

Human Papillomavirus (HPV) Infection and HPV Vaccination: Assessing the Level of Knowledge among Students of the University of Medicine and Pharmacy of Tîrgu Mureş, Romania

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ABSTRACT Human papillomavirus (HPV) infection, a causative factor for cervical cancer, remains a topic of great interest. About 80% of sexually active women are at risk of acquiring an HPV infection at some point in life, the peak incidence of infection having been identified in young women. The aim of the study was to assess the knowledge and attitudes of medical students about sexually transmitted diseases, HPV infection, HPV vaccinations, and student sexual behavior. A transversal study was conducted using a questionnaire on students on the 1st and 6th year at the Faculty of Medicine of Tîrgu Mureş University, Romania. The study resulted in 522 fully completed questionnaires. The percentage of students who had heard about HPV was 82.1% in the 1st year and 99.1% in the 6th year of medical school, but the level of knowledge was different: 62% of senior students had a good or very good level of knowledge, whereas 55.1% of first year students had little knowledge on the topic. About 75% of 6th year students would vaccinate their child against HPV, compared with only 52.4% of 1st year students ($P < 0.001$). The level of knowledge about HPV infection among students in their first year of medical school is rather low, significantly lower compared to 6th year students, which suggests acquiring some basic information in this area since the first year of college or even high school.

KEY WORDS: HPV infection; HPV vaccination; students; sexual behavior

Author contributions

VS designed the study, prepared the material, processed and statistically analyzed the data, interpreted the results, and drafted and edited the manuscript. DM coordinated and monitored the study activities and critically revised the manuscript. TM analyzed the data and critically revised the manuscript. MSH reviewed the material used for the study and critically revised the manuscript. MH reviewed the material used for the study and critically revised the manuscript. CI contributed to the collection and the introduction of the questionnaire in the database of the study. All authors read and approved the final manuscript.

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INTRODUCTION

Human papillomavirus (HPV) infection, a causative factor for cervical cancer (CC), is still a subject of interest in the literature (1,2).

Among sexually active women, 70-80% are at risk of acquiring an HPV infection at some point in life (3,4). The peak incidence of HPV infections has been identified in young women, while men also are at a constant risk of contracting new infections throughout life (5).

According to statistics, CC is the third most common cancer in women after breast cancer and colorectal cancer, with approximately 530 000 cases recorded in 2012, 80% of these in developing countries. Mortality rates rank this type of cancer in fourth place, with approximately 275 000 deaths in 2012, about 90% of these in developing countries. Across Europe, there are about 60 000 women who develop cervical cancer, and 30 000 die from this disease every year with more than 225 000 living with the disease. Cervical cancer incidence rates vary by country; in Eastern European countries rates are 2 to 5 times higher than in Western Europe (6).

Romania ranks first in Europe in terms of mortality from cervical cancer (10.7%), over 6 times more than the average in European Union countries. Of all cancers in women, CC ranks fourth in terms of mortality after breast, colorectal, and lung cancer. The incidence rate was estimated at 28.65%, with over 4 000 new cases discovered according to 2012 data, ranking third after breast and colorectal cancer (7).

In 2008, a free campaign for immunization against HPV types 16 and 18 was introduced in Romania, the target population being girls aged 10 and 11 years. However, the vaccination rate was under 3%, one of the main reasons being the lack of public information (8-10).

Starting from the premise that young medical students are better informed than average, our goal was to assess the attitudes and knowledge of medical students on sexually transmitted diseases (STDs), HPV infection, HPV vaccinations, and the students' sexual behavior.

METHODS

The study was based on a cross-sectional survey using a self-administered validated questionnaire as the research tool. Medical students in years 1 and 6 (the first and the last) at the Faculty of Medicine of the University of Medicine and Pharmacy of Tîrgu Mureş, Romania, were surveyed. The study was approved by the Ethics Committee of the University. Approxi-

mately 670 students were surveyed, which represents about 28.38% of the total students in years 1 and 6 at the Faculty of Medicine.

