



Awareness of HPV and Cervical Cancer Prevention Among University Health Sciences Students in Cyprus

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Abstract

Cervical cancer is preventable; however, despite the existence of primary and secondary means of prevention, its incidence is still higher in certain socioeconomic groups and countries, suggesting gaps in cervical cancer prevention. The objective of this study was to evaluate the knowledge and awareness of health sciences university students in Cyprus regarding HPV and cervical cancer in order to better guide the future development of educational programs to improve cervical cancer prevention. This was a cross-sectional study of 178 university health sciences students in Cyprus using a validated questionnaire on HPV and cervical cancer prevention. Analysis of the completed questionnaires revealed moderate levels of knowledge and awareness with an overall mean score of 23.32 out of 33 on HPV and 8.12 out of 13 on cervical cancer, a score of 9.25 out of 14 on HPV vaccines, and a score of 5.93 out of 9 on cervical cancer screening. Older students achieved higher scores compared to younger students (mean score of 6.76 for 18–22 years old, 9.44 for 23–28 years old, and 10.25 for 29–38 years old; $p < 0.001$). The study found several gaps in the students' knowledge and awareness on cervical cancer prevention. We suggest the design of education programs targeting this population possibly by incorporation of cervical cancer prevention education within students' curriculum to increase knowledge such that the spread of the virus is minimized and these health sciences students are prepared to educate their communities as part of their future practice in health professions.

Keywords Cervical cancer · HPV · Screening · Awareness · HPV vaccine

Introduction

Globally, there are over 500,000 cervical cancer diagnoses and over 275,000 cervical cancer deaths annually [1]. HPV infection represents the basic cause of cervical cancer, with at least 13 HPV strains considered high risk for cancer development (cervix, vulva, vagina, penis, anus, and certain head and neck cancers). HPV16/18 represent the two most common HPV strains associated with cervical cancer and their prevalence declines with age [2, 3].

Cervical cancer is preventable. Even though screening via cytology testing (Pap smear) and HPV testing is implemented widely in Western countries, cervical cancer disparities still exist among different socioeconomic and ethnic groups [4,

5]. HPV vaccines, including the bivalent vaccine against HPV strains 16 and 18, the quadrivalent vaccine which targets strains 6, 11, 16, and 18, and the nonavalent HPV vaccine which targets strains 6, 11, 16, 18, 31, 33, 45, 52, and 58, are used as primary prevention [6, 7].

The preventable nature of cervical cancer has prompted the design of several studies to evaluate the awareness and attitudes of different populations and groups on HPV and cervical cancer. Many studies have targeted health professionals, health sciences students, or university students in general. A study in China involving 1878 medical students revealed that about a quarter of medical students had never heard of HPV, half of the students believed that cervical cancer can be prevented by HPV vaccines, and only 14.4% knew that persistent HPV infection is the necessary cause of cervical cancer [8]. Another study in Greece revealed that only 51.6% of female higher education students knew that cervical cancer is caused by a virus and only 28.41% knew the recommended age for vaccination [9]. A study in Germany revealed that only 31.7% of female and 13.9% of male vocational students knew that HPV is sexually transmitted and only 24.3% of the female and less than 15% of the male students knew that HPV can

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infect both men and women [10]. Another study among medical students in India revealed that although the majority (89.2%) of medical students were aware that infection with high-risk HPV strains is the necessary cause for cervical cancer development, 24.4% were not aware of the existence of a vaccine for cervical cancer, 31.1% were not familiar with what the target population for HPV vaccination is, and 74.8% were not aware of the need to vaccinate men [11]. A different study among medical students in India showed that 26% of the students were not aware that HPV vaccination prevents cervical cancer and 87% were not aware of the need to vaccinate males [12].

Awareness studies on HPV and cervical cancer among healthcare workers have also showed variable results. A study in Cameroon revealed that only 58% of healthcare workers were able to identify the most important etiological factors for cervical cancer [13]. A study in India discovered that only 67.7% of paramedical staff were aware that HPV is the principal cause of cervical cancer and only 53% were aware of the existence of HPV vaccines [14].

