ÉDITORIAL

Renforcer les systèmes de données pour promouvoir la santé et les droits sexuels et reproductifs en Afrique subsaharienne

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Lorretta Favour Chizomam Ntoimo[1,2] et Friday Okonofua[3,4]

Editor, African Journal of Reproductive Health, Nigeria[1]; Department of Demography and Social Statistics, Faculty of Social Sciences, Federal University Oye-Ekiti, Nigeria[2]; Emeritus Professor of Obstetrics and Gynaecology, University of Benin,Nigeria[3] ; Editor in Chief, African Journal of Reproductive Health[4]

Pour toute correspondance**:** Courriel **:** *lorretta.ntoimo@fuoye.edu.ng*

Le développement de la santé et des droits sexuels et reproductifs (SDSR) en Afrique subsaharienne est fondamentalement entravé par la « pauvreté des données de santé »[1]. Si de nombreux pays à revenu élevé ont réalisé des progrès significatifs dans le renforcement de leurs systèmes de données de santé, l'Afrique subsaharienne continue de faire face à d'importantes lacunes[1–3]. Malgré le besoin crucial de pratiques fondées sur des données probantes, le paysage régional des données est caractérisé par une méconnaissance généralisée de la valeur intrinsèque de données exactes. De nombreux pays de la région ne disposent pas de recensements de population réguliers, de dossiers de santé fiables ni de systèmes fonctionnels d'état civil et de statistiques vitales.

L'exactitude des données est souvent compromise par une réticence profondément ancrée des populations à fournir des informations personnelles. Dans de nombreux contextes africains, les tabous culturels, les croyances religieuses et la méfiance envers les « étrangers » entraînent des taux de refus élevés lors des enquêtes menées auprès des ménages et dans les établissements de santé. Par exemple, une étude menée en Afrique du Sud a mis en évidence comment des femmes peuvent refuser de parler de santé reproductive en raison d'une opposition religieuse ou par crainte d'être jugées par les chercheurs[4]. Les données sont parfois sujettes à la falsification et au biais de désirabilité sociale. Les personnes interrogées « apprennent » souvent à répondre de manière à minimiser la longueur des questionnaires, par exemple en déclarant moins de partenaires sexuels pour éviter les questions complémentaires.[5]

Plus grave encore, la crainte de répercussions juridiques ou sociales conduit à la dissimulation active d'informations sensibles par les individus et les établissements de santé. Des personnes ont déclaré avoir menti sur leur statut sérologique ou sur les violences sexistes qu'elles ont subies par crainte d'une intervention policière ou de la stigmatisation sociale.[4]

Même lorsque des données sont disponibles, on observe une minimisation et une non-utilisation systématiques des informations factuelles pertinentes pour la prise de décision et la planification stratégique. L'institutionnalisation du suivi fondé sur les données demeure faible et les plans annuels sont souvent élaborés sans tenir compte des informations sanitaires courantes.[6] Dans de nombreux cas, la planification fondée sur des données probantes est supplantée par l'ingérence politique et le népotisme, où les intérêts politiques — plutôt que les données empiriques — déterminent quels programmes de santé sont mis en œuvre et qui est nommé pour les diriger.[7] Sans s'attaquer à ces barrières culturelles et structurelles, les systèmes de données continueront de produire des informations de mauvaise qualité qui ne permettront pas d'améliorer significativement les résultats en matière de santé sexuelle et reproductive dans la région.[1,8]

Depuis la Conférence internationale sur la population et le développement (CIPD) du Caire en 1994 et jusqu'aux Objectifs de développement durable (ODD) pour 2030, la santé sexuelle et reproductive est reconnue comme un droit humain fondamental.[9–11] Ce droit est désormais inscrit dans les politiques nationales de santé et les cadres juridiques de nombreux pays.

Le droit à la santé sexuelle et reproductive comprend l'accès à la contraception, aux soins de fertilité et d'infertilité, aux services de santé maternelle et périnatale, à la prévention et au traitement des infections sexuellement transmissibles, à la protection contre les violences sexuelles et sexistes, et à l'éducation à des relations saines et sans risque.[12] comprend également le droit à l'information et la capacité de faire des choix éclairés concernant sa vie reproductive.

