

# Awareness of HPV and drivers of HPV vaccine uptake among university students: A quantitative, cross-sectional study

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## Abstract

HPV vaccination is a milestone in primary prevention. However in Italy, vaccine coverage is still nowhere near the target of 95%. We investigated factors associated with inclination to get vaccinated in university students, as they are likely to have just assumed a central role in their healthcare decision-making. University students aged 18–25 were asked to fill in a questionnaire. The effect of socio-demographic and behavioural characteristics on HPV awareness was assessed with a logistic regression adjusting for age, gender, nationality, degree course, relationship, age at first intercourse, number of sexual partners, smoking, sexual orientation, past diagnosis of STDs and knowledge of people who had received HPV vaccine. A second regression adjusting also for information sources, awareness and knowledge investigated factors associated with inclination to receive vaccine. Nine thousand nine hundred and eighty-eight questionnaires were included (response rate 91.3%); awareness of HPV and vaccine was 83.3% and 69.9% respectively. Awareness (AOR: 3.3; 95% CI: 2.3–4.6) and a good knowledge positively affected acceptability, as well as a previous diagnosis of STDs and knowledge of vaccinated people. Healthcare workers (AOR: 1.6; 95% CI: 1.4–1.9) and family members (AOR: 1.7; 95% CI: 1.4–2.1) were the most influencing information sources, even if knowledge of vaccinated people was by far more persuasive (AOR: 2.7; 95% CI: 2.2–3.3). Only 12% of participants were acquainted with skin to skin HPV transmission, while 75% believed in a full effectiveness of condom; less than 22% associated HPV with cancer (other than cervical cancer). Efforts to increase awareness are likely to be worth considering that: awareness is the main determinant of vaccine acceptance; only 50% of individuals not interested in receiving vaccine were aware of it; males are much less aware (AOR: 0.09; 95% CI: 0.07–0.11). Moreover, this study spotlights some misconceptions around HPV and acknowledges a pivotal role of healthcare workers, family and peer influence.

## KEYWORDS

human papillomavirus, sexual health awareness, sexually transmitted infections, vaccination

## 1 | INTRODUCTION

Vaccination against HPV is considered as an essential preventive strategy by the World Health Organization (WHO) ("WHO | Comprehensive cervical cancer prevention & control - a healthier future for girls & women," n.d.). In December 2007, the Italian Ministry of Health included the HPV vaccine in the national immunisation plan and offered it free of charge and actively to all girls of age 12 ("Introduzione della vaccinazione anti-HPV nelle regioni italiane al 30 dicembre, 2008. Aggiornamento,," n.d.) according to the WHO guidelines ("WHO | Comprehensive cervical cancer prevention & control - a healthier future for girls & women," n.d.). Years after the start of the programme, the vaccination coverage still levels off at around 70% in the female target population (girls born after 1996), nowhere near the national target set at 95% ("Introduzione della vaccinazione anti-HPV nelle regioni italiane al 30 dicembre, 2008. Aggiornamento,," n.d.). Moreover, in 2015, six Italian Regions extended the vaccination programme to males. Since 2018, all Italian regions adopted a universal vaccination strategy. HPV cannot be considered as a female-only disease any longer.

Human papillomavirus (HPV) infection is the most common sexually transmitted infection in the world: lifetime prevalence is about 75%, and over 50% of infections are caused by high risk HPV types (Frazer et al., 2006). Although men and women 15–24 years of age are only 25% of the sexually active population, nearly half of all infections are diagnosed in this age group (Baseman & Koutsky, 2005; Frazer et al., 2006).

HPV can cause severe consequences due to its carcinogenic potential. In particular, HPV-DNA has been detected in 99.7% of cervical cancers; HPV-16 and HPV-18 are the two most common types detected in histological samples and they are responsible for about 70% of all cervical cancers (Muñoz, Castellsagué, de González, & Gissmann, 2006). In 1995, the International Agency for Research on Cancer (IARC) recognised HPV as a human carcinogen and in 2005 declared as 'sufficient' the evidences supporting the involvement of HPV in the carcinogenesis of vulvar, vaginal, penile, anal and oropharyngeal cancers (Cogliano et al., 2005; "IARC Handbook of Cancer Prevention Volume 10 - Cervix Cancer Screening," n.d.).

