

DOI: 10.4274/mjima.galenos.2025.25527.11  
Mediterr J Infect Microb Antimicrob 2026;15:25527.11  
Erişim: <http://dx.doi.org/10.4274/mjima.galenos.2025.25527.11>

# Knowledge Level, Vaccination Rates, and Determinants of HPV Vaccination among People Living with HIV in Türkiye: A Cross-sectional Study

Türkiye’de HIV ile Yaşayan Kişilerde HPV Aşısına İlişkin Bilgi Düzeyi, Aşılama Oranları ve HPV Aşılmasını Etkileyen Faktörler: Kesitsel Bir Çalışma

Özlem Gül\*, Nazife Duygu Demirbaş, Ceren Atasoy Tahtasakal, Okan Derin, Ahsen Öncül, Dilek Yıldız Sevgi

University of Health Sciences Türkiye, Şişli Hamidiye Etfal Training and Research Hospital, Department of Infectious Diseases and Clinical Microbiology, İstanbul, Türkiye

## Abstract

**Introduction:** Human papillomavirus (HPV) vaccination has not yet been included in national immunization programs in many low- and middle-income countries, including Türkiye. People living with human immunodeficiency virus (PLWH) are a priority group for vaccination due to their heightened susceptibility to persistent HPV infection and HPV-related cancers. Identifying barriers to vaccination is essential for developing effective prevention strategies.

**Materials and Methods:** We conducted a cross-sectional study between April and July 2024 among PLWH receiving care at a tertiary training and research hospital. Data were collected using a structured questionnaire covering sociodemographic characteristics, HPV knowledge, vaccination history, and attitudes. Statistical analyses were performed to identify factors associated with HPV knowledge and vaccine uptake.

**Results:** A total of 120 individuals participated: 92.5% (n = 111) were male, 6.7% (n = 8) female, and 0.8% (n = 1) transgender. The mean age was 34.6 years. Overall, 60.0% (n = 72) reported awareness of HPV, but only 12.5% (n = 15) had received at least one vaccine dose. Among those aware of HPV, uptake was 18.1%. Vaccination was significantly higher among participants with a previous HPV infection (25.0%,  $p < 0.05$ ) and those informed by physicians (45.8%,  $p < 0.001$ ). Among unvaccinated participants, 48.8% (n = 51) indicated they would accept the vaccine only if it were provided free of charge. Higher education level, younger age, and non-heterosexual orientation were significantly associated with greater HPV knowledge.

**Conclusion:** Despite moderate awareness, HPV vaccination coverage among PLWH in Türkiye remains unacceptably low, primarily due to economic and informational barriers. Expanding cost-free vaccination programs and reinforcing physician recommendations are critical to improving vaccine uptake and reducing the burden of HPV-related diseases in this high-risk population.

**Keywords:** Barriers, cost, health care, HIV, HPV, knowledge, vaccination

## Öz

**Giriş:** Türkiye dâhil olmak üzere birçok düşük ve orta gelirli ülkede insan papilloma virüsü (HPV) aşısı henüz ulusal bağışıklama programına dâhil edilmemiştir. İnsan bağışıklık yetmezliği virüsü (HIV) ile yaşayan kişiler, HPV enfeksiyonu ve buna bağlı kanserlere karşı artmış duyarlılıkları nedeniyle aşılama açısından öncelikli bir risk grubudur. Aşılama önündeki engellerin belirlenmesi, etkili korunma stratejilerinin geliştirilmesi için önem taşımaktadır.

**Gereç ve Yöntem:** Çalışma Nisan–Temmuz 2024 tarihleri arasında, üçüncü basamak bir eğitim ve araştırma hastanesinde HIV ile yaşayan kişiler arasında yürütüldü. Yapılandırılmış bir anket aracılığıyla katılımcıların sosyodemografik özellikleri, HPV hakkındaki bilgi düzeyleri, aşı öyküleri ve aşıya ilişkin tutumları değerlendirildi. HPV bilgisi ve aşılama oranlarıyla ilişkili faktörler istatistiksel olarak analiz edildi.

**Cite this article as:** Gül Ö, Demirbaş ND, Atasoy Tahtasakal C, Derin O, Öncül A, Sevgi DY. Knowledge level, vaccination rates, and determinants of HPV vaccination among people living with HIV in Türkiye: A cross-sectional study. *Mediterr J Infect Microb Antimicrob.* 2026;15:61–68.



**Address for Correspondence/Yazışma Adresi:** Özlem Gül MD, University of Health Sciences, Şişli Hamidiye Etfal Training and Research Hospital, Department of Infectious Diseases and Clinical Microbiology, İstanbul, Türkiye  
**E-mail:** ozlemilbay@gmail.com **ORCID ID:** orcid.org/0000-0002-1668-0157  
**Received/Geliş Tarihi:** 20.10.2025 **Accepted/Kabul Tarihi:** 16.12.2025

**Epub:** 09.01.2026

**Published:** 22.04.2026



©Copyright 2026 The Author(s). Published by Galenos Publishing House on behalf of Infectious Diseases and Clinical Microbiology Specialty Society of Turkey. Licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License (CC BY-NC-ND 4.0).