The questionnaire included 55 items with questions about: 1) demographic data, 2) attitudes towards prevention of serious diseases, 3) sexual behavior, 4) awareness of sexually transmitted diseases and personal medical history, 5) knowledge of infection HPV, 6) awareness of the HPV vaccine that prevents infection. Questions were of the following types: open questions, closed questions with ordered answers, closed with unordered answers, and also binary questions, with a maximum writing time of 20 minutes. For each question respondents were requested to choose one or multiple answers. Details such as the purpose of the study, anonymity, and confidentiality of responses were mentioned in the header of the questionnaire.

Data collection

The survey was conducted in October-November of 2015. Questionnaires were administered at the end of classes during academic activities; the completed questionnaires were collected in reliable storage place. Of the 600 questionnaires administered, a total of 548 students agreed to participate in the study, resulting in a response rate of 91.3%. Twenty-six questionnaires were cancelled due to being either incorrectly or only partially completed. In the end, 522 fully completed questionnaires were entered into an Excel database and statistically processed.

Statistical analysis

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS, version 20, Chicago, IL, USA). The Student's *t*-test was used to assess differences between the means of continuous variables (expressed as mean \pm Standard Deviation (SD)), while the χ^2 test was used for categorical variables (expressed as number (%)). Bivariate analysis (chi square test) was used to benchmark the two years of study (year 1 versus year 6) according to different variables of interest. All tests were interpreted according to the significance threshold of $P=0.05$, and *P* values under the significance threshold were considered statistically significant.

RESULTS

Participants

The study resulted in 290 (55.5%) questionnaires filled in by students from the 1st year and 232 (45.5%) questionnaires from students from the 6th year. Two

Table 1. The attitude of students towards transmissible diseases which can be prevented by vaccination

	1st year no.: 290	6th year no.: 232	P value <i>Chi</i>²
Average age (years) –Student's <i>t</i>-test	19.8±1.32	24.4±1.15	0.0001
Sex (%)			
Women	74.8	73.7	0.77
Men	25.2	26.3	
Are you registered with a general practitioner? (%)	95.5	98.3	0.07
What is your attitude towards an occurring health problem? (%)			
You seek specialist aid	72.1	71.1	0.87
Ask the chemist for advice	6.6	6.0	0.92
You take a medicine that you know	25.5	37.9	0.003
You wait for the problem to go away by itself	9.0	14.7	0.05
What is your attitude towards the prevention of serious diseases? (%)			
Prevention of serious diseases is a mandatory step	61.4	66.8	0.23
More free vaccines should be introduced	15.9	35.3	0.001
You take the vaccine, preferring not to develop the disease	24.5	27.2	0.54
You do not take the vaccine, preferring to acquire immunity through natural infection	11.4	12.1	0.91
Do you know at least two vaccines that are included in the National Immunisation Programme? (%)	73.4	98.3	0.001
Have you ever benefited from a vaccine included in the National Immunisation Programme? (%)	84.5	90.5	0.04
Which do you think are the reasons that parents do not want to have their children vaccinated (%):			
The fear of side effects	63.8	76.7	0.002
Religious reasons	9.7	21.6	0.003
Poor information	41.4	54.3	0.004
They think the vaccine is inefficient	12.8	22.4	0.005
Their GP does not recommend vaccination	3.1	6.5	0.10
The HPV vaccine is new and it requires further research on safety and efficacy	19.7	26.7	0.07

thirds of the students were women, and the mean age for them was 19.8 in the 1st year and 24.4 for the 6th year students ($P=0.0001$). About one quarter of the students came from rural areas. Distribution into ethnic groups found 66.3% of the students were Romanian and 33.7% Hungarian. Of the respondents, 96.7% were registered with a general practitioner (GP). Characteristics of the student groups are shown in Table 1.

General attitude towards prevention of infectious diseases

Upon emergence of health problems, approximately 40% of 6th year students would administer a known drug, compared with only 25.5% of 1st year students ($P=0.003$). Although attitudes towards prevention of serious diseases were similar between 1st

and 6th year students, the latter considered it necessary to introduce more vaccines, especially free ones, for prophylaxis ($P=0.001$). Addressing the relationship vaccine-transmissible disease by year 6 students is reinforced by the fact that these students know more aspects of vaccines included in the National Immunisation Programme (NIP) ($P=0.004$). According to all students, the reasons why parents do not want to have their children vaccinated are the fear of side effects or not knowing the details about the vaccine; religious reasons or the fact that the vaccine is not effective were also key factors according to the students.