The acceptance of HPV vaccine depends on a broad range of factors, including awareness, beliefs, knowledge and perceptions (Beavis & Levinson, 2016; Donati et al., 2012; Marlow, Zimet, McCaffery, Ostini, & Waller, 2013; Schaefer Ziemer & Hoffman, 2013; Yu et al., 2016). In this study, we assessed the awareness of HPV and HPV vaccines in university students aged 18–25 years old, and we investigated the factors associated with HPV awareness and the inclination to get vaccinated against HPV in unvaccinated individuals. Students in this age group were largely not included in the national immunisation plan (except for 18–19-year-old girls, only) and may benefit from supplementary catch-up vaccination programmes, as recently implemented in only few Italian regions. Young adults are likely to have just assumed a central role in their healthcare decision-making (Ragan, Bednarczyk, Butler, & Omer, 2018) and potential barriers to

### What is known about this topic

- The WHO considers vaccination an essential preventive strategy against HPV infection, which is the most common sexually transmitted infection globally.
- In Italy, despite the introduction of a gender-neutral vaccination programme, coverage is still unsatisfactory.
- Potential barriers to vaccination among university students may differ from parents with young children.

### What this paper adds

- Awareness has been growing but a gender gap still persists. Some concepts keep being ignored (HPV involvement in neoplasia other than cervical cancer; skin to skin transmission; multiple sex partnership as risk factor; partial protection of condom).
- Awareness remains the main determinant of vaccine uptake.
- Healthcare workers and family are the most influencing information sources.

vaccination are likely to be different compared with those identified ordinarily among parents of young children.

## 2 | METHODS

The study was conducted among students both females and males at the Universities of REDACTED and REDACTED, Italy from October 2015 to June 2016. Students were recruited on a completely free and voluntary basis and they were not offered any form of compensation for their time. Participants were eligible if they identified themselves as 18–25 years of age and enrolled in one of the courses offered by the University of REDACTED or the University of REDACTED. Degree courses attended by participants were classified in: (a) healthcare professions, (b) sciences, (c) humanities, (d) engineering, (e) law and economics, (f) psychology, (g) medicine and dentistry. Members of the research group visited the sampled classrooms and all students in attendance were invited to complete the questionnaire. Participants were given oral information about the purpose of the study, and reassurance of confidentiality and anonymity. A self-administered, anonymous questionnaire was administered to each participant, with consent inferred from completion of the questionnaire. The questionnaire included socio-demographic factors (age, gender, nationality), involvement in a relationship, age at first intercourse, number of sexual partners within the last 24 months, smoking habit, use of birth pill and sexual orientation. Participants were asked if they had ever been diagnosed with a sexually transmitted disease (STD) or genital warts. The knowledge of people with a diagnosis

of genital warts or who had received HPV vaccine was recorded. The vaccination status and the intention to receive the vaccine were also investigated. Participants' awareness of HPV and HPV vaccine was assessed with two questions: 'Have you ever heard of human papillomavirus (HPV)?' and 'Have you ever heard of HPV vaccine?'. Participants' degree of knowledge of HPV was assessed with a set of seven True/False questions. A score ranging from 0 (no knowledge) to 7 points (maximum knowledge) was calculated for each participant. The method and the questions used to assess the degree of knowledge have been described in detail elsewhere (Baldovin et al., 2019). Students were asked to indicate their sources of information by ticking a pre-labelled box. Response options were: healthcare workers, a friend, a family member, TV, the internet, newspapers or magazines and school/university. Multiple answers were possible. Moreover, four questions with multiple choice options were included in the questionnaire, with the specific purpose of investigating beliefs on the aetiology of HPV, transmission of the infection, prevention and prophylactic efficacy of the vaccine. Questions and response options are reported in Figure 1.

The questionnaire was adapted from Schaefer et al (Schaefer Ziemer & Hoffman, 2013). Pretesting of the questionnaire was conducted; findings from the pilot study and subsequent changes have been described in detail elsewhere (Baldovin et al., 2019).

## 2.1 | Statistical analysis

Descriptive analyses, using absolute and relative frequencies, were performed to assess the prevalence of awareness. Chi-squared tests were conducted to compare the different groups on baseline characteristics. The effect of socio-demographic and behavioural characteristics on awareness was assessed with a binary logistic regression analysis adjusting for age, gender, nationality, degree course, relationship, age at first intercourse, number of sexual partners within last 24 months, smoking habit, sexual orientation, past diagnosis of genital warts or STD, knowledge of people with a diagnosis of genital warts and people who had already received HPV vaccine. All variables were entered in a single step. The same variables, together with the use of different sources of information, awareness of HPV and degree of knowledge, were entered as predictors in a second logistic regression with the purpose of identifying factors associated with the intention to receive the HPV vaccination. This analysis was conducted in the subpopulation of only non-vaccinated participants.

