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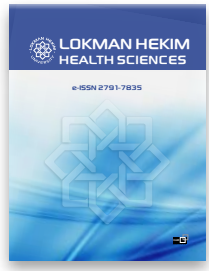

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ORIGINAL ARTICLE

Factors Influencing Human Papillomavirus Information Level and Vaccination Decision Among Nursing Students: A Cross-Sectional Study

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Abstract

Introduction: Screening and vaccination against human papillomavirus (HPV) play a critical role in preventing cervical cancer. This study aimed to assess nursing students' knowledge of HPV, their vaccination status, and the factors influencing their level of knowledge.

Methods: This cross-sectional study was conducted online through Google Forms with participation from 593 nursing students. Data were collected using the HPV Knowledge Scale (HPV-KS). Data were analyzed using the Statistical Package for the Social Sciences version 25.0. Descriptive statistics were calculated, and normality was assessed with the Kolmogorov–Smirnov test. As the data were not normally distributed, non-parametric tests (Mann–Whitney U and Kruskal–Wallis) were used for group comparisons. Effect sizes were calculated. Statistical significance was set at $p<0.05$.

Results: The mean HPV-KS total score was 13.06±6.47. Among the students, 89% had prior knowledge about HPV, 81.8% about HPV screening, and 86.7% about HPV immunization. The HPV-KS total score differed significantly according to age, father's education level, place of residence, academic year, and opinions regarding the inclusion of the HPV vaccine in the national immunization schedule. No significant differences in total HPV-KS scores were observed according to gender, mother's education level, perceived income status, or HPV vaccination status. Gender was associated only with the HPV test/screening knowledge subscale, with higher scores among female students.

Discussion and Conclusion: Nursing students demonstrated insufficient knowledge and low vaccination rates regarding HPV. Integrating the HPV vaccine into the national immunization schedule and providing it free of charge may enhance awareness and contribute to preventing HPV-related diseases.

Keywords: Human papillomavirus; Human papillomavirus vaccine; Knowledge; Nursing

Human papillomavirus (HPV) includes nearly 200 subtypes that infect cutaneous and mucosal cells. In both sexes, HPV can lead to genital and non-genital warts, as well as anal and oropharyngeal cancers. Thirteen high-risk HPV types are implicated in cervical cancer, with HPV 16 and 18 alone accounting for 70% of cases. These types also contribute to penile cancer in men.[1] HPV infection is most commonly observed within the first decade after the onset of sexual activity and is frequently diagnosed between the ages of 15 and 25 in Western countries.[2] Women in Sub-

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Saharan Africa have the highest prevalence of cervical HPV at 24%, succeeded by Latin America and the Caribbean at 16%, Eastern Europe at 14%, and Southeast Asia at 14%.[3] The frequency of occurrence in men varies significantly depending on sexual orientation.[4] According to the Ministry of Health's 2018 data, cervical carcinoma is the tenth most common type of carcinoma among women.[5]

Vaccination is the most effective method for preventing HPV-related cancers.[6] HPV vaccines are recommended before the onset of sexual activity and are most effective between ages 9 and 14.[7] The Centers for Disease Control and Prevention recommends administering two doses of the HPV vaccine to children aged 11 and 12 years, with the first dose as early as 9 years old and the second dose 6–12 months later; and three doses to children aged 15 and older.[8,9] There are three different HPV vaccines. These are Cervarix, Gardasil, and Gardasil 9.[10,11] Despite being included in national immunization programs in many high-income countries, the HPV vaccine is not part of Türkiye's routine vaccination schedule, and this absence – combined with cost-related barriers – reduces vaccination rates.[11]

As future healthcare professionals, nursing students play a critical role in health promotion and vaccination advocacy. Therefore, understanding their knowledge of HPV and their attitudes toward HPV vaccination is essential. This study aimed to evaluate the HPV knowledge levels, vaccination status, and related factors influencing these outcomes among nursing students.

