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Students' HPV vaccination rates are associated with demographics, sexuality, and source of advice but not level of study in medical school

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ABSTRACT

This study aimed to explore how medical students differ regarding the HPV vaccination status according to their demographics, sexuality, medical school year and sources of information regarding the vaccine. The cross-sectional survey included 379 participants from medical school year 1 to 6, in a medical school in Brasilia. Statistical analyses of the data obtained from a questionnaire analyzed contingency tables and highlighted odds ratios effect sizes. The results showed that among all the participants, 80 (21.1%) were vaccinated against HPV, 215 (58.7%) were not vaccinated but wanted to be and 84 (22.2%) were neither vaccinated nor wanted to be vaccinated. . Female gender (OR= 5.88, 95% CI 3.36-10.30), parental advice (OR= 6.95, 95% CI= 3.97-12.16), and absence of sexual initiation before 16 years of age (OR= 3.04, 95% CI= 1.05-8.77) were positively associated with HPV-vaccinated students. In parallel, female gender (OR= 4.74, 95% CI= 2.38-9.44), parental advice (OR= 3.50, 95% CI=1.20-10.22), and reporting two or more recent sexual partners (OR= 2.03, 95% CI= 1.06-3.88) were positively associated with the intention to be vaccinated among unvaccinated students. The high cost of the vaccine was perceived as a barrier among those respondents who wished to be vaccinated. Additionally, among the 84 (81.3% male) students who admitted unwillingness to be vaccinated, approximately two-thirds cited the feeling to be safe, lack of counseling, or low efficacy of the vaccine as the reasons for their reluctance. In conclusion, vaccination coverage was low among these medical students. Nevertheless, female gender, personal advice, and safe sex were the main factors associated with higher levels of vaccination and vaccine acceptance.

KEYWORDS: Medical students. Papillomavirus vaccination. Sexual behavior. Surveys and questionnaires. Cross-sectional study.

INTRODUCTION

Human papillomavirus (HPV) is the most prevalent viral infection of the reproductive tract. HPV is the causal agent of a variety of conditions in both men and women, some of which may progress to cancer. Persistent HPV infection may result in disease, although acute infections may resolve spontaneously without symptoms or treatment[1]. In women, persistent infection with HPV-16 and HPV-18 genotypes (among others) can lead to premalignant lesions that may progress to cervical cancer if left untreated[2]. Moreover, HPV infection is also a causal agent of the majority of oropharyngeal and anogenital cancers and other diseases in both genders[3].

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The United Kingdom introduced a nationwide HPV immunization program in 2008[4]. In Brazil, the use of the quadrivalent vaccine in the national vaccination program started in 2014 and initially targeted girls aged 9-13 years old with a three-dose schedule[5]. Since 2017, the HPV vaccine became available in the public health system for females aged 9-14 years old and males aged 11-14 years old in a two-dose schedule[5]. The efficacy and safety of the quadrivalent vaccine has been reaffirmed by the World Health Organization experts[6].

Evaluating the vaccination status and perceptions of medical students is crucial as their attitudes as future health providers could influence their patients' adherence to vaccination programs against HPV. Most relevant studies have focused on the knowledge and beliefs of the participants regarding the vaccine and its use, with no information on vaccination rates[7]. Nevertheless, a study in Scotland revealed a sharp increase in the vaccination rates of female medical students within a year after the beginning of the national immunization program[4]. Moreover, a survey from the United States found a 44% vaccination rate among medical school students, and the authors asserted the positive role of provider's recommendations[8]. Additionally, a Brazilian study evaluated the level of knowledge and use of the vaccine among medical (and literature) students. The authors highlighted the low vaccination coverage among the students and sex differences in the vaccination rate, familiarity with, and interest in being vaccinated[9].

As a further contribution to the topic, the current study aimed to explore how medical students differ regarding HPV vaccination status according to their demographics, sexuality, medical school year, and sources of information regarding the vaccine. We used a survey questionnaire to pursue the following research questions:

a) does the students' vaccination status relate to their demographics (age, sex, and family income) and level of medical studies?
b) are the students' responses about personal or media sources of information regarding the HPV vaccine related to their vaccination status?
c) do students who report early sexual intercourse or multiple sexual partners have a lower rate of HPV vaccination?

METHODS

This study was a cross-sectional survey on a population of undergraduate students from the first to the sixth year of the Faculty of Medicine, University of Brasilia, a federal public university. We based the sample size calculation on the total of 521 students who were enrolled in for courses and activities in 2017. The sample size needed for a satisfactory response rate was 350 students (95% confidence level, 3% confidence interval).