Lorsque cet accès est retardé ou refusé, les conséquences peuvent être graves, notamment le décès, un handicap permanent et des difficultés socio-économiques. Pour que ces droits se concrétisent, les systèmes de santé ont besoin de systèmes de données robustes. Des données précises, actualisées et

ORIGINAL RESEARCH ARTICLE

Knowledge of human papillomavirus and vaccination attitudes among female university students in Turkey: A cross-sectional study

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Emel Güden[1] Selma D. Sarıkahya[2] and Sevil Ç. Özbay[3]*

Cappodacia University Faculty of Health Sciences, Ürgüp Nevşehir Türkiye[1]; Department of Public Health Nursing, Faculty of Health Sciences, Artvin Çoruh University, Artvin, Türkiye[2] ; Artvin Çoruh University, Faculty of Health Sciences, Department of Emergency Aid and Disaster Management, Artvin, Türkiye[3]

***For Correspondence:** Email: *emel.guden@kapadokya.edu.tr*

Abstract

This study aimed to examine the relationships between human papillomavirus **(**HPV) knowledge, HPV literacy, and health beliefs among female university students within the framework of the health belief model. The cross-sectional study was conducted on the campus of Artvin Çoruh University in Türkiye. A total of 645 female undergraduate students voluntarily participated in face-to-face surveys. While 68.2% of the participants reported having prior awareness of HPV, only 2.0% had received the HPV vaccine. Insufficient knowledge about the vaccine was identified as the primary barrier to vaccination. Significant positive relationships were observed among HPV knowledge, HPV literacy, and health belief scores; higher levels of knowledge and literacy were associated with stronger health beliefs and greater vaccination intention. We conclude that HPV knowledge, literacy, and health beliefs among female university students in Turkey are insufficient, while HPV vaccination uptake is low, warranting immediate remediation actions. *(Afr J Reprod Health 2026; 30 [12]: 95-104).*

Keywords: Cervical cancer, Human papillomavirus, Knowledge, Attitudes, Vaccination

Résumé

Cette étude visait à examiner les relations entre les connaissances sur le papillomavirus humain (HPV), la maîtrise de l'information relative au HPV et les croyances en matière de santé chez les étudiantes universitaires, dans le cadre du modèle des croyances en matière de santé. Cette étude transversale a été menée sur le campus de l'université Artvin Çoruh, en Turquie. Au total, 645 étudiantes de premier cycle ont participé volontairement à des enquêtes en face à face. Alors que 68,2 % des participantes ont déclaré avoir déjà entendu parler du HPV, seules 2,0 % avaient reçu le vaccin contre le HPV. Le manque de connaissances sur le vaccin a été identifié comme le principal obstacle à la vaccination. Des relations positives significatives ont été observées entre les scores relatifs aux connaissances sur le HPV, à la littératie en matière de HPV et aux croyances en matière de santé ; des niveaux plus élevés de connaissances et de littératie étaient associés à des croyances en matière de santé plus fortes et à une intention de vaccination plus marquée. Nous concluons que les connaissances, la littératie et les croyances en matière de santé concernant le HPV chez les étudiantes universitaires en Turquie sont insuffisantes, tandis que le taux de vaccination contre le HPV est faible, ce qui justifie la mise en place immédiate de mesures correctives. *(Afr J Reprod Health 2026; 30 [12]: 95-104).*

Mots-clés: Cancer du col de l'utérus, Papillomavirus humain, Connaissances, Attitudes, Vaccination

Introduction

Human Papillomavirus (HPV) is one of the most prevalent sexually transmitted infections worldwide and plays a critical role in the development of various anogenital and oropharyngeal cancers, particularly cervical cancer. Globally, HPV was estimated to account for approximately 620,000 new cancer cases among women and 70,000 among men in 2019. In 2022, cervical cancer ranked as the fourth most common cancer and the fourth leading cause of cancer-related death among women worldwide, with approximately 660,000 new cases and 350,000 deaths. More than 90% of HPV-related cancers in women are cervical cancers.[1] In Türkiye, cervical cancer remains one of the most frequently diagnosed gynecological malignancies, underscoring the importance of HPV prevention, early detection, and vaccination as key public health priorities.[2]

Vaccination represents one of the most effective strategies for preventing HPV infection. The World Health Organization (WHO)

recommends vaccinating all girls between the ages of 9 and 14, ideally before the onset of sexual activity. Depending on age and immune status, the vaccine may be administered in one, two, or three doses.[1-3]