Materials and Methods

Study Design

This study was designed as a descriptive cross-sectional study. This cross-sectional study was reported in accordance with the STROBE reporting guidelines.

Study Sample

This cross-sectional study was conducted between May and July 2024 at two universities located in different provinces in Türkiye. The target population consisted of all undergraduate nursing students enrolled in these universities during the 2023–2024 academic year.

The inclusion criteria were: Being 18 years of age or older, being enrolled in a nursing program, being able to speak and understand Turkish, and providing informed consent.

An a priori power analysis was performed using G*Power software. Assuming a Type I error rate (α) of 0.05 and a statistical power of 80%, the sample size calculation was based on the mean HPV knowledge scores reported by Özdemir et al.[12] (female: 15.50±8.84; male: 13.47±9.03).[12] According to this analysis, a minimum of 482 students (241 female and 241 male).

A convenience sampling method was used. All eligible nursing students were invited to participate in the study through institutional communication channels (e.g., student WhatsApp groups and/or university e-mail lists). Participation was voluntary, and no randomization procedure was applied. Students who agreed to participate completed the online questionnaire.

A total of 1535 nursing students were invited to participate in the study. Of these, 855 (55.7%) declined participation. Among the 680 students who agreed to participate, 87 (12.8%) were excluded due to incomplete questionnaires. The final analytical sample consisted of 593 students, yielding a response rate of 38.6% (593/1535) (Fig. 1). Data were not collected from the 942 students who did not respond; therefore, potential differences between respondents and non-respondents could not be evaluated.

Since a convenience sampling method and an online self-report survey were used, the study may be subject to selection bias and self-reporting bias. Voluntary participation may have resulted in the overrepresentation of students with greater interest or awareness regarding HPV. In addition, as the data were collected through an online survey, response bias related to internet access and willingness to participate cannot be ruled out.

Data Collection Tools

Data were collected using an online questionnaire created via Google Forms. Before accessing the survey, participants were required to provide informed consent by selecting the statement: "I have read, understood, and agree to participate in the study." The survey was anonymous, and no identifying information was collected.

The study utilized the Introductory Information Form and the HPV Knowledge Scale (HPV-KS) to assess participants' sociodemographic characteristics and HPV knowledge levels. Permission to use the scale was obtained from the original author.

Introductory Information Form: The form comprises 15 questions addressing students' sociodemographic factors, including age, gender, and class, as well as details on HPV infection and vaccination.[10,11,13–15]

HPV-KS: In 2023, Demir Bozkurt and Özdemir[16] assessed the validity and reliability of the Waller et al.[17] measure, created in 2013. HPV knowledge, the HPV test, the HPV vaccine, and the HPV vaccination program are assessed by