**Bulgular:** Çalışmaya toplam 120 kişi katıldı; katılımcıların %92,5'i (n = 111) erkek, %6,7'si (n = 8) kadın ve %0,8'i (n = 1) transgender olarak tanımlandı. Katılımcıların ortalama yaşı 34,6 idi. Katılımcıların %60,0'ı HPV hakkında bilgi sahibi olduğunu bildirmiş, ancak yalnızca %12,5'i en az bir doz HPV aşısı yaptırmıştı. HPV konusunda bilgi sahibi olanlar arasında aşılama oranı %18,1 olarak bulundu. Aşılama oranı, önceden HPV enfeksiyonu geçirenlerde (%25,0;  $p < 0.05$ ) ve hekimden bilgi alanlarda (%45,8;  $p < 0,001$ ) anlamlı olarak daha yüksek saptandı. Aşılınmamış bireylerin %48,8'i (n = 51) aşının yalnızca ücretsiz olması durumunda aşı yapacağını belirtti. Daha yüksek eğitim düzeyi, genç yaş ve heteroseksüel olmayan yönelim, HPV konusunda daha yüksek bilgi düzeyi ile anlamlı olarak ilişkili bulundu.

**Sonuç:** Türkiye'de HIV ile yaşayan bireylerde HPV farkındalığı orta düzeyde olmasına rağmen aşılama oranı belirgin biçimde düşüktür. Ekonomik ve bilgiye erişimle ilgili engeller bu durumu belirleyen temel faktörlerdir. Ücretsiz aşılama programlarının yaygınlaştırılması ve hekimlerin aşı önerilerinin güçlendirilmesi, bu yüksek riskli grupta HPV ilişkili hastalık yükünü azaltmak açısından kritik öneme sahiptir.

**Anahtar Kelimeler:** Engeller, maliyet, sağlık hizmetleri, HIV, HPV, bilgi düzeyi, aşılama

## Introduction

Human papillomavirus (HPV) is the most common sexually transmitted infection (STI) worldwide and is associated with a broad spectrum of diseases, including genital warts and cancers of the cervix, anus, and oropharynx<sup>[1,2]</sup>. People living with human immunodeficiency virus (HIV; PLWH) are particularly susceptible to persistent HPV infection and HPV-related malignancies due to HIV-induced immunodeficiency, which impairs viral clearance and increases oncogenic potential<sup>[3–6]</sup>. Among PLWH, men who have sex with men (MSM) are especially vulnerable to anal HPV infection and the subsequent development of anal cancer<sup>[7]</sup>.

HPV vaccination is highly effective in preventing infections caused by high-risk HPV types. Leading health authorities, including the World Health Organization, the European AIDS Clinical Society, and the Centers for Disease Control and Prevention, recommend HPV vaccination for all eligible individuals, including PLWH<sup>[8,9]</sup>. Nevertheless, in many low- and middle-income countries (LMICs), such as Türkiye, HPV vaccines are not universally incorporated into national immunization programs. This, combined with out-of-pocket payment requirements, significantly restricts access, particularly for economically disadvantaged PLWH<sup>[10]</sup>.

Limited knowledge about HPV and its associated risks further impedes vaccine uptake. Studies in LMICs have shown that PLWH often possess inadequate awareness of HPV-related diseases and the benefits of vaccination, contributing to low vaccination coverage<sup>[11,12]</sup>. Despite the high prevalence of HIV–HPV coinfection in LMICs, data from Türkiye regarding HPV knowledge, attitudes, and vaccine access among PLWH remain scarce. This study aimed to assess the knowledge and attitudes of PLWH toward HPV and HPV vaccination in Türkiye and to identify sociodemographic and clinical factors influencing vaccination uptake. To the best of our knowledge, this is the first study from Türkiye to report HPV knowledge and vaccination data among PLWH. By situating the findings within the broader LMIC context, the results may inform

targeted strategies to enhance HPV prevention among high-risk populations.

## Materials and Methods

This cross-sectional observational study was conducted between April 1 and July 1, 2024, among PLWH aged 18 years or older who was receiving care at a training and research hospital. Data were collected using a structured questionnaire administered through face-to-face interviews. The questionnaire included demographic variables (age, gender, education level, disease history, and number of sexual partners in the past year) as well as items assessing knowledge of HPV and attitudes toward HPV vaccination.

Ethical approval was obtained from the Clinical Research Ethics Committee of University of Health Sciences Türkiye, Şişli Hamidiye Etfal Training and Research Hospital (approval number: 4,338, dated: 12.03.2024). Written informed consent was obtained from all participants prior to enrollment. Data collection was performed anonymously to ensure participant confidentiality.

## Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, version 21.0 (Armonk, NY, USA). Descriptive statistics were used to summarize participants' sociodemographic and behavioral characteristics. Categorical variables were presented as frequencies and percentages, and associations between categorical variables were assessed using the chi-square test or Fisher's exact test, as appropriate. Variables with a  $p$ -value  $< 0.10$  in bivariate analysis were included in a multivariate logistic regression model to identify independent predictors of HPV vaccination. Statistical significance was set at  $p < 0.05$ .

## Results

### Sociodemographic and Behavioral Characteristics

A total of 120 participants were enrolled in the study. The majority were male (92.5%,  $n = 111$ ), followed by female (6.7%,  $n = 8$ ) and

transgender individuals (0.8%, n = 1). Regarding age distribution, 16.7% (n = 20) were younger than 25 years, 37.5% (n = 45) were 25–35 years, 32.5% (n = 39) were 35–45 years, and 13.3% (n = 16) were older than 45 years.