Despite these recommendations, vaccination rates remain suboptimal due to persistent barriers, including limited knowledge, misconceptions, social stigma, and economic constraints.[4] A growing body of evidence demonstrates that higher levels of HPV-related knowledge and health literacy are associated with more favorable attitudes toward vaccination and increased vaccine uptake.[5] University students, women, and individuals in healthcare-related fields or with higher educational attainment tend to have greater knowledge. They are more likely to be vaccinated or express willingness to receive the vaccine. Health literacy, defined as the ability to access, understand, and apply health information, has been identified as a key determinant of vaccination intention, particularly when combined with healthcare professionals' recommendations.[6-7-8]

Improving knowledge levels among young individuals, particularly university students, represents a critical opportunity to enhance HPV-related preventive behaviors. Young adulthood is a period during which sexual activity often begins, while awareness of health risks may still be limited. As HPV infection is frequently asymptomatic yet associated with long-term consequences such as cervical cancer and other malignancies, early acquisition of accurate information and adoption of preventive behaviors are essential not only for individual health but also for broader public health outcomes.[9]

Recent evidence suggests that HPV-related knowledge and health literacy extend beyond basic information acquisition and function as key determinants of preventive decision-making, particularly regarding vaccine acceptance.[10-11] Behavioral research indicates that inadequate health literacy, low perceived susceptibility, and fragmented risk perception contribute to delayed or avoided vaccination, even among highly educated young adults.[7-12]

Furthermore, the widespread dissemination of misinformation through digital media has become a critical factor in vaccine hesitancy, underscoring the need for context-specific, evidence-based assessments of HPV knowledge and literacy.[13]From this perspective, university students constitute a strategically important population, as they represent both a current at-risk group and future decision-makers regarding family and community health. Therefore, evaluating HPV knowledge, literacy, and vaccination attitudes within a theoretical framework such as the Health Belief Model (HBM) is essential for informing targeted, evidence-based public health interventions.[14-15]

The Health Belief Model (HBM) is one of the most widely used theoretical frameworks for explaining preventive health behaviors and has been extensively applied to understand vaccination-related decision-making. The model posits that individuals' engagement in protective behaviors, such as HPV vaccination, is influenced by perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. Within this framework, knowledge and health literacy serve as foundational determinants that shape how individuals interpret health information and form health beliefs, thereby influencing attitudes toward HPV infection and vaccination.[14-15]

In Türkiye, existing evidence suggests that even among university students, who represent a relatively educated segment of society and future parents, HPV related knowledge and health literacy remain insufficient, while vaccination rates are alarmingly low.[16-17] Although recent initiatives by the Ministry of Health and various non-governmental organizations have aimed to increase public awareness of HPV, structural barriers persist. Notably, the HPV vaccine is not currently included in the national immunization program and must be obtained at individual expense, constituting a substantial perceived barrier within the HBM framework.

Despite these contextual challenges, there is a limited body of research in Türkiye that systematically examines HPV related knowledge, health literacy, and vaccination attitudes using a theory-driven approach. In particular, it remains unclear whether exposure to awareness initiatives has translated into increased perceived susceptibility and severity, enhanced perceived benefits of vaccination, and reduced perceived barriers among young women. Therefore, assessing these HBM constructs among female university students is

critical for identifying gaps in preventive health beliefs and informing the development of targeted, theory-based interventions aimed at reducing HPV related health risks, particularly cervical cancer. Accordingly, this study aims to assess HPV-related knowledge and health literacy among female university students in Türkiye and to explore their vaccination attitudes within the framework of the Health Belief Model.

Research hypotheses

H1: There is a significant positive relationship between female university students' HPV knowledge levels, HPV literacy, and health beliefs related to HPV infection and vaccination.
H2: Female university students with prior awareness of HPV have significantly higher HPV knowledge, HPV literacy, and health belief scores compared to those without prior awareness.
H3: Female university students with higher intentions to receive the HPV vaccine have significantly higher HPV knowledge, HPV literacy, and health belief scores compared to those with lower vaccination intentions.

Methods

This study was designed as a cross-sectional descriptive research study and conducted in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

Participants

The study population consisted of 3,605 female undergraduate students enrolled at Artvin Çoruh University in Türkiye during the study period. The university environment, which integrates theoretical instruction, practical training, and campus-based academic activities, provided an appropriate academic context for examining female students' HPV-related knowledge levels, HPV literacy, health beliefs, and vaccination intentions.

In this study, purposive sampling was employed to recruit participants who met the inclusion criteria relevant to the research objectives. Accordingly, being a registered female undergraduate student at the university and providing written informed consent to participate in the study were defined as the inclusion criteria. Students who declined participation, withdrew voluntarily from the study, or completed the data collection forms incompletely or invalidly were excluded from the analysis.