The Ethics Committee on Research in Human Beings of the Faculty of Medicine (1.989.835) approved the study.

In the second semester of 2017, during classes, the survey questionnaires that were created based on a literature review[7,10-12] were applied by four authors of the study, and 392 students returned the questionnaires. Thirteen cases were excluded from the study (six because the respondents omitted information about HPV vaccination and seven because they were younger than 18 years old). Thus, the analyses included 379 questionnaires.

Categorical data were reported as counts and frequencies. These data were checked using contingency analyses, which applied the qui-square test that highlighted the magnitude of odds ratios (ORs), 95% confidence intervals (CIs), or and the Fisher's exact tests. The analyses were carried out with the SPSS software, version 17 (IBM, New York, USA). The respondents were grouped for statistical purposes, as shown in Table 1.

Table 1 - Grouping of respondents for statistical purposes.

Attribute	Groups
Age range	< 24 years; 24 years or older.
Family income	< Five times the minimum wage; five times the minimum wage or more.
Sexual initiation	Before 16 years of age; later or none.
Sexual partners	None; one; two or more (per year).
Vaccination status	Vaccinated; not vaccinated but willing to be vaccinated; not vaccinated and no desire to be vaccinated.
Sources of advice about the vaccine	None; personal (parent, friend, doctor, or health professional); media (internet, printed material, television or government campaigns).

RESULTS

Students' profiles

The mean age of the 379 participants was 21.8± 3.1 years (SD), and 81 (21.6%) students were older than 23 years. Only 161 participants (42.5%) were female. Regarding the level of medical studies, 134 (35.4%) were in their 1st or 2nd year, 137 (36.1%) were in their 3rd or 4th year, and 108 (28.5%) were in their 5th or the 6th year of the medical school. Concerning the family income, 279 (75.8%) reported earnings of five or more Brazilian minimum wages. Among the 372 respondents, 97 (26.1%) were celibate, 93

(25%) had an average of two or more sexual partners per year, and 44 (11.7%) reported the first sexual intercourse under the age of 16. Additionally, 76% of the sexually active students reported the use of barrier contraceptive methods. Furthermore, the vast majority (93.7%) of the participants were aware of the public availability of the HPV vaccine, but less than half (48.9%) knew that it was available to both genders.

HPV vaccination contingencies

Among all the participants, 80 (21.1%) were vaccinated against HPV, 215 (58.7%) were not vaccinated but desired to be and 84 (22.2%) were neither vaccinated nor wanted to be vaccinated. The students' distribution among these three vaccination categories was significantly associated with sex (Cramer's V= .412, p< .001), reported source of information (media, personal, or a mix) about the vaccine (Cramer's V= .276, p< .001), and age bracket (Cramer's V= .139, p= .026) but not with the level of medical studies (Cramer's V= .100, p= .149). Notably, older students (≥ 24 years of age), in comparison with younger participants, had a lower percentage of vaccination (13.4 vs. 23.2%) and a higher percentage of individuals who avoided vaccination (31.7 vs. 19.5%). Table 2 shows that the majority of vaccinated students reported having a personal source of information only.

Comparing the rates of vaccination among the participants, the vaccine acceptance was positively and significantly associated with parental advice (52.0 vs. 13.5%; phi= .376, p< .001), female sex (37.3 vs. 9.2%; phi = .340, p< .001), and delayed or no sexual initiation (23.3 vs. 9.1%; phi= .112, p= .031). In contrast, vaccination was not significantly associated with younger age (phi= .099, p= .054), higher level of medical studies (phi= -.040, p= .435), single partner, celibate status (phi= -.030, p= .560), or higher family income (phi= .013, p= .790). Notably, except for parental advice, no other source of information (personal or media) showed a significant positive association with vaccination. Table 3 highlights the differential ORs of the associations (regarding vaccination) with parental advice, female sex, early sexual initiation and younger age.

Comparing proportions of students willing or not to be vaccinated, significant positive associations were found for female sex (89.1 vs. 63.1%; phi= .273, p< .0001) and parental advice (88.9 vs. 69.6%; phi= .140, p= .0167),

Table 2 - Medical students' vaccine status and sources of information about the HPV vaccine.