Sexual behavior

Table 2 shows the aspects of sexual behavior. For protection against STDs, 6th year students found



Table 2. Sexual behavior comparatively assessed in 1st vs 6th year students

Answers	1 st year no.: 290	6 th year no.: 232	P value <i>Chi</i> ²
Do you think that condom use is effective against STDs? (%)			
Little	8.3	4.7	0.14
Very	26.6	38.8	0.004
What kind of sexual intercourse have you had?* (%)			
Vaginal	63.4	86.6	0.001
Anal	8.6	9.5	0.84
Oral	29.3	46.6	0.001
How many sexual partners have you had so far?* (%)			
One	34.8	26.7	0.06
2-4	22.8	37.1	0.0005
5-9	5.5	15.9	0.0002
Over 10	3.4	7.3	0.07
Duration of a sexual intercourse (average)?, (%)			
≤ 10 minutes	5.9	4.7	0.68
10-20 minutes	19.3	33.6	0.0003
20-30 minutes	21.7	32.8	0.006
Over 30 minutes	17.2	15.5	0.68
The frequency of sexual intercourses per week (average):* (%)			
1-2	39.3	44.8	0.23
3-4	19.0	37.5	0.001
Over 5	2.4	0.4	0.13
In your opinion, as a general rule, at what age does sexual life begin? (%)			
≤ 13 years	0.3	2.2	0.10
14-17 years	30.3	44.0	0.001
18-21 years	53.1	47.0	0.19
22-25 years	8.6	3.4	0.02
Over 25 years	1.4	0.4	0.47
Do you discuss/have you discussed the following topics with your partner? (%)			
Choosing the right contraception method	58.9	74.5	0.0003
The number of children desired, family planning	35.2	61.6	0.0001
Unsatisfied sexual needs	39.7	53.0	0.003
The risk of contracting a sexually transmitted disease	40.0	62.1	0.0001
Previous sexual experiences/A personal history of sex	43.4	69.4	0.0001
The human nature to have more sexual partners	29.0	43.5	0.0008

* percentage differences to 100% derived from respondents who failed to answer the question

condom use very effective, a significantly higher ratio compared with 1st year students ($P=0.004$). Of the respondents who had begun their sexual life, 6th year students practiced different types of vaginal or oral sex at significantly higher percentage values in comparison with 1st year students (86.6%/46.6%). While 19.3% of 1st year students combined vaginal and anal sex, 6th year students did so at a significantly higher percentage, 37.06% ($P=0.001$). Additionally, the number of sexual partners and the average length of the intercourse increased significantly in 6th year students. According to senior students, the optimal age to begin sexual life was 14-17 years of age, while 1st year students consider the optimal age to be 20-21 years of age. In 6th year students, there was a much greater focus on the concepts of family planning. The risk of an unwanted pregnancy or the possibility of acquir-

ing sexually transmitted diseases were more closely monitored and discussed with the sexual partner.

Knowledge about HPV infection

Almost all senior students had heard of HPV infection, 62% showing a good or very good level of knowledge. In contrast, among 1st year students 55.1% had little or very little knowledge about HPV infection (Table 3). The main sources of information for the latter group were the Internet and to a lesser extent healthcare professionals, while for 6th year students healthcare professionals and university courses played a major role. These relevant sources of information helped senior year students to know more details about the ways HPV infection is transmitted, diseases caused by infection, and methods of prevention/ reduction of HPV infection (Table 4).

