

# Human Papilloma Virus Vaccination Knowledge, Prevalence, Risk Factors, and HPV Detection in 18-26 and 27-45-year-old Men and Women

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**ABSTRACT** The US Food and Drug Administration approved a supplemental application for HPV 9-valent vaccine for 27-45-year-old women and men. The Advisory Committee on Immunization Practices did not recommend catch-up vaccination of adults aged 27-45 years, but recognized that some adults who were not previously vaccinated may be at risk for new HPV infection and might benefit from vaccination in this age range. We decided to compare HPV vaccination knowledge, prevalence, risk factors, and history of HPV detection in cohorts with ages of 18-26 and 27-45 years. Men and women aged 18-45 years were asked to complete an anonymous internet survey about HPV infection and vaccination. Valid answers were received from 524 respondents. HPV vaccination rates were low (from 0.00 to 5.56%). All women aged 27-45 years bought the vaccine at their own cost and were vaccinated after sexual debut. Knowledge on existence of the HPV vaccine was better in women ( $P < 0.01$ ). The overall number of sexual partners was significantly higher in men and in persons aged 27-45 ( $P < 0.05$ ). Women aged 27-45 reported higher prevalence of unprotected vaginal and anal sex, a higher number of sexual partners, and lower HPV-related cancer awareness. Our study showed that better knowledge on HPV vaccination and HPV-related cancer awareness did not lead to higher HPV vaccination rates. A substantial number of individuals aged 27-45 years may benefit from HPV vaccination, and information on HPV vaccination should be actively disseminated by physicians and mass media.

**KEY WORDS:** human papilloma virus, vaccination, knowledge, risk factors, HPV detection

## INTRODUCTION

Human papilloma virus (HPV) vaccination is now recommended not only for women but for all persons up to 26 years of age (1). The United States (US) Food and Drug Administration approved a supplemental application for recombinant HPV 9-valent vaccine, ex-

panding the approved use of the vaccine to include women and men aged 27 to 45 years of age (2). However, the Advisory Committee on Immunization Practices (ACIP) did not recommend catch-up vaccination of adults aged 27-45 years, but recognized that some

adults who are not previously vaccinated may be at risk for new HPV infection and might benefit from vaccination in this age range; therefore, ACIP recommended shared clinical decision-making regarding potential HPV vaccination for these individuals (3). We decided to compare HPV vaccination knowledge, prevalence, risk factors, and history of HPV detection in 19-26 and 27-45-year-old cohorts. In our previous publications, we reported low HPV vaccination prevalence (4-6).

The primary goal of our present study was to compare HPV vaccination knowledge, prevalence, risk factors, and history of HPV detection in 18-26 and 27-45-year-old cohorts. Secondary goals were to check if there were other reasons for not intending to get the HPV vaccine except its high price and if sexual orientation had an influence on HPV-related knowledge, risk of HPV transmission, and vaccination prevalence.

### PATIENTS AND METHODS

Men and women aged 18-45 were asked to complete an anonymous internet survey about HPV infection and vaccination. Ethical permission for the study was granted by the Ethics Committee of the Bogomolets National Medical University (protocol number 108).

Data are presented as mean ± standard deviation. Unpaired t-test with Welch's correction and Fisher's exact test (two-sided) were used for statistical analysis. The GraphPad InStat Instant Biostatistics statistical program was used (number of license: GTA-32732-332). The results were considered significant if  $P < 0.05$ .

### RESULTS

Valid answers were received from 524 respondents (235 answers from women aged 18-26 years, 180 answers from women aged 27-45 years, 76 answers from men aged 18-26 years and 33 answers from men aged 27-45 years). Individual results with missed answers were analysed.

Data on knowledge on HPV-related cancers are presented in Table 1. Women had better knowledge on HPV-related cervical cancer than men, and 18-26-year-old women reported better knowledge than women aged 27-45 years ( $P < 0.01$ ). Better knowledge on HPV-related vulvar, vaginal, and penile cancers was reported in women aged 18-26 than in men with ages 18-26 and women aged 27-45 ( $P < 0.01$ ). Knowledge on HPV-related rectal cancers was better in men aged 27-45 than in women aged 27-45 ( $P < 0.01$ ). The main sources of knowledge on HPV-related cancers and HPV vaccination were mass media, university lecturers, and physicians.