Statistical significance for all tests was set at  $p \leq .05$  (two-sided) and confidence intervals (CIs) at 95%. Statistical analysis was performed using IBM® SPSS Statistics® version 23.

## 2.2 | Ethics approval and consent to participate

In accordance with the Italian legislation, data were treated with full confidentiality. Written informed consents were obtained and

collected separately from the questionnaire in order to ensure the anonymity of the data. This study complies with the Declaration of Helsinki. The study protocol was approved by the ethics committee of the Padua Provincial Authority on 30 July 2015.

## 3 | RESULTS

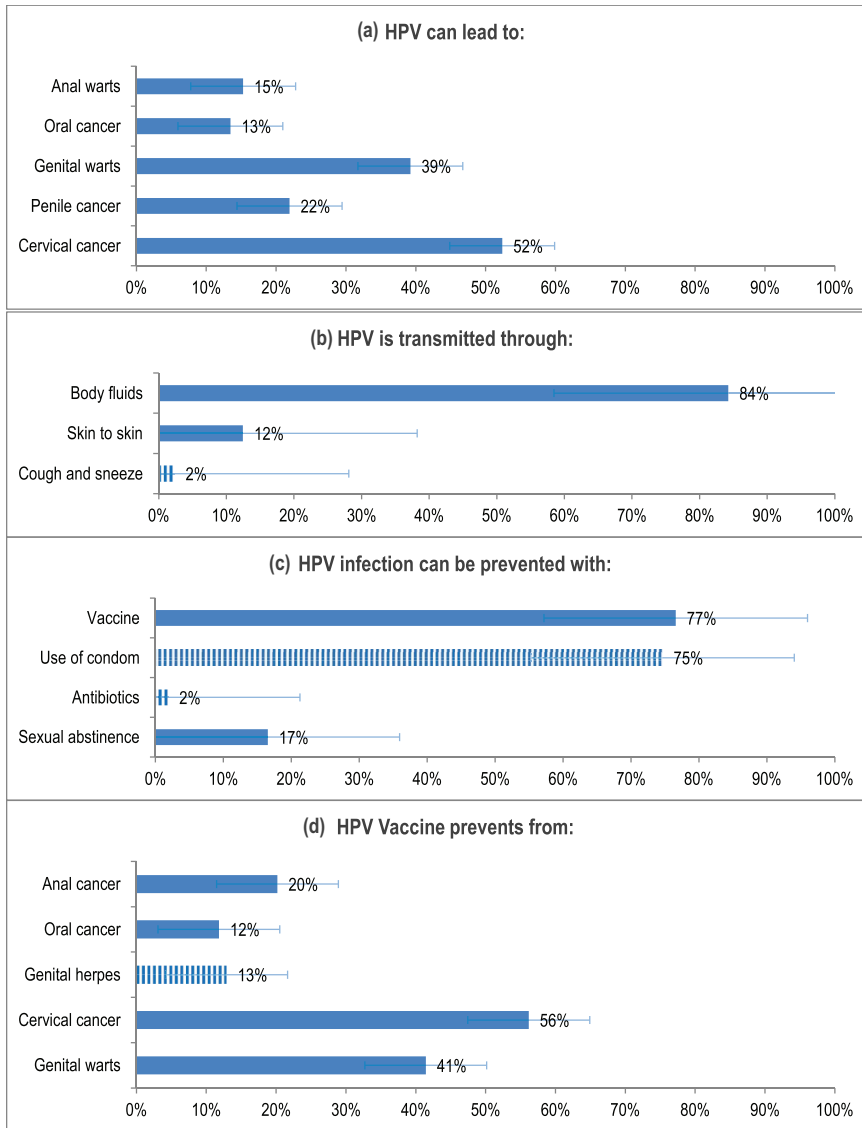
Out of 11,096 candidates, 10,135 students agreed to be included in the study (response rate: 91.3%). After checking for completeness, data quality and failure to adhere to inclusion criteria (individuals out of the target age range or not officially enrolled in one of the two universities at issue), 9,988 questionnaires were included in the study (90.0% over the initial quota of the candidates). Mean age of participants was 20.5 years (SD: 1.81), median age 20.0 years, with a majority of females (60.3%). Mean number of sexual partners over the last 24 months was  $1.68 \pm 2.51$  and the number of students committed in a stable relationship was 44.8%. Participants with Italian citizenship were 97.4%. Socio-demographic and behavioural characteristics are shown in Table 1. Overall, 73.3% of participants were not vaccinated. Of these, 23.3% declared to be intentioned in receiving the vaccine.