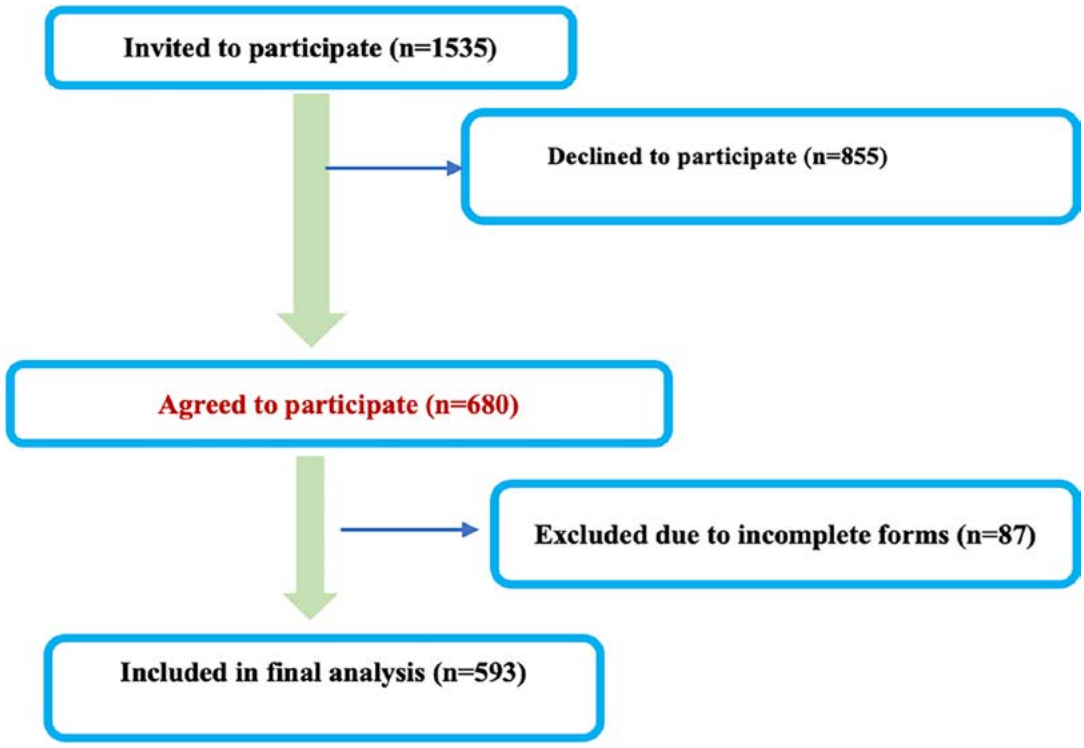

Figure 1. Flow diagram of participant inclusion process.

33 items and four sub-dimensions. Correct responses are rated "1," while wrong and "I don't know" replies receive "0." Scale scores are 0–33. High scores indicate knowledge of HPV screening and vaccination.

Independent variables included demographic (age, gender, class year), socioeconomic (mother's and father's education level, perceived family income), and contextual factors (place of residence during education, HPV awareness, HPV vaccination status, and opinion on inclusion of HPV vaccine in the national immunization schedule). The dependent variable was the HPV-KS total and sub-dimension scores.

Data Analysis

Data were analyzed using IBM Statistical Package for the Social Sciences (SPSS) version 25.0 (IBM SPSS Statistics 25, IBM Corp, Armonk, NY, USA). Descriptive statistics (mean, standard deviation, median, minimum, and maximum) were calculated. The data's normal distribution was assessed utilizing the Kolmogorov–Smirnov Test. Non-parametric techniques were employed for data exhibiting a non-normal distribution. The Mann–Whitney U test was used to compare score distributions between two independent groups, whereas the Kruskal–Wallis test was used for comparisons among more than two independent groups. When the Kruskal–Wallis test indicated a statistically significant difference, post hoc pairwise comparisons were conducted using the Mann–Whitney U test with Bonferroni adjustment to control for multiple comparisons. In addition, effect sizes for Mann–Whitney U tests (r) and Kruskal–Wallis tests (η^2: eta-squared) were calculated. In assessing effect sizes, guideline values were considered: r, 0.10 small effect, 0.30 medium effect, 0.50 large effect; η^2 (eta-squared), 0.01 small effect, 0.06 medium effect, 0.14 large effect (Pautz et al.,[18] 2018; Steyn,[19] 2012). The study assessed the significance level of the findings at a 95% confidence interval and a $p<0.05$.

Ethical Considerations

Ethical approval was obtained from the Non-invasive Research Ethics Committee of the Dokuz Eylül University (No. 2024/16-24, Date: 8 May 2024). In addition, institutional permissions were obtained from the nursing departments of the two different universities where the research was conducted. The research was conducted voluntarily, and informed consent was obtained from participants through Google Forms. During the data collection process, participants' personal data and email addresses were not collected. No identifiable personal data were collected.

Results

A total of 593 nursing students accessed and completed the online questionnaire. All respondents met the

inclusion criteria, and none were excluded due to missing data; therefore, all 593 participants were included in the final analysis.

