

HPV Knowledge, Vaccination Uptake, and Barriers to Vaccination among Healthcare Workers at a University Hospital in Türkiye: A Cross-Sectional Study

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Abstract

Background

Healthcare workers play a central role in human papillomavirus (HPV) vaccination counselling and substantially influence vaccine acceptance. However, adequate theoretical knowledge does not necessarily translate into personal vaccination uptake or effective preventive behaviors.

Objective

This study aimed to assess HPV-related knowledge, personal HPV vaccination uptake, self-reported barriers to vaccination, and factors independently associated with HPV knowledge among healthcare workers at a university hospital in Türkiye.

Methods

This descriptive cross-sectional study was conducted at Süleyman Demirel University Research and Application Hospital between 15 December 2025 and 15 February 2026. A total of 288 healthcare workers participated in the study. Data were collected using a sociodemographic questionnaire and a 33-item Turkish HPV Knowledge Scale. Group differences were evaluated using Mann–Whitney U and Kruskal–Wallis tests, followed by Dwass–Steel–Critchlow–Fligner post-hoc comparisons where appropriate. Effect sizes were reported as r and epsilon squared (ϵ^2). Factors independently associated with total HPV knowledge scores were examined using multivariable linear regression with HC3 heteroskedasticity-robust standard errors.

Results

The mean age of the participants was 36.38 ± 8.62 years, 70.1% were female, and 45.5% were physicians. The mean total HPV Knowledge Scale score was 24.62 ± 6.11 (out of 33). Knowledge gaps were particularly evident regarding vaccine availability and access, age-related indications, and male vaccination. Total knowledge scores differed significantly across the professional groups ($H(4) = 123.02$, $p < .001$, $\epsilon^2 = 0.43$). Post-hoc analyses showed that physicians scored significantly higher than all non-physician professional groups (all $p < .001$). Although male participants had higher knowledge scores in the unadjusted analyses, sex was no longer independently associated with knowledge after adjustment for age, education, profession, income, and marital status ($B = 0.26$, 95% CI -0.92 to 1.45 , $p = .662$). Profession remained strongly associated with knowledge, with all non-physician groups having significantly lower adjusted scores than those of physicians. Only 6.2% of the participants reported having been vaccinated against HPV. The leading reported barriers were lack of knowledge (23.3%), low perceived personal risk (19.8%), and high treatment cost (10.1%).

Conclusions

Healthcare workers demonstrated substantial HPV knowledge, but personal vaccination uptake was strikingly low, indicating a marked knowledge–behavior gap. Professional background emerged as the strongest independent correlate of HPV knowledge, whereas the apparent sex difference was explained after adjusting for other characteristics. Therefore, institutional interventions should prioritize non-physician healthcare professionals and focus on practical vaccine eligibility, access, risk communication, and evidence-based vaccination counselling.

Introduction

Human papillomavirus (HPV) is a non-enveloped, double-stranded circular DNA virus belonging to the Papillomaviridae family. More than 200 HPV genotypes have been described, and high-risk types, especially HPV 16 and 18, are strongly associated with cervical cancer (1–4). HPV is among the most common sexually transmitted infections worldwide, and most sexually active individuals are expected to acquire at least one HPV type during their lifetime (5, 6). Although most infections clear spontaneously, persistent high-risk HPV infections can lead to cervical intraepithelial neoplasia and invasive cancer (7). HPV also contributes to anal, vulvar, vaginal, penile, and oropharyngeal cancers (8).

Prophylactic HPV vaccination is one of the most effective strategies for reducing the HPV-related disease burden. Current vaccines use virus-like particle technology to produce strong neutralizing antibody responses without causing infections (9, 10). The World Health Organization's cervical cancer elimination strategy prioritizes high vaccine coverage, screening, and treatment targets, including vaccination of 90% of girls by age 15 (11, 12). Nevertheless, unequal access, vaccine hesitancy, misinformation, and limited provider recommendations remain important barriers to implementation (13–16).