### 3.1 | Awareness of HPV and HPV vaccines

Overall, more than four out of five participants (83.3%) declared to be acquainted with HPV and two out of three (69.9%) stated to have heard of HPV vaccine.

An adjusted logistic regression was conducted in order to assess the effect of socio-demographic and behavioural characteristics on awareness of HPV. We found significant positive associations of awareness with age, involvement in a committed relationship (AOR: 1.38; 95% CI: 1.13–1.58) and knowledge of people with a diagnosis of genital warts (AOR: 1.89; 95% CI: 1.36–2.62); while male gender (AOR: 0.16; 95% CI: 0.13–0.19), non-Italian nationality (AOR: 0.60; 95% CI 0.39–0.92) and non-medical degree course (with AOR ranging from 0.15 to 0.47 and  $p < .05$  in all cases compared with medical degree) were negatively associated; 6,396 out of 9,988 participants (64.0%) were included in this analysis.

The younger age group showed to be more acquainted with HPV (84.6%). Awareness in the youngest age group was significantly higher than 20-21- and 22-23-years old groups, while no statistically significant difference was noted compared with the eldest group, as supported by the results from the logistic regression. Involvement in a stable relationship was positively associated with a higher level of awareness compared with singles. The proportion of women aware of HPV was higher among women taking birth control pills (96.2% vs. 92.6%;  $\chi^2$  test significance  $< 0.05$ ). About half of the participants had a first-hand knowledge of somebody who received HPV vaccine; however, among those who had not, 69.4% and 44.1% were aware of HPV and HPV vaccine respectively. Non-vaccinated participants constituted 73.3% of the



**FIGURE 1** Attitudes and beliefs about HPV and HPV vaccine in the study population. The bars show the proportion of participants who ticked each item proposed. (a) HPV etiology; (b) transmission of HPV infection; (c) prevention; (d) benefits of HPV vaccines. Solid bar: correct answer; striped bar: wrong answer

sample. Of these, 78.6% and 60.6% were aware of HPV and the vaccine respectively. Participants who were not vaccinated and not intending to receive the vaccine were aware of HPV and the vaccine in 72.8% and 50.2% of the cases respectively.

### 3.2 | Beliefs on the aetiology of HPV, transmission of the infection, prevention and prophylactic efficacy of the vaccine

Cervical cancer and genital warts were indicated by 52% and 39% of participants, respectively, as possible consequences following the HPV infection (Figure 1a). The involvement of HPV in the development of penile cancer, anal warts and oral cancer was less known by participants (22%, 15% and 13% respectively). While 84% indicated the possibility to transmit HPV through body fluid, only 12% of participants pointed at skin to skin contact (Figure 1b). About half of the sample was aware of the fact that HPV is a common and often asymptomatic infection. Three out of four students stated that

HPV infection can be prevented with the use of condom (Figure 1c). While 56% and 41% of the sample were aware of the protective role of vaccine towards cervical cancer and genital warts, respectively, less than one out of five believed in the protection of vaccine against anal and oral cancers (Figure 1d).

### 3.3 | Factors associated with the inclination to get HPV vaccination

The subpopulation for this analysis was constituted only of students who were not vaccinated and reported their willingness to be vaccinated or not; 4453 participants were included. A logistic regression analysis was conducted to identify factors associated with the inclination to get HPV vaccination (Table 2). Approximately 83.7% of intention to receive HPV vaccine was predicted by this model.

Age (AOR: 1.06; 95% CI: 1.01–1.21), a previous diagnosis of STDs or genital warts (AOR: 1.66; 95% CI: 1.22–2.46), knowledge of