Information sources	Students' vaccine status			
	Not vaccinated not willing to (n, %)	Not vaccinated but willing to (n, %)	Vaccinated (n, %)	Total n (%)
None	6 (46.2)	6 (46.2)	6 (7.7)	13 (3.4)
Media only (A)	51 (30.2)	102 (60.4)	16 (9.5)	169 (44.6)
Mix (A & B)	10 (13.0)	54 (70.1)	13 (16.9)	77 (20.3)
Personal only (B)	17 (14.2)	53 (44.2)	50 (41.7)	120 (31.7)
Total	84 (22.2)	215 (56.7)	80 (21.1)	379 (100)

A) printed material, Internet, TV or government campaign; B) parent, friend, doctor or health professional. Measure of association: Cramer's V; value: 0.276, p < .001

Table 3 - HPV vaccination status among medical students grouped according to four categories of retrospective influence on vaccine use (N= 379).

Categories	Groups	Vaccination		Odds ratio		Fisher's exact test
		No	Yes	Value	95% CI	
Parental advice	Yes	36	39	6.95	3.97-12.16	<.0001
	No	263	41			
Sex	Female	101	60	5.88	3.36-10.30	<.0001
	Male	198	20			
Sexual initiation	< 16 years	40	4	.33	.11-.95	.0317
	Later or none	250	76			
Age range	<24 years old	228	69	1.95	.98-3.89	.0659
	≥24 years old	71	11			

Table 4 - Desire of HPV vaccination status among medical students grouped according to four categories ordered by decreasing odds of a relationship (N=299).

Categories	Groups	Wants vaccine		Odds ratio		Fisher's exact test
		No	Yes	Value	95% CI	
Sex	Female	11	90	4.74	2.38-9.44	<.0001
	Male	73	126			
Parental advice	Yes	4	32	3.50	1.20-10.22	.0167
	No	80	183			
Sexual partners	Two or more	14	61	2.03	1.06-3.88	.0371
	One or none	69	148			
Age range	<24 years old	58	170	1.69	.96-2.99	.0715
	≥24 years old	26	45			

while a negative association was found for single partner/celibate status (68.2 vs. 81.3%; phi= -.127, p= .0371). In contrast, no significant associations were found between willing to be vaccinated and younger age (74.6 vs. 63.4%; phi= .106, p= .071), higher level of medical studies (64.8 vs. 74.9%; phi= .102, p= .090), sexual initiation before 16 years old (70.0 vs. 71.8%; phi= -.0102, p= .851), or higher family income (73.1 vs. 71.8%; phi= .012, p= .878). Table 4 highlights the decreasing odds ratios (posture regarding vaccination) for female sex, parental advice, multiple partners and younger age.

Among the 299 unvaccinated students, those willing to be vaccinated (41.9% females) also differed from those who did not want to be vaccinated (86.9% males), both in the relative frequency and the willingness to report the reasons for their reluctance. Only 58.6% of the students gave a reason in the first group (those who wanted to be vaccinated), in comparison with 89.3% who gave a reason in the second group. Out of ten listed reasons, the following four were selected by at least 10% of respondents from one of the groups: excessive cost of the vaccine, not being advised about vaccination, feeling safe from the infection, and the low efficacy of the vaccine. Table 5 highlights the differences in the frequencies between the two groups for the seven most cited reasons not to be vaccinated against HPV.

Table 5 - Differences in reasons for avoiding HPV vaccination between students who want or not the vaccine (N= 299).

Reason cited for reluctance	Want	Not want
	n (%)	n (%)
The high cost of the vaccine	55 (25.6)	9 (10.7)
Not advised about vaccination	25 (11.6)	19 (22.5)
Doubt about vaccine effects	18 (8.4)	3 (3.6)
Feeling safe from infection	14 (6.5)	20 (23.8)
Low efficacy of vaccination	10 (4.6)	13 (15.5)
Other reasons	4 (1.9)	11 (13.1)
No reason cited	89 (41.4)	9 (10.7)

Measure of association: Cramer's V= .487, p < .0001.

DISCUSSION

This study carried out with undergraduate medical students shows significant differences in the HPV vaccination status according to sex, sexual behavior and source of information about the vaccine. The vaccination rates among female medical students in Brasilia and Rio de Janeiro were comparable, but they were much lower than those found in Glasgow or Rochester[4,8,9]. One reason for the lower vaccination rate is the recent start (2014)[5] of the national program of immunization against HPV in Brazil, in comparison with the initiation of the UK (2008)[4] or the US (2006)[8] HPV vaccination. Less emphasis on women's reproductive health could be another reason.