According to the sample size calculation for a known population, the minimum required sample size was determined as 347 participants, based on a population of 3605, a 95% confidence level, and a 5% margin of error.[18] In the present study, data were collected from 645 undergraduate students, exceeding the minimum sample size requirement. This ensured adequate statistical power, enhanced the reliability of the findings, and allowed for subgroup analyses, thereby strengthening the generalizability of the results.

Data collection tools

Personal information form: The Personal Information Form was developed by the researchers based on a review of the relevant literature to collect information on participants' sociodemographic characteristics and HPV-related personal evaluations. The form consisted of 14 items assessing variables including age, faculty, year of study, HPV awareness, sources of HPV-related information, exposure to HPV education or awareness campaigns, and vaccination intentions. Additionally, the form included items exploring participants' perceptions of HPV risk and their self-reported willingness to receive the HPV vaccine.

Human papillomavirus literacy scale (HPV-LS): The HPV-LS was developed by Türkoğlu and Ay in 2024 to assess individuals' knowledge, comprehension, and health-related decision-making processes regarding HPV. The scale consists of 24 items rated on a 5-point Likert scale ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"). Exploratory factor analysis revealed a three-factor structure: knowledge factor, screening factor, and analysis factor. The total score ranges from 24 to 120, with higher scores indicating greater HPV literacy.[19]

Health belief model scale for HPV infection and vaccination (HPV-HBM): Originally developed by Kim in 2012, this 14-item scale measures health beliefs related to HPV infection and vaccination.[20] The Turkish adaptation and validation were

conducted by Güvenç et al. in 2016. Items are rated on a four-point Likert scale, with response options coded as 1 “not at all,” 2 “a little,” 3 “quite a bit,” and 4 “very much.” Higher scores indicate stronger beliefs related to that dimension.[21]

HPV Knowledge Scale (HPV-KS): Developed by Waller et al. in 2013, this 35-item instrument assesses knowledge of HPV, HPV vaccination, and screening tests.[22] The Turkish validation was conducted by Demir in 2021, with two items excluded, resulting in a final 33-item version.[23] Responses include "Yes," "No," and "Don't Know." Correct answers are scored as 1, while incorrect or "Don't Know" responses are scored as 0. The total score ranges from 0 to 33, with higher scores indicating greater knowledge.

Data collection process

Data were collected in April 2025 on the university campus through face-to-face administration of questionnaires. Participants were informed about the purpose and procedures of the study prior to participation, and written informed consent was obtained.

Data analysis

The data were analyzed using IBM SPSS Statistics for Windows, version 26.0 (IBM Corp, Armonk, NY). Prior to the analyses, the normality of the variables was assessed by examining skewness and kurtosis coefficients. According to commonly accepted criteria, a distribution is considered approximately normal when skewness and kurtosis values fall between ±1.0 and ±1.5.

To assess the reliability of the scales employed in the study, Cronbach’s alpha (α) coefficients were calculated. Descriptive statistics, including frequencies, means, and percentage distributions, were used to summarize the data. For group comparisons, independent samples t-tests and one-way analysis of variance (ANOVA) were used for variables that were normally distributed. Additionally, Pearson correlation analysis was performed to investigate the relationships between variables.

Ethics approval and consent to participate

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Prior to participation, informed consent forms were obtained from all participants. Ethical approval was granted by the Artvin Coruh University Ethics Committee (Approval No: 13.02.2025-168504). Furthermore, written permission was obtained from the authors of the measurement instruments used in the study.

Results

A total of 645 female university students participated in the study. The mean age of the participants was 21.1 ± 2.3 years, with an age range of 15 to 40 years. The majority of participants were single (85.6%), and 46.1% were enrolled in the Faculty of Health Sciences. Participation was highest among second-year students (37.2%). Most participants (74.7%) reported their perceived economic status as moderate. The educational attainment of both mothers and fathers was predominantly high school level or lower (Table 1).More than half of the participants reported having prior awareness of HPV. Among those who had heard of HPV, the most frequently cited sources of information were social media (33.3%), followed by university courses (31.9%), internet-based resources (29.5%), and healthcare professionals (19.5%). Less frequently reported sources included family members (8.8%) and television or radio (5.7%). The proportion of female university students who had received the HPV vaccine was 2.0%. Among vaccinated participants, 1.2% had received a single dose, 0.5% had received two doses, and 0.2% had completed the three-dose vaccination schedule.