**TABLE 1** Awareness of HPV and HPV vaccine by socio-demographic and behavioural characteristics

	n <sup>a</sup>	%	Have you ever heard of HPV?		Have you ever heard of HPV vaccine?	
			Yes (%)	$\chi^2$ test (p)	Yes (%)	$\chi^2$ test (p)
Total	9,988		83.3		69.9	
<b>Age (years)</b>						
18–19	3,816	38.2	84.6	.041	72.3	.000
20–21	3,196	32.0	82.5		69.5	
22–23	2,211	22.1	82.0		66.9	
24–25	765	7.7	83.6		68.1	
<b>Gender</b>						
F	6,019	60.3	93.6	.000	86.4	.000
M	3,969	39.7	67.4		44.5	
<b>Nationality</b>						
Italian	9,665	97.4	83.7	.000	70.4	.000
Non-Italian	259	2.6	68.5		52.7	
<b>Degree course</b>						
1 Healthcare professions	2,239	23.1	92.9	.000	84.5	.000
2 Sciences	1,899	19.6	77.0		60.0	
3 Humanities	1,575	16.2	84.2		72.9	
4 Engineering	1,472	15.2	66.7		45.5	
5 Law and Economics	607	6.3	82.4		68.1	
6 Psychology	932	9.6	87.6		72.8	
7 Medicine and Dentistry	978	10.1	94.8		86.9	
<b>Relationship</b>						
Single	5,371	55.2	79.5	.000	64.4	.000
In a committed relationship	4,364	44.8	88.1		77.0	
<b>Age at first intercourse (years)</b>						
14 or less	419	5.5	84.5	.039	71.4	.041
15–16	2,516	33.0	86.1		73.3	
17–18	3,498	45.9	84.3		70.0	
19 or more	1,196	15.7	82.6		69.9	
<b>No. sexual partners within last 24 months</b>						
0	767	9.9	78.4	.000	62.7	.000
1	4,593	59.4	86.1		74.2	
2	1,212	15.7	85.2		69.3	
3+	1,161	15.0	81.8		67.4	
<b>Smoking habit</b>						
Non-smoker	6,927	71.3	83.5	.901	70.6	.053
Current or former	2,785	28.7	83.4		68.6	
<b>Use of birth pill</b>						
No	3,983	69.0	92.6	.000	85.7	.000
Yes	1,786	31.0	96.2		89.2	
<b>Sexual orientation</b>						
Heterosexual	9,329	94.7	83.2	.021	69.8	.199
Homosexual	177	1.8	84.4		69.3	
Other	341	3.5	88.8		74.3	

(Continues)

TABLE 1 (Continued)

	n <sup>a</sup>	%	Have you ever heard of HPV?		Have you ever heard of HPV vaccine?	
			Yes (%)	$\chi^2$ test (p)	Yes (%)	$\chi^2$ test (p)
Past diagnosis of genital warts or STD						
No	9,502	96.0	83.1	.013	69.6	.009
Yes	397	4.0	87.9		76.2	
Knowledge of people with a diagnosis of genital warts						
No	8,973	91.9	82.7	.000	69.1	.000
Yes	795	8.1	91.2		79.7	
Knowledge of people having received HPV vaccine						
No	4,879	50.2	69.4	.000	44.1	.000
Yes	4,834	49.8	—		—	
HPV vaccination status						
Vaccinated	2,552	26.7	—		—	
Non-vaccinated	6,993	73.3	78.6		60.6	
Intention to receive vaccine						
No	5,317	76.7	72.8		50.2	
Yes	1,616	23.3	—		—	

<sup>a</sup>Numbers may not add up to total because of missing values.

people having received HPV vaccine (AOR: 2.70; 95% CI: 2.23–3.27), having heard of HPV from healthcare workers (AOR: 1.65; 95% CI: 1.37–1.99) or a family member (AOR: 1.70; 95% CI: 1.39–2.08) were positively associated with the intention to receive the vaccine, while male gender was negatively associated (AOR: 0.09; 95% CI: 0.07–0.11). Awareness and a higher knowledge of HPV also positively affected the intention to get vaccinated.

## 4 | DISCUSSION

### 4.1 | Awareness of HPV and HPV vaccines

The level of awareness of HPV recorded in our sample is generally satisfactory. Awareness is higher than in previous Italian studies which involved a similar population in terms of age. In the study that Donati et al. conducted in 2008, awareness of HPV stood at 59% while awareness of the vaccine stood at 52% (Donati et al., 2012). The awareness was even lower (30%) in a previous Italian study carried out in 2007 (Di Giuseppe, Abbate, Liguori, Albano, & Angelillo, 2008). Our findings show how the awareness has been growing in the population since the inclusion of the HPV vaccine in the national immunisation programme. Our results are further encouraging, considering that our sample did not include only young females (like the above-mentioned studies did), but about 40% of participants were males. However, a wide scope of improvement is still possible: a recent study from the United States indicates that 95% and 91% of college students had heard of HPV and vaccines respectively

(Kasymova, Harrison, & Pascal, 2019). The gender gap in HPV awareness is a globally shared feature, as shown in other studies from Italy (Pelucchi et al., 2010), UK (Marlow et al., 2013), Hungary (Marek et al., 2011), Australia (Marlow et al., 2013) and the United States (Adjei Boakye et al., 2018; Barnard, George, Perryman, & Wolff, 2017; Gerend & Magloire, 2008; Kasymova et al., 2019). This feature appears to derive from a historically more female-oriented information about the HPV vaccine. Only in the recent years and especially in the Anglosphere countries, the vaccine has started to be referred as the *HPV vaccine*, rather than the *cervical cancer vaccine* (Gunasekaran et al., 2015). This communication strategy, although effective, could be partly responsible for the barriers to a widespread acceptance of HPV vaccine in males. In our sample also, as shown in the following, male gender is associated with a significant lower acceptance of the vaccine compared with females.