Table 3. Comparative description of knowledge about Human papillomavirus (HPV) infection

	1st year no.: 290	6th year no.: 232	P value Chi²
Have you heard about HPV infection?	82.1	99.1	0.0001
On a scale of 1 to 5, how would you describe your level of knowledge about HPV infection? (%)			
Very low	22.3	0.4	0.0001
Low	32.8	6.0	0.0001
Satisfactory	29.0	31.5	0.60
Good	13.8	47.8	0.0001
Very good	2.1	14.2	0.0001
What were your <i>two main sources</i> of information on HPV infection? (%)			
Doctors, healthcare professionals	33.8	77.2	0.0001
Books, magazines, brochures	25.5	40.1	0.0005
Courses	12.4	77.2	0.0001
Internet	52.8	48.3	0.35
Newspapers, radio, TV	23.1	10.8	0.0004
Parents, relatives	13.1	6.5	0.02
Friends, acquaintances	10.0	5.6	0.09
What do you think are the ways of transmission of HPV infection? (%)			
Intimate touch (<i>true</i>)	33.4	44.8	0.001
Insect bites (<i>false</i>)	15.2	3.9	0.01
Heterosexual relationships (<i>true</i>)	67.9	94.8	0.001
Homosexual relationships (<i>true</i>)	55.2	74.6	0.001
Cutaneous/touching warts (<i>true</i>)	26.6	50.9	0.001
Unsterilized needles (<i>false</i>)	57.9	40.9	0.001
Contaminated objects (<i>false</i>)	41.7	34.1	0.007
To what extent do you think HPV infection is a risk to health? (do not know) (%)	15.5	1.3	0.001
What do you think are the diseases caused by HPV infection (%):			
Genital warts;	31.0	72.8	0.001
Anal cancer;	16.9	25.0	0.03
Cervical cancer;	66.9	94.0	0.001
Oropharyngeal cancer;	8.3	38.8	0.001
Sterility;	21.7	24.1	0.58
Do not know.	18.6	0.9	0.001
Tick the methods to prevent/reduce HPV infection (%):			
One single sexual partner;	58.3	80.6	0.001
The use of condoms;	60.7	84.5	0.001
Vaccination;	48.3	83.2	0.001
Personal hygiene, water and soap after the sexual intercourse;	38.3	41.8	0.47
Oral contraceptives;	2.4	4.3	0.33
Delayed onset of sexual life;	10.0	30.2	0.001
Pap smear test.	50.0	70.3	0.001
Have you requested information from your GP (or specialist) about HPV infection and HPV vaccination? (%)	4.5	21.1	0.001



Table 4. Have you received information from your GP (or specialist) about HPV infection and HPV vaccination?

	1st year no.: 290	6th year no.: 232	P value Chi²
What is HPV virus?	20.3%	46.1%	0.001
HPV transmission method?	16.6%	44.8%	0.001
Are nearly all cervical cancers caused by HPV infection?	12.8%	38.8%	0.001
The known types of HPV are divided into those of high risk and low-risk.	13.1%	43.1%	0.001
Genital warts are caused by the same types of HPV that cause cervical cancer.	9.7%	28.0%	0.001
Direct skin contact in the genital area may be sufficient for HPV transmission .	11.4%	33.6%	0.001
The fact that 80% of women will acquire an HPV infection throughout life.	7.9%	31.9%	0.001
A woman can become infected with HPV several times in life because natural infection does not provide protective immunity.	8.3%	34.9%	0.001
Prevention methods against HPV infection?	17.2%	47.8%	0.001
The existence of two vaccines?	7.6%	32.3%	0.001
HPV vaccination recommendations?	12.4%	41.4%	0.001
Benefits of the vaccine?	14.1%	40.9%	0.001
Side effects of the vaccine?	10.0%	31.9%	0.001
Vaccine contraindications and precautions?	9.3%	33.2%	0.001

Knowledge about HPV vaccination

A very good level of knowledge was not found in either group of students. We observed a satisfactory or good level in 67.6% of 6th year students and a low or very low level of knowledge in 73.4% of 1st year students (Table 5). The main sources of information about HPV vaccination for 1st year students were friends, acquaintances, or medical staff to a lesser extent. For senior students, as in the case of information about the infection, the most important sources of information were healthcare professionals and university courses. Relying on sources of accurate information makes senior students more aware of details about HPV vaccination such as the optimal age for vaccination.