The male vaccination rate was one-fourth of the female rate. In addition to the so-called vaccine feminization[13], ascribed to the initial implementation strategy of the HPV vaccination, the male students may feel more protected from HPV infections, as suggested by one of the motives of unwillingness to be vaccinated and the prevalent use of sexual preservatives among the sexually active participants. Research carried out with university students in Turkey, Iran and India showed that 21.7%, 56% and 80% of students, respectively, shared the idea that condoms provide a total protection against HPV[10,14,15] infections, inducing the belief that the use of sexual preservatives would eliminate the need for vaccination.

There was also no significant difference in the vaccination status among income groups, even though more than one-fourth of the unvaccinated students marked the high cost of the vaccine as a reason not to get vaccinated.

The economic barrier is a reality in a country that provides the vaccine free of charge only for the primary school age group[5]. Most respondents were out of the target age group when the national immunization program started in 2014 and therefore would have to bear the cost of vaccination that is about one-third of the minimum wage for each dose. In addition to that barrier, other reasons (and underlying factors) may contribute not to get vaccinated, as suggested by the data shown in Table 5. It is noteworthy that one of these reasons was 'not being counseled about the vaccination', which was reported by one-fifth of the participants who did not want the vaccine.

An interesting finding was the dual role of the student's sexual behavior. Starting sexual intercourse before 16 years of age was negatively associated with vaccination. In contrast, among the unvaccinated respondents, the desire to be vaccinated was positively associated with two or more recent sexual partners. In either case, we suggest that a precautionary approach may support both associations. On the other hand, a study of American youth aged 15-24 years old showed that those who were sexually active had twice the intention of receiving the HPV vaccine when compared to the intentions of women who were not yet sexually active[16]. Additionally, a Spanish study showed that the prevalence of sexual risky behaviors was high in non-vaccinated university women and was primarily related to the non condom use. This finding contradicts the idea that vaccinated women could increase their sexual risks because of the protection ascribed to vaccination[17].

Another interesting result was the strong relationship between either vaccination or the will to be vaccinated and parental advice about the vaccine. While knowledge acquisition was more common through the internet, the press, and government programs, vaccination advice was more effective when provided by parents. Although not surprising, this finding contrasts with the usual emphasis on the role of the health provider[7]. For example, a study reported that the vaccination rate is higher when the provider makes consistent recommendations and emphasizes cancer prevention[18]. However, a study in India showed that most doctors not only felt uncomfortable discussing the reproductive lives of girls with the parents of these adolescents but also believed that their patients would ignore a recommendation for vaccination[19]. We suggest that the planning of HPV vaccination campaigns place more importance on providing advice to the parents of boys and girls while reinforcing the role of well-prepared physicians and other health care providers.

As expected, older students (≥24 years of age), in comparison with younger participants, had a lower percentage of vaccination and a higher percentage of vaccine avoidance. Older students may feel less conviction about the practicality of vaccination for themselves, perhaps due to a longer sexual life. Whatever the reasons, vaccination avoidance is detrimental because of the current evidence of the quadrivalent HPV vaccine efficacy and safety for both, young women[20] and men[21]. One could consider the young adulthood as the final moment for the prevention of HPV-related-cancer.

Furthermore, among the participants in this study, the vaccination status was not significantly related to the level of medical training, which was similar to the findings of other authors[9,22] that a higher level of knowledge did not reflect in higher vaccination rates. On the other hand, Afonso *et al*.[8] observed that students who received all doses of the vaccine had higher university grades than unvaccinated students.

Finally, the high likelihood of lifetime HPV makes vaccination of young adults, including college students, imperative[23]. This issue points to the need for improved vaccine communication training for students in health-related professions, as discussed in the recent systematic literature review[23].The multifaceted approach described by Schnaith *et al*.[24] seems feasible and interesting. This approach includes a mix of information, demonstration, and role plays in students' curriculum to prepare them for communicating the HPV vaccine.

The study has some limitations. The cross-sectional design makes causal explanations difficult and a single medical school approach limits the generalization of results. Furthermore, the accuracy of self-reported data is uncertain. However, the satisfactory response rate supports the internal validity of the results, that are compatible with the current understanding of the problems.

In conclusion, this study confirms the low vaccination coverage among Brazilian medical students from a single federal university and affirms the male disparity in vaccine use. The findings emphasize the consistent association of female sex and parental advice with HPV vaccination. The results also indicate the role that sexual behavior factors play in vaccination status and suggest a preventive perspective as a significant predictor of vaccine use, even if it was observed in only a minority of the student body.

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