All participants had completed at least primary education. Specifically, 5.0% (n = 6) had primary education, 9.2% (n = 11) middle school, 25.8% (n = 31) high school, 43.3% (n = 52) university, and 16.7% (n = 20) postgraduate education.

Regarding sexual orientation, 42.5% (n = 51) identified as homosexual, 32.5% (n = 39) as heterosexual, and 16.7% (n = 20) as bisexual. In the past year, 12.5% (n = 15) reported no sexual partners, 30.0% (n = 36) had one partner, 33.3% (n = 40) had 2–5 partners, and 19.2% (n = 23) had more than five partners.

Overall, 26.7% (n = 32) reported a history of HPV infection, 32.5% (n = 39) had undergone HPV/Pap smear testing, and 52.5% (n = 63) reported previous STIs other than HIV and HPV.

### HPV Knowledge Level

Among participants, 60.0% (n = 72) reported awareness of HPV. To verify self-reported knowledge, participants were asked five specific HPV-related questions. Of these, 55.8% correctly identified that “HPV causes genital warts,” and 48.3% correctly recognized that “HPV can cause cancer.” The statements “HPV only causes disease in women” and “HPV only causes disease in homosexual men” were correctly rejected by 95.8% and 98.3% of participants, respectively. The statement “Condoms completely prevent HPV transmission” had the lowest correct response rate (28.3%).

HPV knowledge was significantly associated with education, age, and sexual orientation. Knowledge rates were highest among university or postgraduate graduates (69.6%) and lowest among participants with primary or middle school education (5.0%, p = 0.015).

When analyzed by age, 70.0% of participants under 25 years, 70.5% of those aged 25–35 years, and 64.0% of those aged 35–45 years reported awareness of HPV, compared to only 26.9% of participants over 45 years, indicating a significant decline in knowledge with increasing age (p = 0.002).

By sexual orientation, 68.6% of homosexual participants reported awareness of HPV, compared with 60.0% of bisexual and 41.0% of heterosexual participants. Knowledge among homosexual and bisexual participants was significantly higher than among heterosexual participants (p = 0.012).

No significant associations were observed between HPV knowledge and gender or number of sexual partners. However, participants with a history of HPV infection were more likely to report awareness than those without (90.6% vs. 48.9%, p < 0.001). Similarly, individuals with a history of other

STIs had higher HPV knowledge than those without (68.3% vs. 50.9%, p = 0.045) (Table 1).

### Knowledge and Attitudes Regarding HPV Vaccines

Overall, 40.8% of participants reported awareness of HPV vaccines, while 59.2% were uninformed. Among participants with knowledge of the vaccine, 6.1% believed no effective vaccine existed, 22.4% thought the vaccine protects only against warts, and 65.3% correctly recognized that it protects against both warts and cancer. Additionally, 42.9% believed the vaccine would be ineffective if not administered early, and 36.7% thought it would be ineffective after wart development.

**Table 1. Association between HPV knowledge level and sociodemographic and clinical variables.**

Variable	Reported HPV knowledge: Yes, n (%)	Reported HPV knowledge: No, n (%)	p-value
<b>Education level</b>			<b>0.015</b>
Primary/middle school	1 (5.0)	16 (95.0)	
High school	12 (37.5)	20 (62.5)	
University/postgraduate	59 (69.6)	26 (30.4)	
<b>Age group</b>			<b>0.002</b>
<25	14 (70.0)	6 (30.0)	
25–35	31 (70.5)	13 (29.5)	
35–45	25 (64.0)	14 (36.0)	
>45	4 (26.9)	12 (73.1)	
<b>Sexual orientation</b>			<b>0.012</b>
Homosexual	35 (68.6)	16 (31.4)	
Bisexual	12 (60.0)	8 (40.0)	
Heterosexual	16 (41.0)	23 (59.0)	
<b>History of HPV infection</b>			<b>&lt;0.001</b>
Yes	29 (90.6)	3 (9.4)	
No	41 (48.9)	43 (51.1)	
<b>History of STIs</b>			<b>0.045</b>
Yes	43 (68.3)	20 (31.7)	
No	29 (50.9)	28 (49.1)	
<b>Gender</b>			<b>0.538</b>
Male	67 (60.4)	44 (39.6)	
Female/transgender	5 (55.6)	4 (44.4)	
<b>Number of sexual partners (last 1 year)</b>			<b>0.619</b>
0	8 (53.3)	7 (46.7)	
1	22 (61.1)	14 (38.9)	
2–5	24 (60.0)	16 (40.0)	
>5	18 (64.3)	10 (35.7)	

Statistical analysis was performed using the chi-square test and Fisher's exact test where appropriate.

The main sources of information were physicians (33.3%), friends (27.8%), the internet (16.7%), social media (13.9%), and non-governmental organizations (NGOs) (8.3%).

### Vaccination Status

Among all participants, 12.5% (n = 15) had received at least one dose of the HPV vaccine. Among the unvaccinated, the most common reasons for not receiving the vaccine were lack of knowledge (48.6%), high cost (21.0%), perception that vaccination was unnecessary (18.1%), prior HPV infection leading to perceived ineffectiveness (2.9%), and older age (4.8%). No participants cited fear of side effects or distrust in vaccine efficacy.

Of participants reporting HPV knowledge (n = 72), only 18.1% (n = 13) had been vaccinated. Vaccination rates were significantly higher among individuals with a history of HPV infection compared to those without (25.0% vs. 8.0%, p = 0.02).