DISCUSSION

The study was carried out on approximately equal groups of full-time students at a medical school with a 6-year study period. This investigation followed the principle of comparing the first with the sixth and final year to assess their level of knowledge on HPV infection and HPV vaccination as well as their awareness and approach to the prevention of sexually transmitted diseases.

Our study demonstrated significant differences between the two groups of students, namely those in the 1st and 6th year, with regard to both the level of knowledge on HPV infection and HPV vaccination. In 1st year students, a low and very low level of knowledge was identified, probably similar to that of the general population, that is, the population without

much medical knowledge. Their sources of information were rather inappropriate and mainly represented by friends and the Internet and only 1/3 by health professionals. On the other hand, knowledge levels among 6th year students was good to very good, an expected level regarding their future profession as doctors.

Regardless of the future specialty, the best information about HPV infection and HPV vaccination is derived from university courses and from healthcare professionals or teachers who cover these topics in university curricula. Student professional development during college years will be beneficial for the general population by providing them with the best information and applying the best decisions about HPV infection and HPV vaccination. According to the opinion of 6th year students, most information on HPV infection and HPV vaccination should be offered by doctors, healthcare professionals, and academics. The students also mentioned books, magazines, brochures, newspapers, and radio and television shows, but on the condition that renowned specialists in this field offered the information. The knowledge they acquired gives 6th year students a different vision of HPV vaccination, so they consider the vaccination mandatory at a significantly higher proportion than 1st year students ($P=0.001$). Being better informed, 3/4 of 6th year students would have their child vaccinated against HPV compared to only half of the first year students ($P=0.001$).

It is clear from our results that developing awareness about HPV infection or HPV vaccination is an important way to increase vaccination rates. The low

Table 5. Comparative description of knowledge about HPV vaccination

	1st year no.: 290	6th year no.: 232	P value Chi²
On a scale of 1 to 5, how would you describe your level of knowledge about HPV vaccination? (%)			
Very low	34.1	3.4	0.0001
Low	39.3	23.3	0.0001
Satisfactory	15.9	40.9	0.0001
Good	6.6	26.7	0.0001
Very good	4.1	5.6	0.55
What were your two main sources of information on HPV vaccination? (%)			
Doctors, healthcare professionals	32.4	71.6	0.001
Books, magazines, brochures	13.4	33.2	0.01
Courses	10.0	64.2	0.001
Internet	19.7	34.9	0.001
Newspapers, radio, TV	24.8	19.4	0.17
Parents, relatives	7.9	6.5	0.24
Friends, acquaintances	45.9	6.0	0.001
Knowledge about HPV vaccination? (%)			
Do you think HPV vaccination is necessary?	65.9	90.5	0.001
Do you think girls will be completely protected against cervical cancer after HPV vaccination?	12.1	24.1	0.001
Is it better to vaccinate as many people as possible to protect unvaccinated ones?	54.1	72.4	0.001
The existence of a cancer in your family would make you decide for HPV vaccination?	44.5	59.9	0.001
HPV vaccination has to be (%):			
Mandatory	32.4	54.7	0.001
Optional	67.6	45.3	
At what age is the first dose of HPV vaccine recommended? (%)			
0-11 years	3.8	17.2	0.001
12-14 years	29.3	49.6	0.001
15-17 years	15.9	8.2	0.01
Over 18 years	7.9	1.3	0.001
Before the onset of sexual activity	13.1	20.7	0.02
Do not know	35.2	7.8	0.001
Would you have your child vaccinated against HPV infection? (%)			
	52.4	76.7	0.001
In your opinion, who should provide the most information regarding HPV infection or HPV vaccination? (%)			
Doctors, healthcare professionals	60.3	94.8	0.001
Academic staff	39.0	50.0	0.01
Books, magazines, brochures	25.9	34.5	0.04
Newspapers, radio, TV	27.2	40.9	0.001
Friends, acquaintances	6.9	6.5	0.99
Parents, relatives	17.2	21.1	0.29

level of knowledge of 1st year students who recently graduated from high school highlights the lack of health education classes which should address these issues.

