77.8%) and Sanitary Engineering (73.33%). Students of the study program Laboratory Technology provided 62.1% of correct answers, while the lowest number of correct answers to the 13th question were provided by the students of Radiological Technologies (38.5%),  $p = 0.014$ . The number of correct answers to other questions from the first section of the questionnaire was not significantly different within observed study programs (Table 2).

#### Assessment of general knowledge about HPV testing

Considering the general knowledge about HPV testing, 35/45 (77.8%) of respondents in the first year and 55/65 (84.6%) in the third year of study knew about HPV testing. According to the year of study, the difference in the number of respondents who knew about HPV testing was not significant ( $p = 0.361$ ).

The best knowledge about HPV testing was shown by the respondents of the Physiotherapy study program (16/18, 88.9%). They were followed by the students of the study programs of Sanitary Engineering (13/15, 86.7%), Laboratory Technologies (25/29, 86.2%), and Health Care (17/22, 77.3%), while the lowest knowledge was shown by the respondents of the Radiological Technology study program (19/26, 73.1%). No significant difference in the number of respondents who knew about HPV testing ( $p = 0.582$ ) of different study programs was seen.

No significant difference was observed in the percentage of correct answers from the second section of the questionnaire, "Knowledge about HPV Testing", between respondents of the first and third year of study and of different study programs (Table 3).

**Table 2.** Assessment of general knowledge about HPV by year of study and study program

Question	Answer	First Year	Third Year	Total	Pearson Chi-Square	p	Laboratory Technologies	Radiological Technologies	Sanitary Engineering	Physiotherapy	Health Care	Total	Pearson Chi-Square	p
1. HPV can cause cervical cancer	True	77.8%	89.2%	84.5%	2.669	0.102	89.7%	76.9%	80.0%	83.3%	90.9%	84.5%	2.675	0.614
	False	22.2%	10.8%	15.5%			10.3%	23.1%	20.0%	16.7%	9.1%	15.5%		
2. A person could have HPV for many years without knowing it	True	80.0%	81.5%	80.9%	0.041	0.840	79.3%	76.9%	73.3%	88.9%	86.4%	80.9%	2.039	0.729
	False	20.0%	18.5%	19.1%			20.7%	23.1%	26.7%	11.1%	13.6%	19.1%		
3. Having many sexual partners increases the risk of getting HPV	True	82.2%	92.3%	88.2%	2.595	0.107	86.2%	76.9%	100.0%	94.4%	90.9%	88.2%	6.116	0.191
	False	17.8%	7.7%	11.8%			13.8%	23.1%	0%	5.6%	9.1%	11.8%		
4. HPV is very rare	True	73.3%	73.8%	73.6%	0.325	0.569	75.9%	65.4%	93.3%	61.1%	77.3%	73.6%	5.588	0.232
	False	26.7%	26.2%	26.4%			24.1%	34.6%	6.7%	38.9%	22.7%	26.4%		
5. HPV can be passed on during sexual intercourse	True	82.2%	84.6%	83.6%	0.111	0.739	89.7%	73.1%	80.0%	94.4%	81.8%	83.6%	4.620	0.329
	False	17.8%	15.4%	16.4%			10.3%	26.9%	20.0%	5.6%	18.2%	16.4%		
6. HPV always has visible signs or symptoms	True	71.1%	64.6%	67.3%	0.510	0.475	72.4%	50.0%	60.0%	72.2%	81.8%	67.3%	6.546	0.162
	False	28.9%	35.4%	32.7%			27.6%	50.0%	40.0%	27.8%	18.2%	32.7%		
7. Using condoms reduces the risk of getting HPV	True	77.8%	83.1%	80.9%	0.483	0.487	86.2%	65.4%	80.0%	94.4%	81.8%	80.9%	6.738	0.150
	False	22.2%	16.9%	19.1%			13.8%	34.6%	20.0%	5.6%	18.2%	19.1%		
8. HPV can cause HIV/Aids	True	35.6%	38.5%	37.3%	0.096	0.757	44.8%	26.9%	20.0%	38.9%	50.0%	37.3%	5.358	0.253
	False	64.4%	61.5%	62.7%			55.2%	73.1%	80.0%	61.1%	50.0%	62.7%		
9. HPV can be passed on by genital skin-to-skin contact	True	51.1%	60.0%	56.4%	0.854	0.355	65.5%	34.6%	60.0%	66.7%	59.1%	56.4%	6.912	0.141
	False	48.9%	40.0%	43.6%			34.5%	65.4%	40.0%	33.3%	40.9%	43.6%		
10. Men cannot get HPV	True	64.4%	69.2%	67.3%	0.277	0.599	89.7%	50.0%	80.0%	50.0%	63.6%	67.3%	13.797	<b>0.008*</b>
	False	35.6%	30.8%	32.7%			10.3%	50.0%	20.0%	50.0%	36.4%	32.7%		
11. Having sex at an early age increases the risk of getting HPV	True	33.3%	53.8%	45.5%	4.513	<b>0.034*</b>	51.7%	46.2%	33.3%	55.6%	36.4%	45.5%	2.828	0.744
	False	66.7%	46.2%	54.5%			48.3%	53.8%	66.7%	44.4%	63.6%	54.5%		
12. There are many types of HPV	True	57.8%	70.8%	65.5%	1.985	0.159	51.7%	69.2%	73.3%	77.8%	63.6%	65.5%	4.235	0.375
	False	42.2%	29.2%	34.5%			48.3%	30.8%	26.7%	22.2%	36.4%	34.5%		