About 80.4% of the study's participants are aged 18–22, and 71.5% are female (n=424). 1.3% of mothers and 5.2% of fathers have a university education or higher. When the perception of the family's monthly income level was questioned, 26% evaluated their income as less than their expenses. It has been determined that during their educational processes, 73% of the students stayed in student dormitories, 12.8% stayed in their family's home, and 14.2% stayed in student houses. The majority of students are 1st-year students, comprising 37.6% (Table 1).

It was established that 89% of students were aware of HPV infection, 81.8% were familiar with HPV screening, and 86.7% had knowledge of HPV vaccination before. When the HPV knowledge status of nursing students was evaluated, it was found that 6.6% did not have information on where HPV is seen. It was ascertained that 6.7% of the students were unaware of the recipients of the HPV vaccination. About 96.5% have not been vaccinated against HPV (n=572). As a reason for not getting vaccinated, 21.7% of the students reported that they had no information about the vaccine. However, 69.1% of the students indicated that they would like to get vaccinated if given the opportunity. 76.7% supported including the HPV vaccination in the national immunization routine, while 19.1% were unsure (Table 2).

The mean HPV-KS score was calculated as 13.06±6.47. Sub-dimension scores were as follows: General HPV knowledge (7.95±3.57), HPV test/screening knowledge (2.38±1.98), HPV vaccine knowledge (1.33±1.18), and HPV vaccination program knowledge (1.39±1.47) (Table 2).

When evaluating the changes in the total and sub-dimension mean scores of HPV-KS according to the age classification of nursing students, it was observed that the mean scores of those aged 23 and above were significantly higher than those of the 18–22 age group. Effect sizes for Mann–Whitney U tests were small across all subdimensions (r=0.10–0.16), indicating limited practical significance despite statistical differences between age groups. A statistically significant difference has been found between gender and the mean score of the HPV Test/Screening Knowledge sub-dimension (U=29548.500, p=0.001). Mothers' education levels were significantly associated with the mean General HPV Knowledge subscale score (KW=10.631, p=0.031). With further analysis, it was found that this difference was due to the mother's education level being non-literate and high school graduate. Significant differences in General HPV Knowledge, HPV Test/Screening Knowledge, and overall scores were observed according to the father's education level. Students whose fathers had a university education or higher demonstrated significantly higher scores compared to other education groups. Perceived family monthly income showed no significant relationship with HPV-KS total and subdimension mean scores (p>0.05).

In the advanced analysis conducted to examine the association between place of residence and the General HPV Knowledge sub-dimension during the educational process on the General HPV Knowledge sub-dimension

Table 1. Introductory characteristics of nursing students (n=593)

Characteristics	n	%
Age		
18–22	477	80.4
23 years and older	116	19.6
Gender		
Female	424	71.5
Male	169	28.5
Mother's education level		
Not literate	84	14.2
Elementary school graduate	48	8.1
Middle school graduate	368	62.1
High school graduate	85	14.3
University graduate and above	8	1.3
Father's education level		
Not literate	14	2.4
Elementary school graduate	38	6.4
Middle school graduate	381	64.2
High school graduate	129	21.8
University graduate and above	31	5.2
The family's perception of their monthly income situation		
Income is less than expenses	154	26.0
Income equals expenses	363	61.2
Income exceeds expenses	76	12.8
Accommodation during the education period		
Student dormitory	433	73.0
Family home	76	12.8
Student home	84	14.2
Academic year		
1st grade	223	37.6
2nd grade	147	24.8
3rd grade	100	16.9
4th grade	123	20.7