The aforementioned studies revealed inadequate knowledge and awareness of various prospective and current healthcare professionals regarding HPV and cervical cancer worldwide. To this extent, we explored the awareness on HPV and cervical cancer of university health sciences students in Cyprus, an island in the Mediterranean. This study will provide key information needed to design an educational program targeting prospective and current healthcare professionals in Cyprus.

Methods

Study Design

This study used a cross-sectional survey to assess the level of knowledge and awareness of health sciences students in Cyprus regarding HPV and cervical cancer prevention. The questionnaire was delivered in English and therefore only students enrolled in English-taught programs were recruited. The universities and programs were selected using a random sampling approach (5 programs selected among 12 programs in 2 universities; both universities sampled). The questionnaire was anonymous and self-completed due to the sensitive nature of some of the questions regarding sexual behavior. The study was approved by the Cyprus National Bioethics Committee, the University of Nicosia Research Bioethics committee, and the Cyprus government data protection office. Permission to deliver the questionnaires at the participating universities was obtained from each university's Dean's office. Students also received a written explanation of the study aims before consenting to participate. Data were collected between February and April 2015. A total of 185 university students

were surveyed and 178 of those had valid data and were included in the analysis. Collected data was entered into Excel and analyzed using IBM SPSS version 21.

Assessment Tool

A questionnaire previously used in a study in Southwest China was used [8]. Permission for using the questionnaire in this study was obtained from the owner. The questionnaire contained five sections (Knowledge and awareness: sections 2–4): (1) Demographics, (2) HPV and cervical cancer, (3) HPV vaccines, (4) Cervical cancer screening, (5) Sexual behavior and attitude.

Measurement

In section 2 of the questionnaire, each answer indicating awareness and each correct answer received a score of 1, whereas each incorrect or “I do not know” answer received a score of 0. The maximum score was 13 (one question was scored 0–2 with 1 being the score for providing partially correct answer and 2 the score for providing the fully correct answer): we classified the level of knowledge and awareness of HPV and cervical cancer as high (score 10–13), medium (score 6–9), and low (score 0–5). The third section of the questionnaire (i.e., knowledge and awareness of HPV vaccines) was scored in a similar way as described for the second section. The maximum score for this section was 14: we classified the level of knowledge and awareness of HPV vaccines as high (score 10–14), medium (score 6–9), and low (score 0–5). Some questions with multiple answers (e.g., how much participants are willing to spend on vaccines?) were coded but not scored and therefore were not included in the scoring system. The fourth section of the questionnaire (i.e., knowledge and awareness of cervical cancer screening) had a maximum score of 9: we classified the level of knowledge and awareness of cervical cancer screening (score 7–9), medium (score 4–6), and low (score 0–3). The fifth section of the questionnaire (i.e., sexual behavior and attitude) had a maximum score of 4: we classified the level of sexual behavior and attitude (i.e., sexually active but practice safe sex) as high (score 3–4), medium (score 2), and low (score 0–1).

Data Analysis

Comparison of the mean scores between males and females and between ethnicities (Cypriot vs. non-Cypriot) was achieved using the Mann-Whitney test or independent samples *t* test. Comparison of the mean scores when more than two groups (age groups and programs of study) were compared was achieved using non-parametric ANOVA. Comparisons of proportions were achieved using the chi-square test.

Results

Demographics of Participants

A total of 220 students were approached, and of those, 185 completed the questionnaires. We excluded 7 completed questionnaires due to inconsistencies and errors in their answers, leaving us with 178 completed questionnaires for analysis. Table 1 provides demographic characteristics of the subjects. Of the 178 participants, 67 (37.6%) were male, and 111 (62.4%) were female. The mean age of participants was 23.26 (standard deviation (SD) 3.491); 42.1% were Cypriot and 57.9% were non-Cypriot. The majority of the students were medical students (53.4%) and the rest of the respondents were either Human Biology (41.6%) or Pharmacy students (5.1%). The distribution of students across year of study was fairly even with 29.2, 27.5, 16.5, and 26.4% being in the 1st, 2nd, 3rd, and 4th years of study respectively (Table 1).