13. HPV can cause genital warts	True	53.3%	72.3%	64.5%	4.183	<b>0.041*</b>	62.1%	38.5%	73.3%	77.8%	81.8%	64.5%	12.559	<b>0.014*</b>
	False	46.7%	27.7%	35.5%			37.9%	61.5%	26.7%	22.2%	18.2%	35.5%		
14. HPV can be cured with antibiotics	True	53.3%	47.7%	50.0%	0.338	0.561	44.8%	38.5%	53.3%	61.1%	59.1%	50.0%	3.378	0.497
	False	46.7%	52.3%	50.0%			55.2%	61.5%	46.7%	38.9%	40.9%	50.0%		
15. Most sexually active people will get HPV at some point in their lives	True	24.4%	32.3%	29.1%	0.797	0.372	24.1%	30.8%	40.0%	33.3%	22.7%	29.1%	1.835	0.766
	False	75.6%	67.7%	70.9%			75.9%	69.2%	60.0%	66.7%	77.3%	70.9%		
16. HPV usually does not need any treatment	True	4.4%	10.8%	8.2%	1.416	0.234	3.4%	3.8%	0%	16.7%	18.2%	8.2%	7.506	0.111
	False	95.6%	89.2%	91.8%			96.6%	96.2%	100.0%	83.3%	81.8%	91.8%		

\*A p-value of < 0.05 was considered statistically significant (bolded numbers in the table)

**Table 3.** Assessment of knowledge about HPV testing by year of study and study program

Question	Answer	First Year	Third Year	Total	Pearson Chi-Square	p	Laboratory Technologies	Radiological Technologies	Sanitary Engineering	Physiotherapy	Health Care	Total	Pearson Chi-Square	p
1. If a woman tests positive for HPV she will definitely get cervical cancer	True	64.4%	70.8%	68.2%	0.490	0.484	62.1%	53.8%	66.7%	83.3%	81.8%	68.2%	6.769	0.149
	False	35.6%	29.2%	31.8%			37.9%	46.2%	33.3%	16.7%	18.2%	31.8%		
2. An HPV test can be done at the same time as a Pap smear test	True	51.1%	63.1%	58.2%	1.565	0.211	58.6%	53.8%	66.7%	61.1%	54.5%	58.2%	0.830	0.934
	False	48.9%	36.9%	41.8%			41.4%	46.2%	33.3%	38.9%	45.5%	41.8%		
3. An HPV test can tell you how long you have had an HPV infection	True	15.6%	29.2%	23.6%	3.755	0.097	24.1%	7.7%	26.7%	22.2%	40.9%	23.6%	7.399	0.116
	False	84.4%	70.8%	76.4%			75.9%	92.3%	73.3%	77.8%	59.1%	76.4%		
4. HPV testing is used to indicate if the HPV vaccine is needed	True	26.7%	35.4%	31.8%	0.932	0.334	37.9%	23.1%	20.0%	22.2%	50.0%	31.8%	6.497	0.165
	False	73.3%	64.6%	68.2%			62.1%	76.9%	80.0%	77.8%	50.0%	68.2%		
5. When you have an HPV test, you get the results the same day	True	24.4%	33.8%	30.0%	1.119	0.290	41.4%	15.4%	26.7%	44.4%	22.7%	30.0%	6.855	0.144
	False	75.6%	66.2%	70.0%			58.6%	84.6%	73.3%	55.6%	77.3%	70.0%		
6. If an HPV test shows that a woman does not have HPV, her risk of cervical cancer is low	True	26.7%	36.9%	32.7%	1.271	0.260	31.0%	23.1%	26.7%	50.0%	36.4%	32.7%	3.959	0.412
	False	73.3%	63.1%	67.3%			69.0%	76.9%	73.3%	50.0%	63.6%	67.3%		