Table 2. HPV awareness, vaccination-related characteristics, and HPV-KS scores among nursing students

	n	%
Have you ever heard of HPV?		
Yes	528	89.0
No	65	11.0
Have you ever heard of the HPV test?		
Yes	485	81.8
No	108	18.2
Have you ever heard of the HPV vaccine?		
Yes	514	86.7
No	79	13.3
Who is HPV found in?		
Sexually active women	39	6.6
Sexually active men	8	1.3
Sexually active women and men	507	85.5
I don't know	39	6.6
Who should receive the HPV vaccine?		
Only women	52	8.8
Both women and men	501	84.5
I don't know	40	6.7
Did you get the HPV vaccine?		
Yes	21	3.5
No	572	96.5
What is your reason for not getting the HPV vaccine?†		
I have no knowledge about the vaccine	124	21.7
The high cost of the fee	227	39.7
The side effects of the vaccine	20	3.5
I'm not in the risk group	180	31.5
I didn't think of it/I forgot	21	3.6
If you had the chance, would you get the HPV vaccine?		
Yes	410	69.1
No	51	8.6
I am ambivalent	132	22.3
Do you think the HPV vaccine should be included in the national immunization schedule?		
Yes	455	76.7
No	25	4.2
I am ambivalent	113	19.1
	Mean±SD	**Median (min-max)**
HPV-KS		
General HPV Knowledge	7.95±3.57	9.00 (0.00–16.00)
HPV Test/Screening Knowledge	2.38±1.98	2.00 (0.00–6.00)
HPV Vaccine Knowledge	1.33±1.18	1.00 (0.00–5.00)
HPV Vaccination Program Knowledge	1.39±1.47	1.00 (0.00–6.00)
Total	13.06±6.47	14.00 (0.00–33.00)

†: Percentages were calculated among students who had not received the HPV vaccine (n=572). SD: Standard deviation; HPV: Human papillomavirus.

Table 3. Mean total and sub-dimension scores of HPV-KS according to the introductory characteristics of nursing students and their knowledge status of human papilloma virus (n=593)