Knowledge and Awareness of HPV and Cervical Cancer

The second section of the questionnaire addressed issues related to knowledge and awareness of HPV and cervical cancer. The highest score attained by a participant was 13

Table 1 Demographics of study participants

Demographic characteristic	<i>N</i> (%) or mean (where indicated)
Age group (years)	
18–22	89 (50)
23–28	77 (43.3)
29–38	12 (6.7)
Mean age (years)	23.26
Gender	
Male	67 (37.6)
Female	111 (62.4)
Ethnicity	
Cypriot	75 (42.1)
Non-Cypriot	103 (58.9)
Program of study	
Medicine	95 (53.4)
Human Biology	74 (41.6)
Pharmacy	9 (5.1)
Year of study	
1	52 (29.2)
2	49 (27.5)
3	30 (16.9)
4	47 (26.4)

and the lowest score was 0. The mean score for this section was 8.12 (SD: 3.05). Thirty-five (19.7%) participants had a low score (0–5) of knowledge and awareness of HPV and cervical cancer, 67 (37.6%) participants had a medium score (6–9), and 76 (42.7%) participants had a high score (10–13) (Table 2). There was no difference in the knowledge and awareness of HPV and cervical cancer between males and females who attained a mean score of 8.36 and 8.03, respectively ($p = 0.4613$). Interestingly, students over 22 years of age had significantly higher mean scores in this section compared to students 18–22 years old (mean score of 6.76 for 18–22 years old, 9.44 for 23–28 years old, and 10.25 for 29–38 years old; $p < 0.001$). We split the students in these age groups since 18–22 is the typical age of undergraduate students, 23–28 is the typical age of most medical students, and 29–38 is a minority of students who decide to pursue studies at an older age.

Knowledge and Awareness of HPV Vaccines

The third section of the questionnaire addressed issues related to knowledge and awareness of HPV vaccines. The highest score attained by a participant was 14 and the lowest score was 0. The mean score for this section was 9.25 (SD 3.21). Thirty (17%) participants had a low score (0–5) of knowledge and awareness of HPV and cervical cancer, 39 (22%) participants had a medium score (6–9), and 108 (61%) participants had a high score (10–14) (Table 2). There was no difference in the knowledge and awareness of HPV vaccines between males and females who attained a mean score of 9.537 and 9.082, respectively ($p = 0.3374$). Students of the 23–28 years of age group had significantly higher mean scores in this section compared to students 18–22 years old (mean score of 8.09 for 18–22 years old, 10.55 for 23–28 years old, and 9.5 for 29–38 years old; $p < 0.001$ for the comparison between the 18–22 age group and 23–28 age group, all other comparisons were not significant; it is also important to note that there are only 12 students in the 29–38-year-old group).

Knowledge and Awareness of Cervical Cancer Screening

The fourth section of the questionnaire addressed issues related to knowledge and awareness of cervical cancer screening. The highest score attained by a participant was 9 and the lowest score was 2. The mean score for this section was 5.93 (SD 1.44). A majority of participants (61.2%) had a medium level score (4–6) of knowledge and awareness of HPV and cervical cancer. Only 32.6% had a high score (7–9) while a minority of 6.2% had a low score (0–3) (Table 2). There was

Table 2 Section-specific and overall scores of knowledge and awareness

Questionnaire section	Mean score (SD)	Highest score	Lowest score	% of participants in the score category		
				Low	Medium	High
HPV and cervical cancer	8.12 (3.05)	13	0	19.7	37.6	42.7
HPV vaccines	9.25 (3.21)	14	0	17	22	61
Cervical cancer screening	5.93 (1.44)	9	2	6.2	61.2	32.6
Overall	23.32 (5.67)	33	7	6.2	43.5	50.3

no difference in the knowledge and awareness of cervical cancer screening between males and females who attained a mean score of 5.761 and 6.027, respectively ($p = 0.3876$).

Overall Knowledge and Awareness of HPV and Cervical Cancer Prevention

We next combined the scores of all sections related to knowledge and awareness (sections 2–4). The highest score attained by a participant was 33 and the lowest score was 7. The mean score for this section was 23.32 (SD 5.67). Eleven (6.2%) participants had a low score (0–12) of combined knowledge and awareness of HPV and cervical cancer prevention, 77 (43.5%) participants had a medium score (13–24), and 89 (50.3%) participants had a high score (25–36) (Table 2). There was no difference in the knowledge and awareness of cervical cancer screening between males and females who attained a mean score of 23.657 and 23.109, respectively ($p = 0.8939$).