In Türkiye, HPV vaccination has not yet been fully integrated into the national childhood immunization schedule, making access dependent on individual awareness, affordability, and healthcare counselling. Healthcare workers are trusted sources of vaccine information, and their recommendations can substantially influence vaccine acceptance (14, 16). However, knowledge gaps, uncertainty about vaccine indications, and personal non-vaccination among healthcare workers may weaken public counselling efforts. Therefore, this study aimed to assess HPV infection and vaccination knowledge, attitudes, and behaviors among healthcare workers and health-related personnel at a university hospital and identify educational gaps relevant to institutional training programmes.

Methods

Study design and reporting framework

This was a descriptive cross-sectional questionnaire-based study. The manuscript was structured according to the STROBE checklist for observational cross-sectional studies, including explicit reporting of the study design, setting, participants, variables, data sources, bias considerations, study size, statistical methods, results, limitations and generalizability.

Setting and participants

The study was conducted at the Suleyman Demirel University Research and Application Hospital in Isparta, Türkiye. Data were collected between 15 December 2025 and 15 February 2026. The source population comprised healthcare workers in the university hospital and related health units (approximately N = 4,000). The minimum required sample size was calculated as 323 using a 95% confidence level, 5% margin of error, design effect of 1, and an unknown prevalence of 50%. A total of 288 participants who met the eligibility criteria, provided informed consent, and completed the questionnaire were included in the analysis.

Data collection and instrument

Data were collected using face-to-face interviews and a Google Forms-based online questionnaire after obtaining written and/or verbal informed consent from the participants. The questionnaire included a sociodemographic form and the Turkish HPV Knowledge Scale. The sociodemographic form assessed age, sex, marital status, education level, professional title, working unit, professional experience, income status, HPV vaccination status, and reasons for non-vaccination status. The sociodemographic form was developed specifically for this study by the research team; an English-language version is provided as Supplementary File 1. The Turkish HPV Knowledge Scale was previously published and validated by Bozkurt and Ozdemir and includes 33 items covering general HPV knowledge, HPV testing, HPV vaccination, and vaccine availability/access (17). Correct answers were summed to calculate domain and total knowledge scores, with higher scores indicating greater HPV knowledge.

Bias and study size

Selection bias was addressed by aiming to reach the calculated sample size across various professional groups. Nevertheless, the study remains vulnerable to voluntary participation and self-report bias. Excluding individuals with no prior HPV knowledge may have also overestimated the institutional knowledge level. The achieved sample was 288 of the calculated 323 target participants, corresponding to 89.2% of the target sample size.

Statistical analysis

Analyses were performed using SPSS version 22 and Jamovi for advanced analysis. Categorical variables are presented as frequencies and percentages. Continuous variables are presented as mean $\pm$

standard deviation and minimum-maximum values. Normality was assessed using the Shapiro-Wilk test. Because the scale scores did not meet the normality assumptions, Mann-Whitney U tests were used for two-group comparisons and Kruskal-Wallis tests for comparisons involving three or more groups. Dwass-Steel-Critchlow-Fligner tests were used for post-hoc comparisons. Effect sizes were reported as r for Mann-Whitney U tests and epsilon squared for Kruskal-Wallis tests. The associations among the scale domains were assessed using Spearman's correlation coefficients. Reliability was evaluated using Cronbach's alpha and McDonald's omega. Statistical significance was set at $p < 0.05$.

A multivariable linear regression model was constructed to examine factors independently associated with the total HPV Knowledge Scale score. Age, sex, educational attainment, marital status, income status, and profession were included simultaneously. Age was entered as a continuous variable and expressed as a 10-year increase. Education level was regrouped as high school or lower, associate degree, bachelor's degree, and postgraduate degree. Heteroskedasticity-consistent HC3 robust standard errors and 95% confidence intervals were used in the analysis. Model fit was reported using R^2 and adjusted R^2 values.