Vaccination rates did not differ significantly by number of sexual partners in the past year (range: 9.8%–15.8%) or by sexual orientation, although rates were slightly higher among homosexual participants (14.5%) than among heterosexual (9.5%) or bisexual (13.0%) participants (Table 2).

Receiving information from a physician was strongly associated with vaccination: 45.8% of participants informed by a doctor were vaccinated, compared with 4.2% of others (p < 0.001; odds ratio = 19.46), highlighting the key role of healthcare providers in promoting vaccination (Table 3). Vaccination rates were 25.0% among participants who received information from friends or the internet but 0% among those relying on social media or NGOs.

Of the vaccinated participants, 20.0% received one dose, 33.3% received two doses, and 46.7% completed the three-dose series. Vaccine types included bivalent (20.0%), quadrivalent (33.3%), and nonavalent (40.0%), with 6.7% unable to recall the type.

### Access to the HPV Vaccine and Perception of Cost

Among unvaccinated participants, 10.8% believed the HPV vaccine was free, 19.2% knew it was paid and were aware of the price, 25.0% knew it was paid but were unaware of the price, and 45.0% had no opinion regarding the cost.

Nearly half of participants (48.6%) indicated they would only consider vaccination if it were free. Among those willing to pay, 31.4% could allocate less than 3,000 TRY, 15.2% could allocate between 3,000 and 6,000 TRY, and 4.8% between 6,000 and 10,000 TRY. The difference in willingness to pay among these budget groups was statistically significant (chi-square = 46.28; p < 0.001), confirming cost as a major barrier to HPV vaccination.

**Table 2. Association between HPV vaccination status and sociodemographic and clinical variables.**

Variable	Vaccinated, n (%)	Not vaccinated, n (%)	p-value
<b>Age group</b>			<b>0.237</b>
<25	4 (20.0)	16 (80.0)	
25–34	4 (8.9)	41 (91.1)	
≥35	7 (12.7)	48 (87.3)	
<b>Education level</b>			<b>0.974</b>
High school or below	6 (13.0)	40 (87.0)	
University	7 (11.9)	52 (88.1)	
Postgraduate	2 (13.3)	13 (86.7)	
<b>Gender</b>			<b>0.471</b>
Female	0 (0.0)	8 (100.0)	
Male	15 (13.5)	96 (86.5)	
Other	0 (0.0)	1 (100.0)	
<b>Sexual orientation</b>			<b>0.791</b>
Heterosexual	4 (9.5)	38 (90.5)	
Homosexual	8 (14.5)	47 (85.5)	
Bisexual	3 (13.0)	20 (87.0)	
<b>Number of sexual partners (last year)</b>			<b>0.847</b>
0–1	8 (14.5)	47 (85.5)	
2–4	4 (9.8)	37 (90.2)	
≥5	3 (12.5)	21 (87.5)	
<b>HPV/pap smear test</b>			<b>0.030</b>
Yes	9 (23.1)	30 (76.9)	
No	6 (7.4)	75 (92.6)	
<b>History of HPV infection</b>			<b>0.020</b>
Yes	8 (25.0)	24 (75.0)	
No	7 (8.0)	81 (92.0)	
<b>History of STIs</b>			<b>0.951</b>
Yes	8 (12.7)	55 (87.3)	
No	7 (12.3)	50 (87.7)	
<b>Knowledge about HPV</b>			<b>&lt;0.001</b>
Yes	13 (18.1)	59 (81.9)	
No	2 (4.3)	45 (95.7)	

Chi-square and Fisher's exact test were used to evaluate associations between categorical variables.

**Table 3. Association between HPV vaccination status and source of information.**

Source of information	Vaccinated, n (%)	Not vaccinated, n (%)	Total, n	Vaccination rate (%)
Doctor	11	13	24	45.8
Friends	5	15	20	25.0
Internet	3	9	12	25.0
NGOs	0	6	6	0.0
Social media	0	10	10	0.0

Vaccination rates according to the source of information were compared using Fisher's exact test. The rate of vaccination was significantly higher among participants who received information from a physician ( $p < 0.001$ , Fisher's exact test; OR = 19.46).

NGOs, non-governmental organizations.

## Discussion

This study demonstrates that although most PLWH in Türkiye were aware of HPV, only a small proportion had received the vaccine, highlighting a notable knowledge–behavior gap. The relatively high knowledge level observed—higher than previously reported in the literature<sup>[13,14]</sup>—may be attributed to the generally high educational attainment of the sample<sup>[15,16]</sup> and greater awareness among younger participants, who likely have easier access to information, higher digital health literacy, and are more frequently targeted by vaccination campaigns<sup>[17]</sup>.

The finding that homosexual and bisexual individuals had higher HPV knowledge aligns with prior studies<sup>[18,19]</sup>. This may reflect their more frequent participation in screening programs and greater engagement with health education services. Additionally, the broader availability of HPV-related counseling for MSM living with HIV may further reinforce this disparity.

Higher awareness among participants who had previously experienced HPV or other STIs may indicate an accelerated learning effect associated with personal illness experience<sup>[20]</sup>.

In our study, most participants reported obtaining information about HPV primarily through social networks and other digital sources. This is consistent with previous research, which identifies digital media, social networks, and the internet as the main sources of HPV-related information, even among PLWH<sup>[21,22]</sup>. While these platforms can facilitate information dissemination, they also carry a risk of misinformation. This underscores the need for healthcare professionals to provide accurate counseling and direct individuals to reliable sources via formal health services.