Educational programs aiming at the pupils are a simple strategy, but potentially effective in enhancing HPV vaccination by providing clear and transparent information on the advantages and disadvantages of HPV vaccination. However, healthcare professionals should be instructed to use appropriate communication strategies that can help reduce fear of side

effects and increase confidence in vaccination among parents.

A study by Paul *et al.* (11) described the results of educational interventions that targeted three main groups which usually have contact with girls eligible for vaccination: parents, healthcare professionals, and teachers. The authors noted that while education programs are needed for these groups, short education sessions are enough to provide the necessary information about HPV and HPV vaccination.



Parents, healthcare providers, and teachers are key decision-makers who can influence the acceptance of HPV vaccination and behavior of young people towards the prevention of HPV infection (12-16).

The reasons for lower adherence to vaccination in the general population are well-known: fear of side effects, no detailed knowledge about the vaccine, poor information, and the fact that the HPV vaccine is new and requires further research on safety and efficacy; these reasons were identified by both groups of students. HPV vaccination programs launched in Romania in recent years have resulted in failure, since the vaccination rates are still very low.

Vaccination and early detection through screening are the most appropriate ways to prevent the development of a future CC. However, the HPV vaccine was introduced to the market only in recent years, too short a period to assess its long-term efficacy. In order to obtain a strong reduction of morbidity and mortality worldwide, it is also important to reduce the morbidity in developing countries. The funding of effective screening or preventive HPV vaccination campaigns could change the incidence of diseases caused by HPV infection in these countries (17).

Several studies have assessed the level of knowledge about HPV vaccination and HPV infection in adolescent and young adult populations. The level is generally low. Consistently, women are more informed than men, given that HPV infection is more commonly associated with female genital pathology. Nonetheless, a higher level of education is also an advantage (18-24).

A Belgian study (17) assessed the knowledge about HPV of students of medical and non-medical specializations. The knowledge was similar to that of 6th year students in our study.

An Italian study assessed knowledge, attitudes, and practices related to HPV infection and vaccination in women aged 18-26 years in order to investigate HPV vaccination acceptance and the possibility of implementing a catch-up public vaccination program for these women. Of the respondents included in the study, 44% were students (25).

The conclusion of a German study conducted on men and women aged 18-20 and 21-25 years was that better education about HPV infection and advice on HPV vaccination is needed. Such education, however, should go beyond the association between HPV and cervical cancer. The study also pointed out that HPV infection is not "only a problem of women", but it is common to both sexes (26).

In our study, 6th year students considered condoms very effective in protection against STDs, at a

significantly higher proportion compared with 1st year students ($P=0.004$). We noticed that in the opinion of senior students the optimal age to begin sexual life would be 14 to 17 years old; however, students from the first year of medical school stated that the optimal age was 20-21 years old. Of the students who began their sexual life, 6th year students practice vaginal, oral, or anal sex at significantly higher percentage levels compared with 1st year students. Amid some differences in age and sexual experience, the number of sexual partners and the average duration of the intercourse significantly increase in senior students. On the other hand, awareness of the risk of an unwanted pregnancy or the possibility of contracting STDs, including HPV infection, causes 6th year students to be more concerned about family planning and to frequently discuss these issues with their sexual partner.

Although HPV infection is the most common, it is not the only causative agent of CC. There are other demographic and behavioral risk factors that increase the relative risk of developing cancer: low education level, early onset of sexual life, multiple sexual partners, long-term use of oral contraceptives, personal history of STDs, the presence of genital warts, lack of routine cytological screening, or previously performed abnormal smears (27).

CONCLUSIONS

The results of our study show that the level of knowledge among students of the first year of medical school about HPV infection is low, significantly lower compared to students of the final year of school. We also found that a high level of knowledge is associated with increased uptake of vaccination as an excellent method to prevent infection and HPV-related malignancies.

In order to reduce the risk of cancer induced by HPV infection, adherence of the population to appropriate preventive programs as well as the dissemination of relevant information by healthcare professionals appear to be key elements. Additionally, informing adolescents and young adults about HPV would help them make the best decisions about their behavior towards health, including the way they are sexually active and the decision whether or not to choose HPV immunization.

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