A p-value of < 0.05 was considered statistically significant

#### Assessment of knowledge about HPV vaccination

By assessing knowledge about HPV vaccination, 22/45 (48.9%) of respondents in the first year and 35/65 (53.8%) in the third year of the study knew about HPV vaccination. According to the year of study, the difference in the number of respondents who knew about HPV vaccination was not significant ( $p = 0.609$ ).

Significantly more respondents of the third year of study (33.8%) answered correctly to question number 7 of the third section of the questionnaire, "Knowledge about HPV vaccination", compared to respondents of the first year of study (8.9%),  $p = 0.002$ . The number of correct answers to other questions from this section was not significantly different between first- and third-year students (Table 4).

The best knowledge about HPV vaccination was shown by the respondents of the study program Physiotherapy (13/18, 72.2%), Radiological Technologies (14/26, 53.8%), Laboratory Technologies (15/29, 51.7%), and Health Care (10/22, 45.5%), while the lowest knowledge was shown by the respondents of the study program Sanitary Engineering (5/15, 33.3%).

No significant difference in the number of respondents from different study programs who knew about HPV vaccination ( $p = 0.244$ ) was observed.

A significant difference was recorded in the percentage of correct answers to questions 2 and 3 in the third section of the questionnaire, "Knowledge about HPV vaccination", ( $p = 0.016$  and  $p = 0.018$ , respectively) among the respondents of different study programs. The

highest number of correct answers to question 2 was provided by the students of the Physiotherapy program (33.3%), followed by the students of Sanitary Engineering (13.3%), Laboratory Technologies (6.9%), and Health Care (4.5%). The students of Radiological Technologies had the lowest percentage of correct answers (3.8%),  $p = 0.016$ . The highest number of correct answers to question 3 was provided by students of

Physiotherapy (77.8%), followed by students of Health Care (59.1%), Laboratory Technologies (55.2%), Radiological Technologies (46.2%), and Sanitary Engineering (20.0%),  $p = 0.018$ . The number of correct answers to other questions from the third section of the questionnaire was not significantly different within study programs (Table 4).