The most commonly reported reasons for not receiving the HPV vaccine included insufficient knowledge about the vaccine, low perceived susceptibility to HPV infection, and concerns regarding the cost of vaccination (Figure 1). Approximately half of the participants indicated that they would consider receiving the HPV vaccine if it were provided free of charge. Additionally, 59.8% reported that increased confidence in the vaccine’s safety and effectiveness would positively influence their vaccination decision. A substantial proportion of participants highlighted the importance of integrating HPV-related education into university curricula and seminars to enhance awareness and promote preventive health behaviors (Figure 1).The mean score on the HPV Knowledge Scale (HPV-KS)

Table 1: Demographic characteristics of female university students (n=645)

Variables		**Mean ± SD**	**Min-Max**
Age		21.07±2.34	15-40
		n	**%**
Marital status	Single	552	85.6
	Married	9	1.4
	In a relationship	84	13.1
Faculty	Health Sciences	302	46.1
	Educational Sciences	155	24.0
	Science and letters	120	18.6
	Vocational School	32	5.0
	School of Health	20	3.1
	Business and Economics	13	2.0
	Tourism	8	1.2
	Forestry	5	0.8
	Others	10	1.7
Year of study	1st Year	124	19.3
	2 st Year	240	37.2
	3 st Year	164	25.4
	4 st Year	117	18.1
Perceived income	Good	132	20.6
	Moderate	482	74.7
	Poor	31	4.8
Mother's education	High school or below	591	91.6
	University or above	54	8.4
Father's education	High school or below	545	84.5
	University or above	100	15.5

Note: Data are presented as n (%). Age is presented as mean ± SD (min–max).

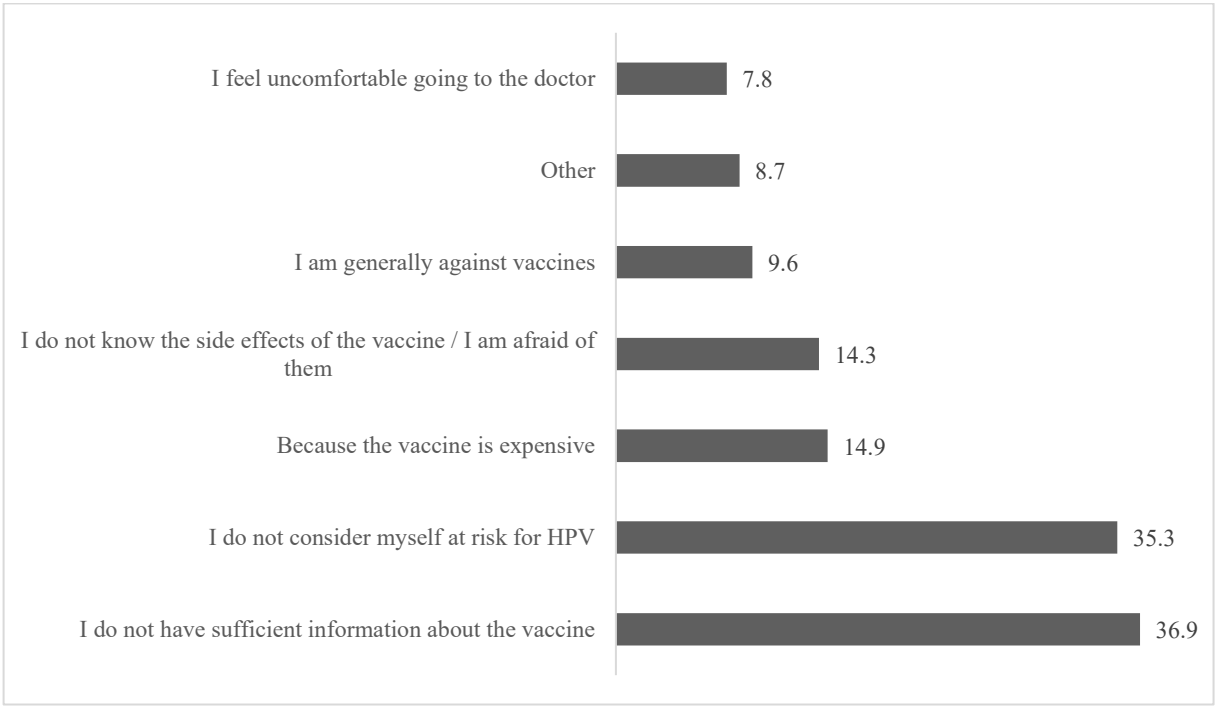

Figure 1: Reasons for not receiving the HPV Vaccine among the participants

Table 2: Mean, correlation, and reliability analysis of the measurement ınstruments

