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Original Article

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Factors associated with non-adherence to HPV vaccine among health science students

Fatores associados à não adesão à vacina contra HPV entre estudantes de ciências da saúde

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Abstract

Introduction: Adolescents and young adults are considered vulnerable groups to human papillomavirus (HPV) infection, due to risky sexual behaviors such as greater number of partnerships and inconsistent condom use. In Brazil the HPV vaccine has been available since 2014, however adherence is still below expectations. Objectives: To identify factors associated with non-adherence to the vaccine, vaccination status and knowledge about HPV among health science students in Goiânia. Materials and Methods: Cross-sectional study, carried out with 131 participants. A questionnaire was applied containing questions about sociodemographic characteristics, knowledge of HPV and vaccination status. Poisson regression was performed to identify predictors of non-adherence to vaccination. Results: Most students were female (81.7%), with a mean age of 17 years. The HPV knowledge score was 67.4%. Of the total, 59 (45.0%) declared themselves vaccinated. The factors associated with non-adherence to the HPV vaccine were age over 18 years, male and parents who had at most eight years of formal study. Conclusion: The findings of this study reinforce the need for intersectoral actions to promote vaccination, involving educational institutions and health units, in order to provide a dialogue between students, parents, health professionals and teachers. It is believed that access to qualified information can contribute to changing behavior and improving decision making, leading students to reflect on their attitudes and risks inherent to HPV infection.

Keywords: papillomaviridae; immunization coverage; students health occupations; Brazil.

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Resumo

Introdução: Adolescentes e adultos jovens são considerados grupos vulneráveis a infecção pelo papilomavírus humano (HPV), devido a comportamentos sexuais de risco como maior número de parcerias e uso inconsistente do preservativo. No Brasil a vacina contra o HPV está disponível desde 2014, contudo a adesão ainda está abaixo do esperado. Objetivos: Identificar os fatores associados à não adesão à vacina, estado vacinal e conhecimento sobre o HPV entre estudantes de ciências da saúde em Goiânia. Materiais e Métodos: Estudo transversal, realizado com 131 participantes. Foi aplicado um questionário contendo questões sobre características sociodemográficas, conhecimento do HPV e estado vacinal. Regressão de Poisson foi realizada para identificar os preditores da não adesão a vacinação. Resultados: A maioria dos estudantes era do sexo feminino (81,7%), com média de idade de 17 anos. O escore de conhecimento sobre o HPV foi de 67,4%. Do total, 59 (45,0%) declararam-se vacinados. Os fatores associados à não adesão à vacina contra o HPV foram idade superior a 18 anos, sexo masculino e pais que tinham no máximo oito anos de estudo formal. Conclusão: Os achados deste estudo reforçam a necessidade de ações intersetoriais para promoção da vacinação, envolvendo as instituições de ensino e unidades de saúde, a fim de proporcionar um diálogo entre estudantes, pais, profissionais de saúde e docentes. Acredita-se que o acesso à informação qualificada possa contribuir para a mudança de comportamento e melhoria da tomada de decisão, levando os estudantes a refletirem sobre suas atitudes e riscos inerentes à infecção pelo HPV.

Palavras-chave: papillomaviridae; cobertura vacinal; estudantes de ciências da saúde; Brasil.

Introduction

Worldwide, human papillomavirus (HPV) infection is one of the most common sexually transmitted infections in both sexes. There are about 200 different HPV genotypes and approximately 40 of them can infect the anogenital and oropharynx tracts, presenting in a wide spectrum of clinical manifestations, ranging from warts to malignancies[1].

In Brazil, the vaccine against this virus was included in the National Immunization Program (NIP) in 2014, and is currently available for girls between nine and 14 years old and boys between 11 and 14 years old, in two doses with an interval of six months. The vaccine offered by Brazil's Unified Health System *(SUS)* is quadrivalent, which prevents against four types of HPV, 16 and 18, present in 70% of cervical cancer cases, and 6 and 11, related to 90% of anogenital warts cases[2].