Racial and ethnic disparities, as well as the condition of living in a host country, affect the level of awareness and knowledge of HPV (Kasymova et al., 2019) and the HPV vaccine uptake (Adjei Boakye et al., 2018) in the population of young adults. Minority groups may have a lower chance of being exposed to information on HPV because of both cultural issues and a lower accessibility to healthcare services. Foreign born people, indeed, are less prone to seek help at general practitioners or outpatients clinics where they could receive more information about prevention (De Luca, Ponzio, & Andrés, 2013). In our sample also, foreign nationality is a valid predictor of the lack of awareness of HPV. However, this finding has to be considered with caution because of the heterogeneity of this group: it may include exchange students from high income countries, foreign

**TABLE 2** Logistic regression. Factors associated with the inclination to receive HPV vaccination (only non-vaccinated participants)

	(reference)	p	OR	95% CI	
				Lower	Upper
Age		.021	1.064	1.010	1.121
Male gender		.000	0.091	0.072	0.115
Non-Italian nationality		.827	0.940	0.539	1.638
Degree course	(Medicine and Dentistry)				
Healthcare professions		.176	0.816	0.608	1.095
Sciences		.061	0.717	0.507	1.016
Humanities		.007	0.620	0.439	0.877
Engineering		.048	0.669	0.449	0.996
Law and Economics		.045	0.641	0.416	0.990
Psychology		.000	0.494	0.342	0.714
Being in a committed relationship		.525	0.940	0.778	1.137
Age at first intercourse	(15–18 y)				
14 years or less		.256	1.239	0.856	1.795
19 years or more		.941	0.991	0.784	1.252
No. sexual partners within last 24 months	(1 or 2 partners)				
0		.317	0.772	0.465	1.282
3 or more		.728	1.047	0.807	1.358
Being smoker		.055	1.206	0.996	1.460
Sexual orientation	(heterosexual)				
Homosexual		.097	0.563	0.286	1.109
Other		.645	0.905	0.593	1.382
Past diagnosis of genital warts or STD		.011	1.661	1.122	2.458
Knowledge of people with a diagnosis of genital warts		.056	1.322	0.992	1.760
Knowledge of people having received HPV vaccine		.000	2.702	2.234	3.269
Sources of information					
Healthcare workers		.000	1.653	1.374	1.990
Friend		.645	1.057	0.836	1.335
Family		.000	1.700	1.392	2.076
TV		.809	0.974	0.786	1.206
Internet		.475	1.091	0.859	1.384
Newspaper		.203	0.810	0.586	1.120
School/University		.599	1.052	0.870	1.272
Awareness and knowledge					
Having heard of HPV		.002	2.147	1.328	3.469
Having heard of HPV vaccine		.000	3.256	2.313	4.585
Increasing degree of knowledge		.010	1.127	1.029	1.234

Nagelkerke R square = 0.50; Model  $\chi^2$  (31) = 1875.62,  $p < .001$ 

Abbreviations: CI, confidence interval; OR, odds ratio.

Bold values indicate  $p < .05$ .

citizens permanently residing in Italy, as well as migrants. Surely, nationality is an independent factor associated with a low vaccine coverage (Héquet & Rouzier, 2017; Lu, Rodriguez-Lainz, O'Halloran, Greby, & Williams, 2014).

In addition, the positive effect of healthcare workers on raising awareness is further underlined by the fact that awareness of HPV and HPV vaccine is higher in females using birth pills (Table 1); in Italy indeed, a prescription following a medical examination is

necessary in order to use birth control pills (Agenzia Italiana del Farmaco (AIFA), n.d.). This circumstance may offer the opportunity to women to get more acquainted with primary and secondary prevention. However, this consideration has to be done with caution because it lies only on a bivariate analysis (this variable was not entered in the logistic regression, not to halve the number of cases included in the analysis).