	HPV-KS				
Descriptive features	**General HPV knowledge mean±SD**	**HPV test/screening knowledge mean±SD**	**HPV vaccine knowledge mean±SD**	**HPV vaccination program information mean±SD**	**Total mean±SD**
Age					
18–22	7.74±3.69	2.24±1.95	1.27±1.15	1.29±1.42	12.55±6.49
23 years and older	8.82±2.91	2.93±2.05	1.59±1.27	1.81±1.56	15.17±5.98
	U=23629.500, p=0.014*, r=0.10	U=22302.500, p=0.001*, r=0.14	U=23632.500, p=0.011*, r=0.10	U=22088.500 p=0.000*, r=0.16	U=21553.000, p=0.000*, r=0.16
Gender					
Female	8.01±3.24	2.54±1.92	1.35±1.08	1.33±1.36	13.24±5.85
Male	7.79±4.31	1.98±2.10	1.27±1.41	1.55±1.70	12.60±7.82
	U=35550.000, p=0.881, r=0.01	U=29548.500, p=0.001*, r=0.14	U=32535.500, p=0.069, r=0.08	U=34610.500, p=0.502, r=0.03	U=32677.000, p=0.094, r=0.07
Mother's education level					
Not literate	7.53±3.72	2.10±2.11	1.28±1.14	1.28±1.54	12.21±6.80
Elementary school graduate	7.58±4.06	2.43±1.87	1.27±1.19	1.60±1.59	12.89±6.82
Middle school graduate	7.82±3.53	2.34±1.94	1.33±1.18	1.35±1.41	12.86±6.36
High school graduate	8.95±3.29	2.69±2.08	1.40±1.19	1.47±1.49	14.51±6.34
University graduate and above	9.75±1.28	3.37±1.92	1.62±1.68	2.12±2.03	16.87±5.27
	KW=10.631, p=0.031*, η^2=0.011	KW=6.163, p=0.187, η^2=0.003	KW=0.565, p=0.967, η^2=0	KW=3.333, p=0.504, η^2=0	KW=8.912, p=0.063, η^2=0.008
Father's education level					
Not literate	4.42±4.56	2.57±2.79	1.21±1.25	1.57±1.94	9.78±8.93
Elementary school graduate	8.00±4.36	2.18±1.91	1.44±1.24	1.55±1.67	13.18±7.45
Middle school graduate	7.73±3.62	2.26±1.95	1.26±1.16	1.27±1.39	12.54±6.49
High school graduate	8.48±3.03	2.46±1.96	1.42±1.22	1.49±1.46	13.87±5.76
University graduate and above	9.93±1.73	3.64±1.81	1.74±1.15	2.12±1.74	17.45±4.15
	KW=20.839, p=0.000*, η^2=0.029	KW=14.364, p=0.006*, η^2=0.018	KW=7.035, p=0.134, η^2=0.005	KW=9.462, p=0.051, η^2=0.009	KW=23.792, p=0.000*, η^2=0.034
The family's perception of their monthly income situation					
Income is less than expenses	8.15±3.62	2.36±2.05	1.45±1.35	1.42±1.57	13.40±6.90
Income equals expenses	7.75±3.61	2.34±1.95	1.27±1.10	1.33±1.40	12.71±6.35
Income exceeds expenses	8.50±3.25	2.57±2.06	1.35±1.17	1.61±1.53	14.05±6.06
	KW=3.087, p=0.214, η^2=0.002	KW=0.911, p=0.634, η^2=0	KW=0.910, p=0.634, η^2=0	KW=2.475, p=0.290, η^2=0.001	KW=3.717, p=0.156, η^2=0.003
Accommodation during the education period					
Student dormitory	7.67±3.66	2.30±1.97	1.29±1.15	1.33±1.39	12.60±6.45
Family home	8.55±3.16	2.43±1.97	1.27±1.15	1.32±1.52	13.59±5.73
Student home	8.85±3.28	2.78±2.06	1.58±1.36	1.78±1.74	14.96±6.88
	KW=6.325, p=0.042*, η^2=0.007	KW=3.460, p=0.177, η^2=0.002	KW=2.774, p=0.250, η^2=0.001	KW=4.551, p=0.103, η^2=0.004	KW=6.562, p=0.038*, η^2=0.008

Table 3 (cont.). Mean total and sub-dimension scores of HPV-KS according to the introductory characteristics of nursing students and their knowledge status of human papilloma virus (n=593)

	HPV-KS				
Descriptive features	**General HPV knowledge mean±SD**	**HPV test/screening knowledge mean±SD**	**HPV vaccine knowledge mean±SD**	**HPV vaccination program information mean±SD**	**Total mean±SD**
Academic year					
1st grade	6.08±4.07	1.65±1.79	1.02±1.13	1.03±1.32	9.80±6.76
2nd grade	8.82±2.54	2.42±1.94	1.29±1.13	1.25±1.37	13.80±4.92
3rd grade	9.59±3.00	3.22±1.90	1.79±1.28	2.14±1.74	16.74±6.25
4th grade	8.95±2.53	2.97±1.99	1.56±1.10	1.60±1.34	15.10±4.89
	KW=87.897, p=0.000*, η^2=0.144	KW=58.291, p=0.000*, η^2=0.094	KW=36.495, p=0.000*, η^2=0.057	KW=43.183, p=0.000*, η^2=0.068	KW=94.991, p=0.000*, η^2=0.156
Did you get the HPV vaccine?					
Yes	8.04±4.35	1.95±2.06	0.76±1.09	1.38±1.32	12.14±6.95
No	7.94±3.55	2.39±1.98	1.35±1.18	1.39±1.47	13.09±6.46
	U=5275.000, p=0.338, r=0	U=5240.500, p=0.312, r=0	U=4262.500, p=0.018*, r=0.097	U=5859.500, p=0.844, r=0	U=5926.500, p=0.918, r=0
Do you think the HPV vaccine should be included in the national immunization schedule?					
Yes	8.54±3.00	2.60±1.95	1.42±1.18	1.47±1.46	14.05±5.87
No	6.52±4.63	2.20±2.19	1.56±1.38	1.72±2.09	12.00±8.13
I am ambivalent	5.89±4.51	1.52±1.87	0.92±1.05	0.98±1.26	9.32±7.01
	KW=30.959, p=0.000*, η^2=0.049	KW=28.930, p=0.000*, η^2=0.046	KW=15.997, p=0.000*, η^2=0.024	KW=12.350, p=0.000*, η^2=0.018	KW=39.973, p=0.000*, η^2=0.064