Variable	M	SD	1	2	3	α
1. HPV-KS	9.8	7.1	1	.579**	.485**	0.90
2. HPV-LS	76.5	20.6		1	.590**	0.96
3. HPV-HBM	36.1	10.1			1	0.93

Note: M = Mean; SD = Standard Deviation. HPV-KS = Human Papillomavirus Knowledge Scale; HPV-LS = Human Papillomavirus Literacy Scale; HPV-HBM = Health Belief Model Scale Related to Human Papillomavirus Infection and Vaccination. **p < .001.

Table 3: Comparison of participants' HPV-KS, HPV-LS and HPV-HBM scale scores according to various characteristics

Variables	**n**	**HPV-KS (Mean±SD)**	**HPV-LS (Mean±SD)**	**HPV-HBM (Mean±SD)**
Marital Status		F=1.09 / p=. 337	F=0.242 / p=.785	F=0.679 / p=.508
Single	552	9.9±7.0	76.5±20.6	36.3±9.9
Married	9	10.2±6.6	72.4±26.1	32.8±10.8
In a relationship	84	8.7±7.4	77.3±19.8	35.6±11.2
Faculty		F=10.301 / **p=.001**	F=5.123 / **p=.001**	F=3.972 / **p=.001**
Health Sciences	302	12.8±7.0	83.0±20.2	38.2±9.2
Educational Sciences	155	7.3±6.1	70.8±21.0	35.1±10.3
Arts and Sciences	120	6.6±6.4	70.2±19.2	31.9±11.7
Vocational School	32	11.1±6.1	74.3±17.7	37.7±6.9
School of Health	13	5.9±5.4	66.2±22.3	36.0±6.8
Business and Economics	10	6.2±5.7	75.5±10.1	32.7±10.9
Tourism	8	6.4±4.7	76.2±16.1	37.8±9.7
Forestry	5	8.8±4.4	67.7±11.6	34.8±4.3
Year of Study		F=9.129 / **p=.001**	F=8.390 / **p=.001**	F=1.530 / p=.206
1st Year	124	7.4±6.9	69.9±22.0	35.0±11.8
2nd Year	240	9.3±6.4	76.3±17.3	36.8±9.2
3rd Year	164	10.9±7.3	77.3±21.6	35.8±10.1
4th Year	117	11.6±7.7	82.9±21.8	36.9±9.8
Perceived Income		F=0.215 / p=.807	F=2.387 / p=.093	F=1.381 / p=.252
Good	132	10.0±7.4	79.7±18.5	37.3±10.4
Moderate	482	9.7±6.9	75.5±21.1	35.3±10.0
Poor	31	10.2±8.1	78.6±19.3	34.6±8.8
Previous Awareness of HPV		t=13.713 / **p=.001**	t=9.842 / **p=.001**	t=8.556 / **p=.001**
Yes	440	12.1±6.2	82.4±18.3	38.1±8.4
No	205	4.8±6.3	63.3±21.7	32.1±11.6
HPV Vaccination Status		t=1.693 / p=.091	t=1.712 / p=.087	t=1.695 / p=.091
Yes	14	12.9±6.3	81.4±17.5	37.1±8.8
No	631	9.7±7.1	76.1±20.7	36.0±10.1
Intention to Get Vaccinated if Free		F=44.200 / **p=.001**	F=14.890/**p=.001**	F=16.654 / **p=.001**
Yes	338	12.0±6.5	80.6±19.8	38.2±8.9
No	292	7.4±6.9	72.2±20.3	34.02±11.20
Undecided	15	3.8±5.6	68.3±23.9	30.8±11.8
Intention based on increased confidence in vaccine safety and effectiveness		F=55.860 / **p=.001**	F=21.107/ **=.001**	F=29.399 / **p=.001**
Yes	386	12.0±6.5	80.4±19.4	38.4±8.6
No	239	7.0±6.7	71.6±20.3	33.4±10.9
Undecided	20	2.1±4.6	60.3±25.1	26.7±12.9

Note: Data are presented as mean ± SD. *t*-test and one-way ANOVA were used. HPV-KS= Human Papillomavirus Knowledge Scale; HPV-LS= Human Papillomavirus Literacy Scale; HPV-HBM= Health Belief Model Scale Related to Human Papillomavirus Infection and Vaccination. $p < .05$.