Being informed does not always translate into behavioral change. In the case of HPV, knowledge does not necessarily lead to the adoption of preventive behaviors such as vaccination. Indeed, only 12.5% of participants reported having been vaccinated, and just 46.7% had completed the three-dose series. Similar gaps between awareness and vaccine uptake have been documented among PLWH in other contexts<sup>[23,24]</sup>.

The low vaccination rates despite relatively high knowledge suggest that general education does not directly reflect health literacy, highlighting the importance of targeted public health education and the need for health systems to bridge the gap between knowledge and action.

A recent randomized controlled trial from Brazil demonstrated that a personalized, web-based intervention significantly increased both HPV vaccine initiation and completion rates among PLWH compared with standard educational approaches<sup>[25]</sup>. Similarly, a systematic meta-analysis found that digital reminders and provider-based interventions, including SMS reminders and electronic health record prompts, were more effective in promoting HPV vaccination uptake than client education alone<sup>[26]</sup>. In Türkiye, where HPV vaccines are not included in the national immunization program and economically disadvantaged groups face additional access barriers, such low-cost and scalable digital interventions could play a critical role in improving vaccination coverage among PLWH.

The unexpectedly low vaccination rates among individuals engaging in high-risk sexual behaviors suggest that these groups are not adequately targeted in vaccination programs, revealing potential strategic gaps. Previous research has similarly documented suboptimal HPV vaccine uptake among individuals with histories of risky sexual behavior, including heterosexually active adults at increased risk for HIV and transgender or gender-diverse populations, who often experience overlapping behavioral and structural risk factors<sup>[27,28]</sup>. In our study, participants reporting risky sexual behaviors, such as having multiple sexual partners, did not show a statistically significant association with vaccination status. This finding suggests that, even within high-risk groups, awareness may not readily translate into preventive action, and access-related or systemic barriers may be more decisive.

Conversely, some studies have reported that MSM living with HIV are more likely to accept HPV vaccination<sup>[29]</sup>. A systematic review indicated that HPV vaccine uptake among HIV-negative MSM ranged from 2.7% to 91.5%, whereas among MSM

living with HIV, it ranged from 5.6% to 90.0%, highlighting both heterogeneity and generally higher uptake in the latter group<sup>[30]</sup>. A recent meta-analysis further reported HPV vaccine acceptance among men with same-sex orientation at approximately 62.2%, compared with 47.0% among men in general<sup>[31]</sup>. In our study, although homosexual participants exhibited higher vaccination rates than heterosexual participants, the difference was not statistically significant, likely due to limited sample size. Greater engagement of MSM with healthcare services, coupled with exposure to comprehensive sexual health education and counseling, may explain the relatively higher vaccine acceptance observed in this group.

Among individuals with a history of HPV infection, the knowledge rate was 90.6%, compared with 48.9% among those without such a history. Although this knowledge increase was positively reflected in vaccination behavior, only 25.0% of individuals with prior HPV infection were vaccinated, compared with 8.0% without such history. Thus, while increased knowledge may enhance vaccination behavior, the uptake remains suboptimal. The low vaccination rates among individuals with HPV-related disease history suggest that opportunities for secondary prevention are underutilized. Failure to provide vaccination counseling to individuals who have undergone HPV testing or have a history of warts may result in missed vaccination opportunities. Similar patterns have been reported in the general population, where women with high-grade cervical lesions remain unvaccinated despite clear eligibility, often due to misconceptions about age limits, prior HPV infection, or lack of provider recommendation<sup>[32]</sup>. Additionally, catch-up vaccination in older age groups remains underused<sup>[33]</sup>.

Increasing HPV vaccination among (PLWH) requires more than simply providing information. Our analysis revealed that the source of information critically influences the decision to vaccinate. Physician-delivered information has consistently been identified as the strongest predictor of vaccination<sup>[34–36]</sup>. Healthcare providers who actively recommend the HPV vaccine significantly increase uptake, whereas the absence of such recommendations remains a major barrier<sup>[37]</sup>. However, even when providers recognize the importance of vaccination, practical, evidentiary, and ethical challenges may hinder recommendations, particularly for older or high-risk populations, including gay, bisexual, and other MSM<sup>[38]</sup>. These findings highlight the pivotal role of healthcare professionals in initiating vaccination discussions, correcting misconceptions, and facilitating access for eligible individuals.

Conversely, in our study, vaccination rates were significantly lower among participants who relied on social media or internet sources for information. Although the internet can

increase awareness of HPV vaccination, it may also disseminate misinformation, contributing to vaccine hesitancy<sup>[39]</sup>.

When participants were asked why they had not been vaccinated, lack of knowledge and cost were the most frequently cited reasons. Notably, 48.6% of unvaccinated participants stated that they would only receive the vaccine if it were free. This aligns with evidence from the Eastern Mediterranean Region, where the high cost of the HPV vaccine—especially in non-Gavi-eligible middle- and high-income countries—was identified as a major barrier to immunization. In contexts without vaccine subsidies, financial burden substantially reduces vaccination rates, even among high-risk populations<sup>[40]</sup>. Considering the burden of HPV-related infections and cancers in PLWH, providing free vaccination to this group is critically important.