Ethical considerations

Ethics approval

was obtained from the Suleyman Demirel University Health Sciences Ethics Committee on 09 December 2025, meeting no. 107; decision no. 38. Permission to use the scale was obtained through email correspondence with relevant researchers. All the participants provided informed consent.

Results

A total of 288 participants were enrolled in the study. The mean age was 36.38 ± 8.62 years, with a range of 21 to 58 years. The sample was predominantly female, married, and highly educated, and physicians constituted the largest professional group (Table 1).

Table 1
Participant characteristics (n = 288)

Characteristic	Category	n (%) or mean +/- SD
Age, years	Mean +/- SD (range)	36.38 +/- 8.62 (21–58)
Sex	Female	202 (70.1%)
	Male	86 (29.9%)
Marital status	Married	199 (69.1%)
	Single	72 (25.0%)
	Divorced/widowed/separated	17 (5.9%)
Education level	Bachelor degree	151 (52.4%)
	Master degree	63 (21.9%)
	Associate degree	36 (12.5%)
	Doctorate	23 (8.0%)
	High school	14 (4.9%)
	Middle/primary school	1 (0.3%)
Profession	Physician	131 (45.5%)
	Midwife/nurse	95 (33.0%)
	Medical secretary	18 (6.3%)
	Health officer	13 (4.5%)
	Other healthcare professions	31 (10.8%)
Income status	Income equals expenses	128 (44.4%)
	Income higher than expenses	87 (30.2%)
	Income lower than expenses	73 (25.3%)

The mean total HPV Knowledge Scale score was 24.62 ± 6.11 out of 33. Overall, 69.8% of the participants had high HPV knowledge, 25.6% had moderate knowledge, and 4.6% had low knowledge. The highest and lowest scores were observed in the general HPV knowledge and vaccine availability/access domains, respectively. The overall reliability of the scale was high (Cronbach's alpha = 0.88; McDonald's omega = 0.89) (Table 2).

Table 2
HPV Knowledge Scale domain scores

Domain	Items	Mean +/- SD	95% CI	Shapiro-Wilk p
General HPV knowledge	16	13.01 +/- 2.84	12.68–13.34	< .001
HPV test knowledge	6	4.37 +/- 1.57	4.19–4.55	< .001
HPV vaccine knowledge	5	3.88 +/- 1.30	3.72–4.03	< .001
HPV vaccine availability/access	6	3.36 +/- 1.63	3.18–3.55	< .001
Total HPV Knowledge Scale	33	24.62 +/- 6.11	23.91–25.33	< .001

Item-level findings showed strong knowledge of cervical cancer causation, sexual transmission, multiple partner risk, male infection, and the continued need for screening after vaccination. The most visible knowledge gaps were in diagnostic interpretation, vaccine licensing/age indications, and male vaccination (Table 3).

Table 3
Selected item-level knowledge strengths and gaps

Area	Item content	Finding
Cervical cancer causation	HPV can cause cervical cancer	272/288 (94%) correct
Transmission	Multiple sexual partners increase HPV risk	276/288 (96%) correct
Transmission	HPV can be transmitted during sexual intercourse	275/288 (95%) correct
Clinical course	Visible signs/symptoms are not always present	228/288 (79%) correct
Diagnostic knowledge gap	HPV does not cause HIV/AIDS	166/288 (58%) correct
Diagnostic knowledge gap	HPV test does not show duration of infection	208/288 (72%) correct
Vaccination	HPV-vaccinated girls still need smear screening later	244/288 (85%) correct
Vaccination	HPV vaccines do not protect against all STIs	234/288 (81%) correct
Vaccination access gap	HPV vaccine is licensed for women aged 30–45 years*	93/288 (32%) answered "do not know"
Male vaccination knowledge gap	HPV vaccination is permitted for males aged 11–26 years	94/288 (33%) answered "do not know"

Group comparisons showed that total knowledge differed significantly by sex, education level, profession, and income. Male participants had higher total scores than female participants did. Participants with higher educational attainment and physicians had higher knowledge scores. Income status was associated with total knowledge, whereas marital status showed no significant difference.