was 9.8 ± 7.1, while the mean score on the HPV Literacy Scale (HPV-LS) was 76.5 ± 20.6. The mean score on the Health Belief Model Scale related to HPV infection and vaccination (HPV-HBM) was 36.1 ± 10.1.Significant positive correlations were observed among all three scales. Specifically, HPV knowledge was positively correlated with HPV literacy ($r = .579$, $p < .001$) and health beliefs ($r = .485$, $p < .001$), while HPV literacy was also positively correlated with health beliefs ($r = .590$, $p < .001$). These findings indicate that higher levels of HPV knowledge and literacy are associated with more favorable health beliefs regarding HPV prevention and vaccination (Table 2).

No statistically significant differences were observed in HPV literacy scores according to perceived income ($p = .093$). However, participants with higher income levels tended to report higher scores. Similarly, no statistically significant difference was found in HPV literacy scores according to vaccination status ($p = .091$), although vaccinated participants had relatively higher mean scores.Participants with prior awareness of HPV demonstrated significantly higher HPV literacy scores compared to those without such awareness ($p = .001$). In addition, participants who indicated willingness to receive the HPV vaccine if provided free of charge had significantly higher literacy scores ($p = .001$). Likewise, greater confidence in the safety and effectiveness of the vaccine was associated with significantly higher HPV literacy levels ($p = .001$) (Table 3).

Health belief scores did not differ significantly according to marital status ($p = .508$). However, statistically significant differences were observed across faculties ($p = .001$). Students enrolled in health-related faculties reported higher health belief scores, whereas those in the Faculty of Arts and Sciences exhibited lower scores (Table 3).

No statistically significant differences in health belief scores were observed across academic years ($p = .206$), although a slight increasing trend was noted with advancing year of study. Similarly, perceived income was not significantly associated with health belief scores ($p = .252$), despite relatively higher scores among participants with higher income levels. Participants with prior awareness of HPV had significantly higher health belief scores compared to those without awareness ($p = .001$). Although vaccinated participants demonstrated with priorth belief scores, this difference was not statistically significant ($p = .091$). Participants who expressed willingness to receive the HPV vaccine if provided free of charge, as well as those with greater confidence in its safety and effectiveness, exhibited significantly higher health belief scores ($p = .001$) (Table 3).

Discussion

The findings of this study indicate that female university students in Türkiye demonstrate suboptimal levels of HPV related knowledge, HPV literacy, and health beliefs. Despite representing a relatively educated population, only slightly more than half of the participants had prior awareness of HPV, and the vaccination rate remained as low as 2%.[4-25] These findings highlight persistent gaps in awareness and engagement in preventive health behaviors. They further suggest that access to higher education alone does not necessarily translate into adequate health knowledge or preventive practices, particularly in the absence of structured, theory-based educational interventions.

Considering the global burden of HPV-related cervical cancer, the World Health Organization has set a target of vaccinating 90% of girls by the age of 15 as part of the strategy to eliminate cervical cancer as a public health problem.[1] However, the present findings suggest that Türkiye remains considerably far from achieving this target, particularly among young adult women. This gap appears to be associated not only with limited access to vaccination but also with deficiencies in key constructs of the Health Belief Model (HBM), including perceived susceptibility, perceived severity, and perceived benefits.

In line with the first research hypothesis (H1), significant positive associations were identified among HPV knowledge, HPV literacy, and health belief scores. This finding is consistent with the Health Belief Model (HBM), indicating that knowledge and literacy play a central role in shaping individuals' health beliefs.[14-20]

It is also consistent with previous research demonstrating that higher levels of disease-specific knowledge and health literacy are associated with more favorable attitudes toward vaccination

and preventive health behaviors.[5-8] Within this framework, insufficient knowledge and literacy may hinder accurate risk perception and reduce motivation for vaccination.

In support of the second hypothesis (H2), participants with prior awareness of HPV demonstrated significantly higher levels of knowledge, literacy, and health belief scores. This finding indicates that exposure to health-related information not only enhances knowledge but also strengthens individuals' perceptions of risk and benefit, and is consistent with the existing literature.[20-26-27.] In this context, awareness may function as a critical "cue to action" within the framework of the Health Belief Model.[28]

In addition, students enrolled in health-related faculties were found to have higher levels of knowledge and literacy compared to their peers in other disciplines. This finding supports previous studies indicating that formal health education plays a significant role in enhancing HPV-related knowledge and awareness.[6-29] Furthermore, the increase in knowledge and literacy scores across academic years suggests a cumulative effect of education, highlighting the importance of integrating HPV-related content into university curricula.