Evidence from multiple settings indicates that HPV vaccination can be cost-effective for PLWH by preventing HPV-related diseases and reducing healthcare expenditures. In China, a Markov model analysis demonstrated that vaccinating women living with HIV aged 18–45 years, particularly with the quadrivalent vaccine, was cost effective and substantially reduced genital warts, cervical cancer incidence, and related mortality compared with no vaccination<sup>[41]</sup>. In Germany, dynamic transmission modeling suggested that extending HPV vaccination to MSM up to ages 26 or 45 could avert thousands of anogenital cancers and warts, with incremental cost-effectiveness ratios within acceptable thresholds<sup>[42]</sup>. Similarly, in the United States, modeling studies in HIV-positive MSM indicated that treating high-grade squamous intraepithelial lesions combined with adjuvant HPV vaccination in individuals aged 38 years or older was cost effective compared with no intervention<sup>[43]</sup>. Collectively, these findings suggest that HPV vaccination offers favorable economic value for both women and men living with HIV. Ensuring insurance coverage, implementing health policies to reduce out-of-pocket costs, expanding reimbursement mechanisms, and integrating HPV vaccination into publicly funded programs may substantially improve access for PLWH, particularly in countries such as Türkiye, where financial barriers remain significant.

Given that lack of knowledge and high vaccine cost remain major barriers to HPV vaccination among PLWH, interventions should also address social and psychological factors influencing uptake. In particular, stigma associated with HIV and other STIs may discourage individuals from seeking vaccination or discussing it with partners. Culturally sensitive education, community engagement, and the creation of a supportive, non-judgmental healthcare environment may facilitate vaccine access, empower informed decision-making, and encourage open communication about HPV prevention<sup>[11]</sup>.

Although this study identifies important trends, several methodological limitations must be acknowledged. First, the sample size was limited in certain subgroups, such as women and heterosexual individuals, which may have reduced the ability to detect statistically significant differences. For variables showing no significant differences, this may reflect insufficient statistical power rather than a true absence of effect. The cross-sectional design precludes causal inferences; therefore, relationships should be interpreted as associations rather than causation. Additionally, reliance on self-reported data may introduce response bias. Multicenter studies with larger samples are needed to confirm these findings and enable broader generalization.

This research did not receive specific funding, and the authors declare no conflicts of interest.

## Conclusion

In this study, 60.0% of participants reported awareness of HPV, yet only 12.5% had received at least one dose of the HPV vaccine. Among participants aware of HPV, the vaccination rate was 18.1%. Higher vaccination rates were observed among individuals with a history of HPV infection and those who received information from a physician. Greater HPV knowledge scores were associated with higher education, younger age, and non-heterosexual orientation. Notably, 48.8% of unvaccinated participants indicated they would accept the vaccine only if it were free. These findings suggest that, in this study population, vaccination coverage among PLWH remains substantially lower than awareness levels. Cost-related barriers and limited physician-delivered information were identified as key factors influencing uptake. Incorporating HPV vaccination into publicly funded programs and providing structured counseling within HIV care settings may enhance vaccine access and uptake among PLWH in Türkiye.

## Ethics

**Ethics Committee Approval:** Ethical approval was obtained from the Clinical Research Ethics Committee of University of Health Sciences Türkiye, Şişli Hamidiye Etfal Training and Research Hospital (approval number: 4,338, dated: 12.03.2024).

**Informed Consent:** Written informed consent was obtained from all participants prior to enrollment.

## Footnotes

### Authorship Contributions

Surgical and Medical Practices: Ö.G., Concept: Ö.G., N.D.D., D.Y.S., Design: Ö.G., D.Y.S., Data Collection or Processing: Ö.G., N.D.D., C.A.T., O.D., A.Ö., D.Y.S., Analysis or Interpretation: Ö.G., O.D., Literature Search: Ö.G., N.D.D., C.A.T., A.Ö., Writing: Ö.G., N.D.D., D.Y.S.