Data on knowledge on HPV vaccination, personal HPV vaccination status, and HPV testing is presented in Table 2. Knowledge on the existence of the HPV vaccine was better in women ( $P < 0.01$ ). Knowledge on HPV vaccination for both sexes was better in women aged 18-26 than in men aged 18-26 and women aged 27-45 years ( $P < 0.01$ ). Among women aged 18-26, the HPV vaccine was provided free of charge in four cases, bought by parents in three cases, and bought by respondents in four cases. In 8 of them, vaccination was before sexual debut. All women aged 27-45 bought the vaccine at their own cost and were vaccinated after sexual debut. Both vaccinated men received the vaccine from their parents before sexual debut.

**Table 1.** Knowledge on HPV-related cancers

Answer options	Men 18-26 years		Men 27-45 years		Women 18-26 years		Women 27-45 years	
	(n=76)		(n=33)		(n=233)		(n=180)	
	Yes	No	Yes	No	Yes	No	Yes	No
Cervical cancers	56 (73.68%)	20 (26.32%)	23 (69.70%)	10 (30.30%)	222 (95.28%)	11 (4.72%)	158 (87.78%)	22 (12.22%)
Oral and throat cancers	27 (36.00%)	48 (66.00%)	15 (45.45%)	18 (54.55%)	94 (40.34%)	139 (59.66%)	60 (33.33%)	120 (66.67%)
Vulvar and vaginal cancers	49 (64.47%)	27 (35.53%)	17 (51.52%)	16 (48.48%)	185 (79.40%)	48 (20.60%)	103 (57.22%)	77 (42.78%)
Rectal cancers	27 (35.53%)	49 (64.47%)	17 (51.52%)	16 (48.48%)	98 (42.06%)	135 (57.94%)	58 (32.22%)	122 (67.78%)
Penile cancers	33 (43.42%)	43 (56.58%)	15 (45.45%)	18 (54.55%)	145 (62.23%)	88 (37.77%)	62 (34.44%)	118 (65.56%)

**Table 2.** Knowledge on HPV vaccination, personal HPV vaccination, and HPV testing

Answer options	Men 18-26 years		Men 27-45 years		Women 18-26 years		Women 27-45 years	
	Yes	No	Yes	No	Yes	No	Yes	No
Knowledge on HPV vaccination	45 (60.00%)	30 (40.00%)	16 (48.48%)	17 (51.52%)	183 (77.87%)	52 (22.13%)	136 (75.56%)	44 (24.44%)
Knowledge on vaccination for both sexes	33 (43.42%)	43 (56.58%)	13 (39.39%)	20 (60.61%)	158 (67.23%)	77 (32.77%)	90 (50.00%)	90 (50.00%)
Personal HPV vaccination*	2 (2.67%)	73 (97.33%)	0	33 (100%)	13 (5.56%)	221 (94.44%)	10 (5.56%)	170 (94.44%)
HPV test	5 (6.85%)	68 (93.15%)	7 (22.58%)	24 (77.42%)	85 (36.48%)	148 (63.52%)	103 (57.87%)	75 (42.13%)
HPV test results	1 (20.00%)	4 (80.00%)	3 (37.50%)	5 (62.50%)	22 (25.29%)	65 (74.71%)	36 (34.95%)	67 (65.05%)

\* At least one dose of HPV vaccine

Only two vaccinated women reported more than ten sexual partners. Reasons for not being vaccinated are presented in Table 3. Prevalence of the HPV test was higher in women aged 27-45 than in women aged 18-26 years and men aged 27-45 years ( $P<0.001$ ), and was better in women aged 18-26 than in men aged 18-26 years ( $P<0.001$ ) and in men aged 27-45 than in men aged 18-25 ( $P<0.05$ ). Prevalence of HPV positive tests did not differ between groups.