*: p<0.05. U=Mann–Whitney U test; KW= Kruskal–Wallis test; r=Effect size (0.10 small effect, 0.30 medium effect, 0.50 large effect); η^2=Eta-squared (0.01 small effect, 0.06 medium effect, 0.14 large effect); HPV: Human papillomavirus; SD: Standard deviation.

(U=15609.500, p=0.038) and the total score mean (U=15110.000, p=0.014), it was determined that the difference was observed between students living in dormitories and those living in student houses. Statistically significant difference was found across academic years in all sub-dimensions and the total score. Overall, mean scores increased progressively with advancing academic year. Academic year showed the strongest effect among all variables, demonstrating large effect sizes for general HPV knowledge (η^2=0.144) and total scores (η^2=0.156), and moderate effect sizes for test/screening knowledge (η^2=0.094) and vaccination program knowledge (η^2=0.068).

The mean score of the HPV Vaccination Knowledge sub-dimension varied significantly according to HPV vaccination status (U=4262.500, p=0.018). Perspectives on including the HPV vaccine in the national immunization protocol were moderate effect size in the overall HPV-KS (η^2=0.064). The difference has been attributed to those who responded "yes" and "undecided" over the incorporation of the vaccine into the immunization Protocol (Table 3).

Discussion

This study aimed to evaluate nursing students' HPV knowledge, vaccination status, and factors associated with HPV knowledge. Although awareness of HPV infection, screening, and vaccination exceeded 80%, detailed knowledge levels were limited, as reflected by low overall and sub-dimension HPV-KS scores. Total HPV-KS scores varied significantly according to age, father's education level, place of residence, academic year, and opinions regarding the inclusion of the HPV vaccine in the national immunization schedule. Gender differences were observed only in the HPV test/screening knowledge subscale. Despite high awareness, HPV vaccination rates were extremely low and were frequently attributed by students to a lack of information and cost-related barriers.

High awareness levels are consistent with previous studies among university students in Türkiye and other countries.[12-14,20–23] However, similar to previous research,[12,21,24] overall knowledge scores remained low, indicating persistent informational gaps despite widespread exposure to HPV-related content.

Older students demonstrated higher knowledge levels, consistent with findings from Liu et al.,[10] although not all Turkish studies reported such an association.[12,15,21] Female students showed higher knowledge regarding HPV testing and screening, which aligns with prior research.[10,11,12,13,20] This pattern may be related to the strong association between HPV and cervical cancer and the focus on women in national screening programs in Türkiye.

Higher parental education was associated with greater HPV knowledge, supporting findings from both Turkish and international studies.[15,21,25] Parents with greater health literacy may be more likely to expose their children to accurate information and model health-promoting behaviors, which may explain this association. In contrast, perceived income level was not related to knowledge in our sample, possibly due to limited income variability and the exclusion of HPV vaccination from the national immunization schedule.

Students living in shared houses had significantly higher HPV knowledge than those residing in dormitories. Çakır et al.[21] similarly reported higher awareness among students living in shared houses. Other studies found no significant relationship between living arrangements and HPV knowledge.[12,15] Students living in shared houses may have better financial resources, more private study environments, and greater access to individual internet services, potentially facilitating easier access to reliable information.