We next split the participants into three age groups as in the individual sections and compared the mean score of overall awareness among the age groups. We found that the older age groups achieved significantly higher scores than the younger group (score of 25.727 for the 23–28-year-old group, score of 25 for the 29–38-year-old group, and score of 20 for the 18–22-year-old group; $p < 0.0001$) (Table 3). We also assessed whether there were differences in the mean scores among students of different study programs. Students studying medicine achieved a higher mean score of overall knowledge and awareness (mean score 24.705) compared to students studying Human Biology (mean score 21.7) and students studying Pharmacy (mean score 21.6) ($p = 0.0044$) (Table 3). When we examined overall mean score by ethnicity, we found that non-Cypriots achieved a higher mean score (23.9) compared to Cypriots (22.4; $p = 0.0387$) (Table 3). Finally, we examined the overall mean score by whether participants had previously engaged in sexual activity or not. There was no difference between those (119 participants) who engaged in sexual activity (mean score of 23.3) compared to those (58 participants) who had not engaged in sexual activity (mean score of 23.3) (Table 3).

Participant's Answers to Individual Questions on HPV and Cervical Cancer Prevention

We selected some of the questions that addressed issues that should be common knowledge such as being aware of HPV and that HPV can cause cervical cancer. One hundred sixty-two out of 178 (91%) students had heard of HPV. However, only 78 out of 178 (43.8%) knew that most HPV infections are asymptomatic. In addition, only 125 out of 178 (70%) students knew that HPV can infect men, 139 out of 178 (78%) students knew that HPV can cause cervical cancer, and 154 out of 178 (86.5%) knew that HPV is sexually transmitted. Interestingly, only 57 out of 178 (32%) students knew that persistent HPV infection is necessary for cervical cancer development. None of these answers showed significant differences between males and females (Table 4).

Table 3 Overall knowledge and awareness by age group, sex, field of study, and sexual activity

Demographic characteristic	Number	Mean overall score	<i>p</i> value
Age group (years) ^a			
18–22	88	20.9	
23–28	77	25.7	< 0.0001
29–38	12	25.6	
Gender ^b			
Male	67	23.7	0.8939
Female	110	23.1	
Ethnicity ^b			
Cypriot	74	22.4	0.0387
Non-Cypriot	103	23.9	
Program of study ^a			
Medicine	95	24.7	
Human biology	73	21.7	0.0044
Pharmacy	9	21.6	
Sexual activity ^c			
No sexual activity	58	23.3	0.0985

^a Non-parametric ANOVA

^b Mann-Whitney test

^c Independent samples *t* test

Table 4 Participants' answers for selected individual questions on HPV and cervical cancer prevention

Question	Total number All students = 178 (%)	Males number Males = 67 (%)	Females number Females = 111 (%)
Have you heard of HPV? (Yes)	162 (91)	61 (91)	101 (91)
Is HPV symptomatic? (No)	78 (43.8)	29 (43.3)	49 (44.1)
Can HPV cause cervical cancer? (Yes)	139 (78.1)	57 (85.1)	82 (73.9)
Is HPV sexually transmitted? (Yes)	154 (86.5)	61 (91)	93 (83.8)
Is persistent HPV infection the necessary cause of cervical cancer? (Yes)	57 (32)	20 (29.9)	37 (33.3)

When asked about their sources of knowledge about HPV vaccination, 60 out of 177 students (33.8%) indicated the Internet/television, 45 (25.4%) students indicated school sources, 33 (18.6%) students indicated the hospital, 18 (10.2%) indicated a publication, and 17 (9.6%) indicated their family/friends. Interestingly, a greater proportion of females (87%) than males (69%) indicated that they would like to receive more HPV-related education by experts ($p = 0.0057$).