Participants in a committed relationship show a 33% higher chance of having heard of HPV compared with those not involved in a relationship. More in detail, we noticed that 73.0% of males in a committed relationship heard of HPV, while only 64.7% of single males did. A reasonable explanation may lie in the chance of having heard about HPV from the female partner. Awareness seems to benefit from the influence of peers and sharing experiences (Verelst, Kessels, Delva, Beutels, & Willem, 2019): our findings show that the first-hand knowledge of people diagnosed with genital warts is also associated with a 89% higher probability of being aware of HPV.

#### 4.2 | Beliefs on the aetiology of HPV, transmission of the infection, prevention and prophylactic efficacy of the vaccine

While awareness of HPV is overall satisfactory, some misconceptions remain. Only slightly more than half of our sample was able to point at HPV as involved in the aetiology of cervical cancer. This finding is in line with other Italian studies (Donati et al., 2012; Pelucchi et al., 2010), but it appears unsatisfactory when compared with UK, the United States and Australia where this proportion ranges between 77% and 93% (Gerend & Magloire, 2008; Marlow et al., 2013). Interestingly, 39% of our sample showed to be aware of the aetiology of genital warts, whereas in previous Italian studies the results ranged between 9% and 17% (Donati et al., 2012; Firenze et al., 2015; Sopracordevole et al., 2013), showing a promising trend over the years. However, the involvement of HPV in anogenital conditions (other than cervical cancer) and oral cancer is still largely unknown. Communicating the right information in this regard poses a pivotal challenge, especially nowadays that a universal HPV vaccination strategy has been adopted in Italy and the prophylactic protection of HPV vaccines has been extended by the 9-valent vaccine.

More than 80% of participants are aware of the transmission of the HPV infection via body fluids. Three quarter of the sample indicated that the use of condom would prevent from an HPV infection. Unfortunately, this is only partially true and most of participants are unaware of the possibility of getting HPV infection via skin to skin contact. Currently, no other means than vaccine are able to provide a robust protection against HPV and this feature makes HPV vaccines irreplaceable. This finding poses a challenge since people may overestimate the protection offered by the use of condom (Gunasekaran et al., 2015; Mann, Stine, & Vessey, 2002), that in our study was thought to be as much protective as vaccine (75% and 77% respectively).

#### 4.3 | Factors associated with the inclination to get HPV vaccination

The WHO considers vaccination as an essential preventive strategy against HPV infection. Understanding the role of main drivers involved in the decision whether to receive HPV vaccine is an unavoidable step in order to achieve satisfactory vaccination coverage levels. University-aged individuals are a peculiar population since they just begin to become independent in taking decisions regarding their own health. Potential barriers to vaccination in this population are likely to be different compared with those identified among parents, for example the fear of a potential increase in unsafe sexual behaviours (Bastani et al., 2011; Berenson & Rahman, 2012) or concerns about adverse reactions and sequelae following vaccine administration (Bonanni et al., 2018).

Previous awareness of HPV and vaccine is associated with a favourable intention to get vaccinated and it could be reasonably considered as the first step towards vaccination. In our sample, 50% of people not intentioned to receive the vaccination are unaware of the vaccine (Table 1). The results—which are in line with Barnard et al. (Barnard et al., 2017)—pose an unmissable challenge and offer room for manoeuvre.

Unvaccinated students who intended to undergo HPV vaccination show higher knowledge, while a previous Italian study conducted on mothers showed no association between HPV immunisation acceptance and knowledge (Tozzi et al., 2009). Good knowledge may be, thus, a key step to actively accept a health intervention, although there may be differences between intention and action and knowledge is not necessarily a direct predictor of healthy behaviours (Armitage & Conner, 2001).

Even though 84% of students in our sample are aware of the HPV transmission through body fluids, the condition of having multiple sex partners (Dimbuene, Emina, & Sankoh, 2014)—in our study measured as having three or more sexual partners within last 24 months—is not associated to vaccination intention. Instead, studies from the United States showed that a similar population feels to be at high risk of HPV infection (Lefkowitz, Kelly, Vasilenko, & Maggs, 2014) and the intention to receive HPV vaccination was related to being sexually active and having multiple sexual partners (Schaefer Ziemer & Hoffman, 2013). This finding digs a furrow with the United Kingdom, the United States and Australia where the relation between HPV infection and sexual activity or means of transmission seems to be fully understood (Marlow et al., 2013).

Students with a previous diagnosis of STD or genital warts are more likely to intend to get the vaccination (AOR: 1.67; 95% CI: 1.12–2.46). On the one hand, the direct experience of an STD may be responsible for a change in risk perception. On the other hand, individuals with similar conditions may have very likely sought assistance from healthcare workers, where they could have had the chance to get acquainted with prevention tools.