In contrast, perceived income was not significantly associated with HPV knowledge, literacy, or health belief scores. This finding may be explained by the relatively homogeneous educational environment of the sample, where the influence of socioeconomic factors may be attenuated. It also suggests that individual educational experiences within the university setting may play a more prominent role than socioeconomic background in shaping HPV related knowledge and beliefs.Consistent with the third hypothesis (H3), participants with a higher intention to receive the HPV vaccine demonstrated significantly higher levels of knowledge, literacy, and health beliefs. Lack of knowledge and low perceived risk emerged as the most commonly reported barriers to vaccination.

These findings emphasize the critical role of perceived susceptibility and perceived severity, core components of the HBM, in influencing vaccination intentions. Moreover, willingness to receive the HPV vaccine increased significantly when it was hypothetically offered free of charge, highlighting the impact of economic barriers (perceived barriers) on health-related behaviors. In addition, higher confidence in the vaccine's safety and effectiveness was associated with higher vaccination intention. This finding supports previous research indicating that vaccine acceptance is shaped not only by knowledge but also by trust, cultural beliefs, and accessibility.[29-30] Within the framework of the Health Belief Model, trust in vaccine safety may be conceptualized as a "cue to action.[28]

In line with previous research, low perceived risk, often stemming from beliefs such as not being sexually active or being in a monogamous relationship, was associated with reduced engagement in preventive behaviors.[31] This highlights the need for educational interventions that explicitly address misconceptions regarding HPV transmission.

Strengths and limitations

This study has several limitations that should be considered when interpreting the findings. First, the research was conducted at a single university and included only female undergraduate students, which may limit the generalizability of the results to the broader university population. Second, the very small number of participants who had received the HPV vaccine reduced the statistical power to examine associations between vaccination status and other variables. In addition, data were collected using self-report measures, which may be subject to social desirability and recall bias. Furthermore, the cross-sectional design of the study precludes causal inferences regarding the relationships among variables. Finally, the exclusion of male students from the study limits the scope of the findings, as HPV-related knowledge, literacy, and attitudes among male students were not assessed.

This study demonstrates that HPV-related knowledge, literacy, and health beliefs among female university students in Türkiye are insufficient, and HPV vaccination uptake remains critically low. The findings highlight that higher levels of HPV knowledge and literacy are strongly associated with more favorable health beliefs and greater vaccination intention, supporting the applicability of the Health Belief Model in explaining HPV-related preventive behaviors. Lack of knowledge, low perceived susceptibility, concerns about vaccine safety, and economic

barriers emerged as key obstacles to vaccination. These results underscore the need for theory-based, comprehensive educational interventions that enhance risk perception, address misconceptions, and strengthen confidence in vaccine safety. Additionally, policies aimed at improving vaccine accessibility, particularly through cost reduction or inclusion in national immunization programs, may play a pivotal role in increasing HPV vaccination uptake and reducing the long-term burden of HPV-related diseases, especially cervical cancer, among young women.The findings of this study indicate a critical need to strengthen HPV-related education and vaccination strategies among female university students in Türkiye. Low levels of HPV knowledge, literacy, and health beliefs, together with extremely low vaccination uptake, highlight the importance of theory-driven interventions grounded in the Health Belief Model.In practice, nurses and other healthcare professionals play a critical role in promoting HPV awareness by delivering evidence-based education that enhances risk perception, addresses misconceptions, and increases confidence in the vaccine's safety and effectiveness. Integrating HPV-related content into university courses and campus-based educational programs, particularly in non-health-related faculties, may help reduce knowledge gaps and support informed vaccination decisions.At the policy level, the strong influence of cost on vaccination intention highlights the need to include the HPV vaccine in the national immunization program or implement subsidized vaccination policies. Furthermore, coordinated collaboration among health authorities, universities, and non-governmental organizations is essential for developing culturally appropriate, accessible, and sustainable HPV prevention initiatives. Collectively, these efforts may contribute to increased vaccine uptake and the long-term reduction of HPV-related disease burden in Türkiye.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Conflict of interest

The authors have no relevant financial or non-financial interests to disclose

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Authors' contributions

EG: Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Supervision, Project administration. SDS: Conceptualization, Supervision, Data curation, Writing – review & editing. SÇÖ: Methodology, Supervision, Writing – review & editing.All authors have read and approved the final version of the manuscript.

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