Total HPV knowledge scores differed significantly across the professional groups ($H(4) = 123.02$, $p < .001$, $\epsilon^2 = 0.43$). DSCF post-hoc comparisons showed that physicians had significantly higher knowledge scores than midwives/nurses, medical secretaries, health officers, and other healthcare professionals (all $p < .001$). Midwives/nurses also scored significantly higher than medical secretaries ($p = .002$) and other healthcare professionals ($p < .001$), whereas the difference from health officers did not reach statistical significance ($p = .058$). No significant differences were observed among medical secretaries, health officers, and other healthcare professionals (all $p > .97$) (Table 4).

Table 4
Key group comparisons for HPV knowledge

Grouping variable	Outcome	Test statistic	p	Effect size
Sex	Total score	Mann-Whitney U = 6427.00	< 0.001	$r = -0.26$
Marital status	Total score	Kruskal-Wallis chi-square = 1.44, df = 2	0.487	$\epsilon^2 = 0.01$
Education level	Total score	Kruskal-Wallis chi-square = 57.95, df = 5	< 0.001	$\epsilon^2 = 0.20$
Profession	Total score	Kruskal-Wallis $H(4) = 123.02$	< 0.001	$\epsilon^2 = 0.43$
Income status	Total score	Kruskal-Wallis chi-square = 13.45, df = 2	0.001	$\epsilon^2 = 0.05$

Personal HPV vaccination uptake was low in this study. Only 18 participants (6.2%) reported having received HPV vaccinations. Among the reported reasons for non-vaccination, lack of knowledge (23.3%), not perceiving oneself as being at risk (19.8%), and high cost (10.1%) were the leading barriers. This finding indicates that high theoretical knowledge did not translate into preventive behavior at the same level.

In the multivariable linear regression model, age, sex, educational attainment, marital status, income status, and profession were simultaneously entered as predictors of the total HPV knowledge score. The model explained 45.8% of the variance in HPV knowledge (adjusted $R^2 = .432$). After adjustment, sex was no longer significantly associated with total HPV knowledge ($B = 0.26$, 95% CI - 0.92 to 1.45, $p = .662$). In contrast, profession remained strongly associated with knowledge scores; compared with physicians, midwives/nurses, medical secretaries, health officers, and other healthcare professionals had significantly lower adjusted scores (Table 5).

Table 5

Multivariable linear regression analysis of factors associated with total HPV knowledge score (n = 288)

Predictor	Adjusted B	Robust SE	95% CI	p value
Age, per 10-year increase	-0.43	0.44	-1.28 to 0.43	.330
Sex (ref: Female)				
Male	0.26	0.61	-0.92 to 1.45	.662
Education level (ref: High school or lower)				
Associate degree	0.83	2.29	-3.65 to 5.32	.716
Bachelor's degree	3.23	2.08	-0.83 to 7.30	.119
Postgraduate degree	2.54	2.15	-1.67 to 6.75	.236
Marital status (ref: Married)				
Single	-1.64	0.78	-3.18 to - 0.11	.036
Divorced/widowed/separated	1.46	1.23	-0.96 to 3.88	.236
Income status (ref: Income equals expenses)				
Income higher than expenses	0.14	0.68	-1.19 to 1.48	.835
Income lower than expenses	1.12	0.76	-0.38 to 2.61	.144
Profession (ref: Physician)				
Midwife/nurse	-4.26	0.83	-5.88 to - 2.63	< .001
Medical secretary	-8.46	1.69	-11.77 to - 5.15	< .001
Health officer	-8.91	2.27	-13.36 to - 4.47	< .001
Other healthcare professions	-9.95	1.36	-12.62 to - 7.28	< .001

Discussion

This study showed that healthcare workers and health-related personnel at a university hospital had relatively high HPV knowledge, with nearly seven out of ten participants classified as having high knowledge. This is consistent with the expectation that tertiary care and educational institutions provide greater exposure to HPV-related information. However, the domain pattern is important: general HPV knowledge was stronger than knowledge of vaccine access and availability in this study. This distinction suggests that educational interventions should move beyond general disease awareness and address

practical vaccination counselling, vaccine schedules, eligibility, reimbursement/access issues and referral pathways.