**Table 4.** Assessment of knowledge about HPV vaccination by year of study and study program

Question	Answer	First Year	Third Year	Total	Pearson Chi-Square	p	Laboratory Technologies	Radiological Technologies	Sanitary Engineering	Physiotherapy	Health Care	Total	Pearson Chi-Square	p
1. Girls who have had an HPV vaccine do not need a Pap smear test when they are older	True	62.2%	56.9%	59.1%	0.309	0.578	65.5%	42.3%	40.0%	72.2%	72.7%	59.1%	8.763	0.067
	False	37.8%	43.1%	40.9%			34.5%	57.7%	60.0%	27.8%	27.3%	40.9%		
2. Two of the vaccines offer protection against genital warts	True	4.4%	15.4%	10.9%	3.275	0.070	6.9%	3.8%	13.3%	33.3%	4.5%	10.9%	12.135	0.016*
	False	95.6%	84.6%	89.1%			93.1%	96.2%	86.7%	66.7%	95.5%	89.1%		
3. The HPV vaccines offer protection against all sexually transmitted infections	True	53.3%	52.3%	52.7%	0.011	0.916	55.2%	46.2%	20.0%	77.8%	59.1%	52.7%	11.855	0.018*
	False	46.7%	47.7%	47.3%			44.8%	53.8%	80.0%	22.2%	40.9%	47.3%		
4. Someone who has an HPV vaccine cannot develop cervical cancer	True	51.1%	56.9%	54.5%	0.362	0.547	58.6%	42.3%	33.3%	66.7%	68.2%	54.5%	7.204	0.126
	False	48.9%	43.1%	45.5%			41.4%	57.7%	66.7%	33.3%	31.8%	45.5%		
5. HPV vaccines offer protection against most cervical cancers	True	24.4%	30.8%	28.2%	0.526	0.468	27.6%	11.5%	33.3%	38.9%	36.4%	28.2%	5.507	0.239
	False	75.6%	69.2%	71.8%			72.4%	88.5%	66.7%	61.1%	63.6%	71.8%		
6. The HPV vaccine requires three doses	True	11.1%	15.4%	13.6%	0.412	0.521	17.2%	7.7%	13.3%	22.2%	9.1%	13.6%	2.614	0.624
	False	88.9%	84.6%	86.4%			82.8%	92.3%	86.7%	77.8%	90.9%	86.4%		
7. The HPV vaccines are the most effective if given to people who have never had sex	True	8.9%	33.8%	23.6%	9.176	0.002*	24.1%	11.5%	46.7%	11.1%	31.8%	23.6%	8.901	0.064
	False	91.1%	66.2%	76.4%			75.9%	88.5%	53.3%	88.9%	68.2%	76.4%		
8. The HPV vaccine is offered to girls aged 12–13 years	True	22.2%	24.6%	23.6%	0.084	0.771	27.6%	15.4%	26.7%	22.2%	27.3%	23.6%	1.489	0.829
	False	77.8%	75.4%	76.4%			72.4%	84.6%	73.3%	77.8%	72.7%	76.4%		
9. The HPV vaccine is offered to women aged 30–45 years	True	22.2%	24.6%	23.6%	0.084	0.771	20.7%	23.1%	20.0%	11.1%	40.9%	23.6%	5.455	0.244
	False	77.8%	75.4%	76.4%			79.3%	76.9%	80.0%	88.9%	59.1%	76.4%		
10. The HPV vaccine that is offered is free	True	4.4%	9.2%	7.3%	0.903	0.342	6.9%	7.7%	13.3%	0%	9.1%	7.3%	2.349	0.672
	False	95.6%	90.8%	92.7%			93.1%	92.3%	86.7%	100.0%	90.9%	92.7%		
11. The HPV vaccine that is offered protects against genital warts	True	17.8%	15.4%	16.4%	0.111	0.739	17.2%	11.5%	6.7%	22.2%	22.7%	16.4%	2.592	0.628
	False	82.2%	84.6%	83.6%			82.8%	88.5%	93.3%	77.8%	77.3%	83.6%		
12. The HPV vaccine is offered to boys aged 12–13 years	True	24.4%	23.1%	23.6%	0.028	0.868	20.7%	23.1%	13.3%	22.2%	36.4%	23.6%	3.020	0.554
	False	75.6%	76.9%	76.4%			79.3%	76.9%	86.7%	77.8%	63.6%	76.4%		
13. The HPV vaccine is usually offered in schools	True	4.4%	9.2%	7.3%	0/903	0.342	6.9%	3.8%	13.3%	5.6%	9.1%	7.3%	1.462	0.833
	False	95.6%	90.8%	92.7%			93.1%	96.2%	86.7%	94.4%	90.9%	92.7%		

A p-value of < 0.05 was considered statistically significant

## Discussion

All aspects of HPV infection and its linkage to cancer development might be adopted at a younger age to prevent the potential consequences later. In countries that still do not have an established organized cervical screening program, such as BIH, it is substantial to continuously raise awareness about the nature of HPV infection, diagnosis, and vaccination. A considerable responsibility rests on future healthcare workers who, based on their knowledge, will point out this problem, impose the need to establish preventive measures and participate in their systematic and organized implementation.

The students' knowledge presented in this study was unsatisfactory regardless of the year and study program. Similarly, awareness of HPV and its link to cervical cancer was low in the general population of women in China and even lower among government and medical staff (23).

According to a study by Badgujar et al. (24), students showed a better understanding of cancer development and the formation of genital warts associated with HPV when compared to already employed respondents. In the present study, significantly more respondents in the third year of study ( $p = 0.041$ ) and the Health Care study program ( $p = 0.014$ ) correctly answered to the question of whether HPV can cause genital warts.

In a study at the University of Great Britain conducted through a conversation with many students in different fields (25), neither male nor female respondents were aware of how HPV is transmitted or what genital warts are, despite being familiar with the HPV vaccines and the regimen of their taking at the age before being sexually active. On the other hand, the male respondents considered HPV among the top health issues in men.

A study by Keser et al. (26) involved students in the third, fourth, and fifth year of Dentistry. Many more students in the fourth and fifth study years participated, and they showed better knowledge when it comes to human papillomavirus-related oral cancer (some types of HPV cause oral cancer,  $p = 0.000$ ;  $p < 0.05$ ). Undergraduate students attending health sciences and other schools at the Universities of Genoa and Bari (27) showed poor knowledge but good attitudes about HPV. Therefore, they concluded that future healthcare workers need training on HPV. Although the knowledge from respondents of our study was also poor, third-year undergraduate health students gave more correct answers to questions about general knowledge of HPV and HPV testing ( $p = 0.007$  and  $p = 0.009$ , respectively) than first-year students. It is crucial to continuously educate health workers and increase awareness among the general population about the issue of cervical cancer. This will not only aid in preventing the disease but also help manage individuals infected with HPV more effectively.