**Conflict of Interest:** No conflict of interest was declared by the authors.

**Financial Disclosure:** The authors declared that this study received no financial support.

## References

1. Jensen JE, Becker GL, Jackson JB, Rysavy MB. Human papillomavirus and associated cancers: a review. *Viruses*. 2024;16(5):680.
2. Otter S, Whitaker S, Chatterjee J, Stewart A. The human papillomavirus as a common pathogen in oropharyngeal, anal and cervical cancers. *Clin Oncol (R Coll Radiol)*. 2019;31(2):81-90.
3. Tadese BK, You X, Ndao T, Tota JE, Chen YT, Chowdhary A, Pan J, Costa AC, Mugo N. The burden of HPV infections and HPV-related diseases among people with HIV: a systematic literature review. *J Med Virol*. 2025;97(4):e70274.
4. Looker KJ, Rönn MM, Brock PM, Brisson M, Drolet M, Mayaud P, Boily MC. Evidence of synergistic relationships between HIV and human papillomavirus (HPV): systematic reviews and meta-analyses of longitudinal studies of HPV acquisition and clearance by HIV status, and of HIV acquisition by HPV status. *J Int AIDS Soc*. 2018;21(6):e25110.
5. Pérez-González A, Cachay E, Ocampo A, Poveda E. Update on the epidemiological features and clinical implications of human papillomavirus infection (HPV) and human immunodeficiency virus (HIV) coinfection. *Microorganisms*. 2022;10.
6. Denny LA, Franceschi S, de Sanjosé S, Heard I, Moscicki AB, Palefsky J. Human papillomavirus, human immunodeficiency virus and immunosuppression. *Vaccine*. 2012;30(Suppl 5):F168-74.
7. Yuniastuti E, Teeratakulpisarn N, Jee WS, Nilasari H, Rachmadi L, Somia IKA, Sukmawati MDD, Amijaya KAT, Yee IA, Hairunisa N, Hongchookiat P, Trachunthong D, Pankam T, Nonenoy S, Ramautarsing R, Azwa I, Merati TP, Phanuphak P, Phanuphak N, Palefsky JM. Incidence, clearance, persistence and factors related with high-risk anal HPV persistence in South-East Asian MSM and transgender women. *AIDS*. 2020;34(13):1933-41.
8. World Health Organization. Human papillomavirus vaccines: WHO position paper, December 2022. *Wkly Epidemiol Rec*. 2022;97(50):645-72.
9. Meites E, Szilagyi PG, Chesson HW, Unger ER, Romero JR, Markowitz LE. Human papillomavirus vaccination for adults: updated recommendations of the Advisory Committee on Immunization Practices. *MMWR Morb Mortal Wkly Rep*. 2019;68:698-702.
10. Akinsolu FT, Abodunrin O, Adewole IE, Olagunju M, Gambari AO, Raji DO, Idigbe IE, Njuguna DW, Salako A, Ezechi OC. Willingness to pay for HPV vaccine among women living with HIV in Nigeria. *Vaccines (Basel)*. 2023;11(5):928.
11. Huff KA, Braun A, Salvaggio MR, McGough P, Frank-Pearce SG, Kendzor DE, Bui TC. Promoting HPV vaccination in people with HIV: factors to consider. *Int J Environ Res Public Health*. 2023 Mar 31;20(7):5345.
12. Kojic EM, Rana AI, Cu-Uvin S. Human papillomavirus vaccination in HIV-infected women: need for increased coverage. *Expert Rev Vaccines*. 2016;15(1):105-17.
13. Kabarambi A, Kizito S, Hunleth J, Silver MI, Niyonzima N, Ssewamala F. HPV vaccine uptake and its predictors among adolescent girls and young women living with HIV in central Uganda. *AIDS Behav*. 2025 Mar 10. Epub ahead of print.
14. Villavicencio A, Kelsey G, Nogueira NF, Zukerberg J, Salazar AS, Hernandez L, Raccamarich P, Alcaide ML. Knowledge, attitudes, and practices towards HPV vaccination among reproductive age women in a HIV hotspot in the US. *PLoS One*. 2023;18(1):e0275141.