The reported start of sexual life was later in women aged 27-45 than in women aged 18-26 years ( $17.26\pm 2.21$  and  $18.85\pm 2.97$ ,  $P<0.001$ ). The overall number of sexual partners was significantly higher among men and in older age groups (women 18-26 years:  $3.09\pm 3.59$ , women 27-45 years:  $5.68\pm 9.66$ , men 18-26 years:  $5.26\pm 6.16$ , men 27-45 years:  $9.81\pm 8.92$ ;  $P<0.05$ ). Data on the prevalence of different types of unprotected sexual activities is presented in Table 4. Prevalence of unprotected vaginal intercourse was higher in women aged 27-45 than in women aged 18-26 ( $P<0.001$ ) and men aged 27-45 ( $P<0.05$ ). The overall number of sexual partners for unprotected vaginal intercourse was higher in men aged 18-26 and women aged 27-45 than in women aged 18-26 (women 18-26 years:  $1.56\pm 1.51$ , women 27-45 years:  $2.72\pm 2.76$ , men 18-26 years:  $2.88\pm 4.52$ ;  $P<0.05$ ). The prevalence of unprotected oral sex with opposite sex partners was higher in men aged 18-26 than in women aged 18-26 ( $P<0.01$ ). The overall number of opposite sex partners for unprotected oral sex was higher in men than in women (women 18-26 years:  $1.53\pm 1.57$ , women 27-45 years:  $2.22\pm 4.30$ , men 18-26 years:  $4.26\pm 6.09$ , men 27-45 years:  $5.44\pm 5.82$ ;  $P<0.05$ ). Prevalence of unprotected anal intercourse was higher in women aged 27-45 than in women aged 18-26 ( $P<0.01$ ). The overall number of sexual partners for unprotected anal intercourse was higher in men

aged 18-26 and women aged 27-45 than in women aged 18-26 (women 18-26 years:  $0.26\pm 0.63$ , women 27-45 years:  $0.45\pm 0.67$ , men 18-26 years:  $0.88\pm 2.01$ ;  $P<0.05$ ). Among vaccinated respondents, sexual contacts with men and women were reported by one woman from the 18-26 age group and two women from the 27-45 age group. A male respondent that reported same sex sexual practices reported significantly worse knowledge on HPV vaccination (1 from 8) than men that did not reported same sex sexual practices (43 out of 67) ( $P<0.01$ ). A similar tendency was reported in women aged 18-26, but the difference did not reach a level of statistical significance (of the 23 women who reported same sex sexual practices, 15 knew about HPV vaccination, of the 212 women who did not report same sex sexual practices, 168 knew about HPV vaccination;  $P=0.18$ ). This difference was absent in women aged 27-45 years (of the 20 women who reported same sex sexual practices, 16 knew about HPV vaccination, of the 155 women that did not report same sex sexual practices 117, knew about HPV vaccination;  $P=0.79$ ).

## DISCUSSION

Prevalence of HPV vaccination was very low in all groups, with the lowest rate among men aged 27-45—where none of respondents were vaccinated. Most of our respondents knew about the HPV vaccine, except for men aged 27-45. Our results showed that better knowledge on HPV vaccination and HPV-related cancer awareness did not lead to higher HPV vaccination rates. The most frequent sources of information in all cases were physicians, university lecturers, and mass media. It has been previously reported that HPV vaccination status was not significantly associated with an increased likelihood of sexual debut or decreased age of sexual debut, after controlling for age, race,

**Table 3.** Reasons for not being vaccinated

Answer options	Men 18-26 years (n=70)	Men 27-45 years (n=32)	Women 18-26 years (n=207)	Women 27-45 years (n=157)
Do not know about the HPV vaccine	20 (28.57%)	11 (34.38%)	37 (17.87%)	25 (15.92%)
Not afraid to be infected with HPV	7 (10.00%)	1 (3.13%)	6 (2.90%)	3 (1.91%)
High vaccine cost	5 (7.14%)	0	27 (13.04%)	11 (7.01%)
Parents are against HPV vaccination	1 (1.43%)	0	0	1 (0.64%)
Afraid of complications	3 (4.29%)	2 (6.25%)	8 (3.86%)	7 (4.46%)
Unsure about HPV vaccination efficacy	5 (7.14%)	5 (15.63%)	13 (6.28%)	6 (3.82%)
Lack of information about HPV vaccination	13 (18.57%)	4 (12.50%)	38 (18.36%)	45 (28.66%)
Other reasons	16 (22.86%)	9 (28.13%)	78 (37.68%)	59 (37.58%)