Discussion

The knowledge and awareness study we conducted among university health sciences students in Cyprus revealed moderate awareness on HPV, cervical cancer, HPV vaccines, and cervical cancer screening. These scores were higher in older students and medical students compared to those of other majors. This may reflect more exposure to topics related to cervical cancer screening and HPV vaccination in the medical curriculum and medical student clinical experiences. These topics are not covered in the curriculum of Human Biology and Pharmacy students. Interestingly, non-Cypriot students had a slightly higher overall awareness score (23.9) compared to Cypriots (22.4). However, there were no differences in overall awareness among genders or students with/without sexual activity.

Ninety-one percent of the students had heard of HPV; however, it was alarming that 21.9% of health sciences students were not aware that HPV can cause cervical cancer, only 32% of the students were aware that persistent HPV infection is the necessary cause of cervical cancer, and 43.8% knew that HPV is asymptomatic. Surprisingly, 13.5% were not aware that HPV is sexually transmitted.

The awareness of HPV and cervical cancer in our study population seems to be in line with the awareness reported in other populations in China and Greece: 76.5% of medical students in China and 91% of students in our study were aware of HPV [8]. Furthermore, 14.4% of the medical students in China and 32% of health sciences students in Cyprus knew that persistent HPV infection is the necessary cause of cervical cancer. The apparent differences may simply reflect a larger proportion of younger participants in the study in China

compared to that in ours. More specifically, 89.6% of the study sample in China was 17–22 years old compared to 50% of our study sample being 18–22 years old. Comparing our results to those of a study in Greece, 78% of the students in our study knew that HPV can cause cervical cancer, which was higher than the 51.6% of female higher education students in Greece who knew that cervical cancer is caused by a virus. However, the difference between the two studies may relate to the fact that the study in Greece had a higher fraction of young participants (60.7% were 18–29 years old) and it included non-health science students as well. In fact, the Greek study showed that health science students had better awareness and sexual habits compared to non-health science students [9]. The gaps in knowledge among our participants and those of these other studies may reflect the lack of national cervical cancer screening programs in these countries. When the study was conducted in China, none of the HPV vaccines were approved by the China Food and Drug Administration at the time. Even though Cervarix and Gardasil were privately available in Cyprus, an HPV vaccination program was implemented by the Ministry of Health in 2016, after our study was conducted. Greece includes HPV vaccines in their National Vaccination program, and since 2008, the cost of vaccination is covered by social security for females 12–26 years old.

Cervical cancer awareness studies have been conducted in other countries as well. Interestingly, a study in India revealed that 89.2% of medical students were aware that infection with high-risk HPV strains is the necessary cause for cervical cancer development compared to 78% of students in our study [11]. However, a study among Cameroon healthcare workers revealed that only 58% were aware of the etiological factors for cervical cancer and another study in India showed that only 67.7% of paramedical staff were aware that HPV is the principal cause of cervical cancer.

The existing gaps in the knowledge of our population may contribute to the underuse of HPV vaccination. The preventable nature of HPV infection and cervical cancer makes it essential to raise awareness in this young population of health sciences students who are the ambassadors of health knowledge dissemination to their communities and can promote HPV vaccination. This can be achieved by incorporating education in relevant university courses. Only 25.4% of the

surveyed student population reported school sources as their source of knowledge on HPV and cervical cancer, whereas 33.8% revealed the Internet/television as the source of information. Social media could also be used to target this young population.

Our study has a few limitations. Firstly, we had to exclude students attending Greek-speaking programs since the survey was administered in English. However, this did not exclude Greek-speaking students that typically attend English programs and therefore our study population is still representative of that in other universities. Secondly, we could not perform random selection of students due to privacy regulations.

To conclude, even though a certain level of knowledge regarding HPV and cervical cancer exists in the study population, there are still gaps to be filled. Even if a small proportion of students are unaware of HPV and cervical cancer, this could be enough to keep the virus spreading among this young population. In addition, we found gaps in student knowledge and awareness on HPV vaccination. Thus, robust education programs regarding HPV and cervical cancer in this young population are essential to increase the awareness of cervical cancer prevention.

Compliance with Ethical Standards

The study was approved by the Cyprus National Bioethics Committee, the University of Nicosia Research Bioethics committee, and the Cyprus government data protection office. Permission to deliver the questionnaires at the participating universities was obtained from each university's Dean's office. Students also received a written explanation of the study aims before consenting to participate.

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