15. Amboree TL, Nyitray AG, Schneider J, Gargurevich N, Kuo J, Chiao EY, Hwang LY, Fujimoto K. Are human papillomavirus knowledge and vaccine uptake associated with HIV status and social determinants of health in young sexual minority men? *Prev Med Rep*. 2023;32:102132.
16. Stephens ES, Dema E, McGee-Avila JK, Shiels MS, Kreimer AR, Shing JZ. Human papillomavirus awareness by educational level and by race and ethnicity. *JAMA Netw Open*. 2023 Nov 1;6(11):e2343325.
17. Alzahrani R, Alghamdi MA, Mahmud AMA, Alsobyani F, Taurin S, Bakhiet M. HPV awareness and vaccine knowledge gaps among adults in Bahrain: a community-based study. *Discov Public Health*. 2025;22:238.
18. Zou H, Grulich AE, Cornall AM, Tabrizi SN, Garland SM, Prestage G, Bradshaw CS, Hocking JS, Morrow A, Fairley CK, Chen MY. How very young men who have sex with men view vaccination against human papillomavirus. *Vaccine*. 2014 Jun 30;32(31):3936-41.
19. Gilbert P, Brewer NT, Reiter PL, Ng TW, Smith JS. HPV vaccine acceptability in heterosexual, gay, and bisexual men. *Am J Mens Health*. 2011 Jul;5(4):297-305.
20. Hernandez-Marrero J, Ramos-Cartagena JM, Soto-Salgado M, Rivera-Santiago T, Ortiz-Ortiz KJ, Colón-López V, Deshmukh AA, Ortiz AP. Anal cancer risk and HPV infection knowledge and awareness among Hispanic persons living with HIV in Puerto Rico. *Res Sq [Preprint]*. 2024:rs.3.rs-4565682.
21. Tung WC, Jones D, Lu M. Sources of information and communication about HPV among Chinese students attending U.S. colleges: implications for culturally appropriate strategies. *J Transcult Nurs*. 2022;33(3):437-45.
22. Kassymbekova F, Rommel A, Kaidarova D, Auyezova A, Nukusheva S, Dunenova G, Bolatbekova R, Zhetpisbayeva I, Abdushukurova G, Glushkova N. Developing HPV vaccination communication strategies: assessing knowledge, attitudes, and barriers among healthcare professionals in Kazakhstan. *Vaccines*. 2024;12(11):1225.
23. Chambers C, Gillis J, Lindsay J, Benoit AC, Kendall CE, Kroch A, Grewal R, Loutfy M, Mah A, O'Brien K, Ogilvie G, Raboud J, Rachlis A, Rachlis B, Yeung A, Yudin MH, Burchell AN. Low human papillomavirus vaccine uptake among women engaged in HIV care in Ontario, Canada. *Prev Med*. 2022;164:107246.
24. Cleva M, Gaspari V, Ceccarelli A, Pianese G, Griffa D, Orioni G, Cintori C, Diegoli G, Gori D, Montalti M. HPV vaccine awareness and uptake among sexually transmitted infections clinic users: a cross-sectional study in Bologna, Italy. *Int J Environ Res Public Health*. 2024;21(11):1515.
25. de Brito KC, da Silva MFCR, Cardoso CW, Silva LK, Khouri R, de Albuquerque Junior AE, Vianna NA, Almeida MDCC, Moreira Junior ED. A randomized, controlled trial of a web-based tailored intervention to increase human papillomavirus vaccination among people living with HIV/AIDS. *PLoS One*. 2025;20(3):e0319646.
26. Chandeying N, Thongseiratch T. Systematic review and meta-analysis comparing educational and reminder digital interventions for promoting HPV vaccination uptake. *npj Digit Med*. 2023;6:162.
27. Amboree TL, Wermuth PP, Montealegre JR, Fujimoto K, Mgbere O, Darkoh C. Sexual behaviors and human papillomavirus vaccination in a heterosexually active adult population at increased risk for HIV infection. *Arch Sex Behav*. 2023 Feb;52(2):793-801.
28. Pho AT, Mangal S, Bakken S. Human papillomavirus vaccination among transgender and gender diverse people in the United States: an integrative review. *Transgend Health*. 2022 Aug 1;7(4):303-13.
29. Yao PY, Lin CY, Ko NY, Zou H, Lee CW, Strong C. Predicting human papillomavirus vaccine uptake in men who have sex with men: the influence of vaccine price and receiving an HPV diagnosis. *BMC Public Health*. 2022 Jan 6;22(1):28.
30. Moran C, Garcia-Iglesias J, Kerr C. Human papillomavirus vaccination uptake among men who have sex with men living with HIV. *Sex Transm Infect*. 2025:sextrans-2024-056361. Epub ahead of print.
31. Shen F, Du Y, Cao K, Chen C, Yang M, Yan R, Yang S. Acceptance of the human papillomavirus vaccine among general men and men with a same-sex orientation and its influencing factors: a systematic review and meta-analysis. *Vaccines (Basel)*. 2023;12(1):16.
32. Russ SM, Brackney M, Meek J, Niccolai LM. Missed opportunities for HPV vaccination among vaccine-eligible women with high grade cervical lesions. *Vaccine*. 2019 Jul 18;37(31):4262-7.
33. Couto E, Sæterdal I, Juvet LK, Klemp M. HPV catch-up vaccination of young women: a systematic review and meta-analysis. *BMC Public Health*. 2014;14:867.
34. Rosenthal SL, Weiss TW, Zimet GD, Ma L, Good MB, Vichnin MD. Predictors of HPV vaccine uptake among women aged 19-26: importance of a physician's recommendation. *Vaccine*. 2011;29(5):890-5.
35. Ylitalo KR, Lee H, Mehta NK. Health care provider recommendation, human papillomavirus vaccination, and race/ethnicity in the US National Immunization Survey. *Am J Public Health*. 2013;103(1):164-9.
36. Gerend MA, Shepherd MA, Lustria MLA, Shepherd JE. Predictors of provider recommendation for HPV vaccine among young adult men and women: findings from a cross-sectional survey. *Sex Transm Infect*. 2016;92(2):104-7.
37. Cartmell KB, Young-Pierce J, McGue S, Alberg AJ, Luque JS, Zubizarreta M, Brandt HM. Barriers, facilitators, and potential strategies for increasing HPV vaccination: a statewide assessment to inform action. *Papillomavirus Res*. 2018;5:21-31.
38. Grace D, Gaspar M, Rosenes R, Grewal R, Burchell AN, Grennan T, Salit IE. Economic barriers, evidentiary gaps, and ethical conundrums: a qualitative study of physicians' challenges recommending HPV vaccination to older gay, bisexual, and other men who have sex with men. *Int J Equity Health*. 2019;18(1):159.
39. Patel PR, Berenson AB. The internet's role in HPV vaccine education. *Hum Vaccin Immunother*. 2014;10(5):1166-70.
40. Hakimi S, Lami F, Allahqoli L, Alkatout I. Barriers to the HPV vaccination program in the Eastern Mediterranean region: a narrative review. *J Turk Ger Gynecol Assoc*. 2023;24(1):48-56.
41. Liu H, Zou M, Shen M, Kamarulzaman A, Chen S, Li J, Li R, Liu H, Zou Z, Zhang L. HPV vaccination is highly effective and cost-effective for cervical cancer prevention in women living with HIV in China: a cost-effectiveness analysis. *Int J Cancer*. 2025 Mar 15;156(6):1225-35.
42. Palmer C, Wähler C, Wölle R, Kreuter A, Klusmann JP, Witte J, Luzak A, Reuschenbach M. Cost-effectiveness analysis of HPV vaccination of men who have sex with men in Germany. *Infection*. 2025.
43. Deshmukh AA, Chiao EY, Cantor SB, Stier EA, Goldstone SE, Nyitray AG, Wilkin T, Wang X, Chhatwal J. Management of precancerous anal intraepithelial lesions in human immunodeficiency virus-positive men who have sex with men: clinical effectiveness and cost-effectiveness. *Cancer*. 2017;123(23):4709-19.