sex, and substance use (7). Our results showed that women aged 27-45 reported higher prevalence of unprotected vaginal and anal sex, a higher number of sexual partners, and lower HPV-related cancer awareness. However, older women had higher prevalence of HPV tests in comparison with other groups. Meanwhile, frequency of positive HPV test results did not differ between all groups. It has been previously reported that having two or more lifetime sex partners and a history of any sexually transmitted disease were the most important determinants of high-risk HPV incidence, and that a greater number of lifetime partners was associated with reduced clearance rates for any HPV infection (8). The number of lifetime sex partners in our study was similar to results from an US study by Rositch *et al.* (9). In another study, Ukrainian medical students (10) reported lower prevalence of unprotected vaginal intercourse than 18-26-year-old respondents from the present study. The reason was

likely higher heterogeneity than respondents in our present study.

There was no difference in HPV vaccination rates between those who reported same sex sexual contacts and those who did not. Male respondents who reported same sex sexual contacts also showed poor knowledge on HPV vaccination, and none of them was vaccinated. In a study by Agénor *et al.*, no difference was found in the odds of initiating HPV vaccination between participants with male and female sexual partners and those with only male sexual partners (11). In another study, the adjusted prevalence of HPV vaccine awareness was similar among heterosexual, bisexual, and lesbian respondents. Among those who had heard of the vaccine, 33.2% of bisexual women had initiated HPV vaccination in comparison with 28.4% of their heterosexual counterparts (12).

The most common reasons for not intending to get the HPV vaccine reported in the literature were

**Table 4.** Involvement in different types of unprotected sexual activities

Answer options	Men 18-26 years	Men 27-45 years	Women 18-26 years	Women 27-45 years
Unprotected vaginal sex	50 (75.76%)	24 (88.89%)	151 (79.47%)	167 (98.24%)
Unprotected oral sex with opposite sex partner(s)	56 (93.33%)	23 (85.19%)	135 (75.00%)	122 (75.31%)
Unprotected oral sex with same sex partner(s)	7 (11.29%)	0	23 (13.22%)	20 (12.99%)
Unprotected anal sex with opposite sex partner(s)	21 (32.31%)	13 (50.00%)	35 (20.11%)	58 (35.80%)
Unprotected anilingus with opposite sex partner(s)	15 (23.81%)	7 (26.92%)	41 (23.43%)	31 (19.75%)
Unprotected anilingus with same sex partner(s)	0	0	5 (2.94%)	5 (3.27%)

the belief that vaccination is not necessary, not having received a recommendation for HPV vaccine from the provider, concerns about vaccine safety or side-effects, negative or lack of information about the vaccine, and lack of trust in vaccine effectiveness (13-15). In our study, the most common reasons for not intending to get the HPV vaccine were lack of information, high vaccine cost, and lack of trust in vaccine effectiveness. We assume that a significant number of respondents that needed more information did not know the cost of the HPV vaccine (approximately 25 US dollars per dose for Cervarix and about 125 US dollars per dose for Gardasil).

A recent cross-sectional survey of US adults aged 27-45 years showed that less than half of respondents (42.9%) were likely to get the HPV vaccine (16). Over 80% of persons aged 27-45 with no history of HPV vaccination needed more information about safety, effectiveness, personal benefit, provider recommendation, side-effects, and risks. Patient-centered interventions are needed to engage adults in a shared decision-making process regarding HPV vaccination (17). Meanwhile, the immune response to HPV vaccination in men and women aged 27-45 is comparable to the one observed in men and women aged 18-26 years (18,19). Therefore, the 27-45 age group should receive information on the existence of the HPV vaccine to have an opportunity to buy the vaccine, as the minority of our respondents of corresponding age did.

Our study had some limitations. There were few male respondents, especially in the 27-45 age group. The participants of this survey were recruited using social media. Therefore it is possible that respondents were more educated and had better knowledge than the general population of the same age. Population studies or studies where participants are well-matched by factors other than gender are more reliable for research on gender differences (20,21).

## CONCLUSION

Our study showed that better knowledge on HPV vaccines and HPV-related cancer awareness did not lead to higher HPV vaccination rates. A substantial number women aged 27-45 years may benefit from HPV vaccination, and information on HPV vaccination should be actively disseminated by physicians and mass media.

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