According to a survey among 500 students in Pakistan (28), most of whom attended some health or biological disciplines, poor knowledge about HPV was shown. Namely, one group of students stated that HPV causes AIDS, while another group stated that HPV infection could be prevented/treated using antibiotics. Significant differences were recorded in the number of correct answers about general knowledge about HPV, HPV testing ( $p = 0.011$ ), and vaccination against HPV ( $p = 0.001$ ) among students of different study programs. The best knowledge about HPV, HPV testing, and vaccination showed the students of Health Care, then students of Physiotherapy, Laboratory Technologies, and Sanitary Engineering, while the students of Radiological Technologies had the lowest knowledge level.

The level of knowledge about HPV infection among students attending the first year at the Faculty of Medicine of Tîrgu Mureş University in Romania was poor compared with the students attending the sixth study year, where even 75% of them answered they would vaccinate their child against HPV (29).

Also, first-year students entering University in Western Turkey showed significantly poor general knowledge about HPV, with 59.6% of respondents having zero as their questionnaire score, but very few of them, regardless of gender, intended to be vaccinated (30).

Among 957 medical and paramedical students (31), only 44.9% showed good knowledge about HPV vaccination, with only 17.9% of respondents considering that the vaccine was more than 95% effective. General knowledge about the vaccine dosing and its role in preventing HPV-causing conditions was poor.

Comparing the results from our study a statistically significant difference in knowledge about HPV vaccination between the respondents of the first and third year of study was not observed, and knowledge was unsatisfactory. Only when it comes to the effectiveness of HPV vaccines when given to people who have never had sexual intercourse, we noticed a statistically better knowledge of students in the third year of study.

School-age is a very receptive time for cancer prevention and the HPV vaccine strategy because most people are infected with HPV in that period of life (32).

## Conclusion

Future health professionals are expected to show better knowledge and attitudes than our study has proven. Therefore, we believe that investing more efforts in education of all health worker profiles will help promote awareness about preventive measures to preserve the reproductive health of the at-risk population. Achieving a high level of knowledge about the nature of HPV infection could improve the implementation of organized cervical screening programs in our country and enable a more responsible approach towards addressing this issue.



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## HUMANI PAPILOMA VIRUS: ISTRAŽIVANJE ZNANJA I STAVOVA STUDENATA DODIPLOMSKIH ZDRAVSTVENIH STUDIJA

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Cilj ove studije bio je proceniti znanje budućih zdravstvenih radnika u Bosni i Hercegovini (BiH) o prirodni humanog papiloma virusa (HPV), HPV testiranju i vakcinaciji i njihove stavove prema tome.

Ovo deskriptivno-analitičko prospektivno istraživanje preseka sprovedeno je korišćenjem standardizovanog upitnika koji su popunjavali studenti prve i treće godine dodiplomskih studija različitih studijskih programa Fakulteta zdravstvenih studija Univerziteta u Sarajevu.

Istraživanje je rezultiralo sa 110 potpuno popunjenih upitnika. Procenat studenata zdravstvenih studija koji su čuli za HPV iznosio je 88,9% na prvoj godini, a 92,3% na trećoj godini. Studenti treće godine imali su bolje opšte znanje o HPV-u ( $p = 0,007$ ) i HPV testiranju ( $p = 0,009$ ). Značajne razlike uočene su u opštem poznavanju HPV-a kod studenata svih studijskih programa ( $p < 0,001$ ), u znanju o HPV testiranju ( $p = 0,001$ ), te vakcinaciji ( $p = 0,001$ ). Studenti programa Zdravstvena nega i Fizioterapija imali su više znanja i primerenije stavove od studenata na drugim studijskim programima.

Bez obzira na studijsku godinu i program, može se reći da je nizak nivo znanja koje o HPV infekciji imaju studenti u BiH. Ciljane intervencije u zdravstvenom obrazovanju mogle bi u budućnosti pozitivno uticati na širenje znanja o HPV-u i na usvajanje preventivnih metoda.

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**Ključne reči:** *humani papiloma virus, infekcija papiloma virusom, studenti, vakcinacija, ankete, upitnici*

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