Many factors influence people's beliefs, opinion and, last but not least, the decision whether to undergo vaccination or not; a



good communication strategy might vary according to political or cultural structures and different sources of information may have different roles (Bonanni et al., 2018). A recent study from the United States showed how healthcare influence and social support associate with vaccination status (Barnard et al., 2017). Consistently with these findings, in our sample students that received information from healthcare workers and family members show a 65% and 70%, respectively, higher inclination to get vaccinated. The healthcare and the family settings show to be very effective in driving health-related choices. However, despite healthcare workers and family members showing a high reliability, peer influence entails an even greater impact: the knowledge of people having received the HPV vaccine is associated with a 2.7 times higher acceptance of the HPV vaccine. This implies that people are more prone to accept a vaccination policy if other individuals have already undergone vaccination. Peer effects play a pivotal role in vaccine decision-making and this feature is globally shared, regardless of the population investigated, the vaccines involved and geographic distribution: studies from Belgium (Verelst, Willem, Kessels, & Beutels, 2018), the United States (Gidengil et al., 2012; Khurana, Sipsma, & Caskey, 2015), South Africa (Verelst et al., 2019) and Australia (Hall et al., 2002) show similar results.

## 5 | LIMITATIONS

Our study shows several limitations. Since the study population consisted of only university students, results may not be inferred to the whole Italian population of the same age because of the effects of different educational levels. Italian females in the age group of 18–19-year-olds were offered free-of-charge HPV vaccination in accordance with the national vaccination programme. This feature may influence awareness and knowledge in this group because of an over exposition to information on HPV compared with older students and male students. Our findings suggest that a favourable position towards receiving the HPV vaccine increases with age (OR: 1.06; 95% CI: 1.01–1.12; per 1-year increase) in line with findings from previous literature (Rashid, Labani, & Das, 2016). Although the self-administration and the anonymity of the survey, it is not possible to exclude the presence of a social desirability bias. It should be considered that if the survey was the first exposure to the availability of a HPV vaccine, then assessing the intention to get vaccinated might not be completely reflective of a longer-term behaviour, since participants were asked to declare their inclination without being in possession—very presumably—of contextual information (such as costs, availability, safety or effectiveness of the vaccine) which is crucial in the decision-making process.

The very large sample size—about 10,000 participants—is a strength of this study.

## 6 | CONCLUSIONS

Years after the inclusion of HPV vaccine in the national immunisation plan, the vaccine coverage in Italy is still unsatisfactory. University students are a peculiar population: they have just assumed a central role in their own healthcare decision-making and potential barriers to HPV vaccination are likely to be different compared with those identified among parents of young children in other studies.

Our study suggests that awareness of HPV has been growing in Italy, however a comparison with previous Italian studies has to be done with caution because of differences in sampling strategies and characteristics of study populations. In any case, a gender gap remains and raising awareness among males poses a paramount challenge, especially in light of the recent adoption of the universal vaccination strategy in Italy.

Awareness of the vaccine remains the main determinant of vaccine uptake. Efforts to extend awareness in the population seem to be mandatory and are likely to be worth, considering that only 50% of individuals who declared not to be interested in receiving the vaccine were aware of it.

This study also identifies areas of weakness in students' knowledge and misconceptions that might be targeted as first. Communication strategies should: (a) raise awareness on the involvement of HPV in neoplasia other than cervical cancer; (b) clarify transmission via skin to skin contact; (c) stress the association between the condition of having multiple sex partners and an increased risk of infection; (d) scale down the perception of the protection provided by the condom.

Different sources of information have different impacts on the acceptability of HPV vaccine: while healthcare workers and family members are shown to be the most reliable sources of information, our findings demonstrate how communication strategies should not leave the role of peer influence out of consideration.

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### CONFLICT OF INTEREST

VB received grants for taking part in advisory boards and at expert meetings, and for acting as speaker and/or organiser of meetings/congresses. The other authors have no potential conflict of interest to disclose.

### AUTHORS' CONTRIBUTION

All authors contributed to the research article and approved the final version. SC: study conception and design, drafting of the manuscript. CB: intellectual content, drafting of the manuscript. TB: study conception, supervision. AB: data interpretation and supervision. MF statistical analyses, interpretation of data and drafting of the manuscript, SEB: interpretation of data and drafting of the manuscript. SM: study conception and design, data collection.

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