Knowledge levels increased significantly with academic year, particularly among 3rd-year students. This finding is consistent with research among medical students, where knowledge increased with grade level.[12] Emre et al.[20] also found higher HPV vaccine knowledge among second-year students and above. In our study setting, women's health and reproductive health courses are offered during the third year, which may be related to the higher knowledge levels observed in this group.

Interestingly, students who were not vaccinated had higher HPV vaccine knowledge scores than vaccinated students, although the number of vaccinated participants was extremely small. The most common reasons for not receiving the vaccine were its high cost, the perception of low personal risk, and a lack of information. These findings are consistent with earlier research.[13,20,26,27] Some studies reported that higher knowledge increases willingness to be vaccinated,[12,14] while others found no relationship between vaccination status and knowledge.[15] Given the low HPV vaccination rates in Türkiye, largely due to the vaccine not being included in the national immunization schedule, the pattern observed in our study is unsurprising.

Globally, many countries include HPV vaccination in routine immunization programs for adolescent girls and boys.[28] Previous studies from Türkiye similarly reported strong support for national inclusion despite a considerable proportion of undecided individuals.[14,20] In our study, students who supported the inclusion of HPV vaccination in the national immunization schedule had higher HPV knowledge scores than those who were undecided.

Although several sociodemographic variables were statistically associated with HPV knowledge levels, the effect sizes of these associations were generally small, suggesting limited practical significance. In contrast, the academic year demonstrated a comparatively larger effect size, highlighting the potential contribution of formal nursing education to the development of HPV-related knowledge. Taken together, these findings suggest that structured educational exposure may play an important role in differentiating knowledge levels among nursing students.

Limitations

This study has several limitations. First, its cross-sectional design does not allow for establishing causal relationships between variables. Second, the use of convenience sampling and voluntary participation may have introduced selection bias, as students who were more interested in HPV or vaccination may have been more likely to participate. The study was conducted among nursing students from only two universities, which may limit the generalizability of the findings to students from different regions or institutions with diverse socio-cultural backgrounds. Data were collected through self-reported online measures, which may be subject to social desirability and recall bias. The use of an online survey may also have limited participation to students with internet access and may have contributed to non-response bias. Furthermore, although statistically significant differences were identified, most effect sizes were small, limiting the practical significance of several findings. Finally, potential confounding factors in HPV knowledge level and vaccination status could not be statistically controlled, which constitutes a methodological limitation.

Future research using longitudinal designs, multi-center sampling approaches, and analytical models that account for potential confounders would help clarify the determinants of HPV knowledge and vaccination behaviors among nursing students.

Conclusion

Nursing students demonstrated limited knowledge regarding HPV despite high levels of awareness. Knowledge levels were associated with several demographic and educational factors, with academic year emerging as a particularly relevant contributor. Students who supported the inclusion of HPV vaccination in the national immunization schedule exhibited higher knowledge levels and more favorable attitudes, underscoring the relationship between knowledge and policy perceptions.

These findings emphasize the importance of strengthening HPV-related education within undergraduate nursing curricula and promoting early and sustained exposure to accurate information. Given that HPV vaccination is included in the national immunization programs of many countries, its integration into Türkiye's routine vaccination schedule and provision free of charge may contribute to reducing disease burden and improving public awareness.

Future research should further explore the underlying reasons for vaccine hesitancy or indecision among nursing students and evaluate the effectiveness of curriculum-based interventions aimed at improving HPV knowledge and vaccination uptake.

Ethics Committee Approval: The Dokuz Eylül University Non-invasive Research Ethics Committee granted approval for this study (date: 08.05.2024, number: 2024/16-24).

Informed Consent: The purpose, scope, confidentiality principles, and voluntary nature of the study were explained to all participants on the introductory page of the online questionnaire. No identifying or personal information was collected. By voluntarily completing the online questionnaire, participants were considered to have provided online informed consent.

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