The finding that physicians and participants with higher education levels scored higher is expected, given their greater exposure to biomedical and preventive health education. However, nurses, midwives, health officers, medical secretaries, and other allied health personnel frequently interact with patients and families. Therefore, lower knowledge in non-physician groups may have direct implications for counselling opportunities, particularly because provider recommendation is a key determinant of HPV vaccine acceptance (14, 16).

Gender differences in knowledge should be interpreted cautiously. Although male participants had higher total HPV knowledge scores in the unadjusted analyses, this association disappeared after adjustment for age, educational attainment, profession, income status, and marital status. The attenuation of the sex difference appears to reflect differences in professional and educational composition, particularly the substantially greater proportion of physicians among male participants than among female participants. In contrast, profession remained strongly and independently associated with HPV knowledge, with all non-physician groups demonstrating lower adjusted scores than the physicians.

The most striking finding was the discrepancy between knowledge and personal vaccination behavior of the participants. Despite relatively high mean knowledge scores, only 6.2% of participants reported being vaccinated against HPV. This gap may reflect cost barriers, low perceived susceptibility, lack of adult vaccination counselling, uncertainty about age indications, and the fact that HPV vaccination is not universally accessible through the National Immunization Programme. The finding aligns with broader vaccine hesitancy literature, where knowledge is necessary but not sufficient for vaccine uptake (15).

These results have practical implications for institutional training (18). Educational programs should prioritize: (i) technical vaccine knowledge, including dose schedules and adult/male indications; (ii) risk perception for both women and men; (iii) how to deliver strong, evidence-based vaccine recommendations; (iv) access and cost counselling; and (v) stigma-sensitive communication (18–20). Such training may be particularly important for non-physician health personnel, who are often trusted as first-contact professionals.

This study had both strengths and limitations. Strengths include the use of a validated Turkish HPV Knowledge Scale, inclusion of multiple healthcare professional groups, reporting of reliability coefficients, and use of non-parametric tests with effect sizes. The limitations of this study include its single-center design, cross-sectional structure, self-reported data, voluntary participation, and possible overestimation of knowledge because individuals with no prior HPV knowledge were excluded. Causal inference cannot be made, and the findings may not be generalizable to all healthcare workers in Türkiye.

Conclusion

Healthcare workers at a university hospital demonstrated high overall HPV knowledge; however, knowledge was uneven across domains, and personal vaccination uptake was very low. The weakest domain was vaccine availability/access, and the leading barriers to vaccination were a lack of knowledge, low perceived risk, and cost. Institution-level education should focus on practical vaccine counselling, risk communication, access pathways, and strong provider-recommendation skills, especially for allied healthcare personnel. Multicenter and interventional studies are needed to evaluate whether targeted training improves both counselling behavior and HPV vaccine uptake.

Abbreviations

HPV

human papillomavirus

STROBE

Strengthening the Reporting of Observational Studies in Epidemiology

SPSS

Statistical Package for the Social Sciences

DSCF

Dwass–Steel–Critchlow–Fligner

CI

confidence interval

SD

standard deviation

HC3

heteroskedasticity-consistent type 3.

Declarations

Ethics approval and consent to participate:

Ethics approval was obtained from the Suleyman Demirel University Health Sciences Ethics Committee on 09 December 2025 (meeting no. 107, decision no. 38). The study was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. Informed consent was obtained from all individual participants included in the study.

Consent for publication:

Not applicable.

Competing interests:

The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this manuscript.

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Author Contribution

U.D., G.K. and F.Y.B contributed to the conception, design, data collection, analysis, interpretation, drafting, and critical revision of this manuscript. All the authors approved the final manuscript.

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Availability of data and materials:

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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