Vaccination in this age group provides a high immunogenicity that contrasts the immune responses observed after natural infection[2]. In addition, there is scientific evidence that vaccination before sexual intercourse is the most effective and cost-effective way to prevent thousands of cases and types of HPV-related cancers[3].

Adolescents and young adults are vulnerable to this infection, due to sexual risk behaviors such as a greater number of partners and inconsistent condom use. In Brazil, national epidemiological research on HPV infection found a prevalence rate of 53.6% among young adults, of which 35.2% are cases at high risk for the development of cancer, thus highlighting the importance of vaccination in this population group as a preventive measure[4].

Studies have shown low vaccine coverage against HPV[5-7], which can be attributed to the limited knowledge about this infection, and uncertainties about the safety or efficacy of the vaccine[8,9]. In the case of students in the health field, the investigations have revealed a knowledge gap about this disease[10-13], which can have a direct impact on adherence to the vaccine and the quality of care provided by these future professionals.

Therefore, this study aims to identify the factors associated with non-adherence to the vaccine, vaccination status and knowledge about HPV among health science students in Goiânia, Goiás.

Material and Methods

Sample and type of study

This is an observational, cross-sectional and analytical study, whose sample consisted of students of health sciences from the Federal Institute of Education, Science and Technology of Goiás *(IFG)* in the city of Goiânia involving 131 students of both sexes. This study was approved by the Human Research Ethics Committee of the Federal Institute of Education, Science and Technology of Goiás, under opinion No. 2,556,614, and authorized by the Board of the Educational Institution where the study was conducted.

Study design

Data collection took place from March to July 2018, in the morning, afternoon and evening. All eligible students were approached by a researcher and those who agreed to participate in the study received guidance on the objectives, risks, and benefits of participating in the research. The Informed Consent Form (ICF) was read by the interviewers and signed by the participants.

Data were collected through a self-administered questionnaire containing questions about sociodemographic characteristics, knowledge of HPV, vaccination status and possible factors associated with non-adherence to the HPV vaccine.

Inclusion and exclusion criterias

Included in the research were students regularly enrolled in health courses, in the technical modality, attending the integrated course at their institution full-time, in Clinical Analysis, Nutrition and Dietetics, Health Surveillance, and integrated technical courses in Nursing, in the Youth and Adult Education modality, who signed the Informed Consent and excluded those under 18 who did not obtain authorization from their parents or legal guardians.

Collected procedures

The study outcome variable was the direct answer to the question about whether or not the respondent had received the HPV vaccine. Adherence to the vaccine was defined using each student's self-report. Sociodemographic characteristics such as sex, age, race, religion, parental education, marital status, and family income were considered as independent variables. To characterize knowledge about HPV infection, the following questions about their knowledge were addressed: means of communication through which the information was received, forms of transmission, causes, signs, symptoms, and preventive attitudes.

The overall HPV knowledge score was calculated as the sum of correct answers divided by the total number of questions. A good level of knowledge was considered when the overall score was equivalent to 70% of correct answers. The answer options were “yes”, “no” and “I don't know”. A score of zero (0) was assigned for an incorrect answer or marked as "I don't know" and one (1) point for a correct answer.

Statical analysis

The data were analyzed using the statistical program STATA, version 14 (StataCorp LP, College Station, TX, USA). Mean and standard deviation (SD) were calculated for continuous variables. The prevalence of self-reported HPV vaccination was estimated with a 95% confidence interval (95% CI). Chi-square tests ($\chi 2$) and Fisher's exact test were used to verify the association between possible independent variables and non-adherence to the HPV vaccine. For the calculation of the adjusted prevalence ratio (PRaj), the variables that presented p value ≤ 0.10 were subjected to Poisson regression analysis with robust variance, having previously been tested for the occurrence of interaction. Values of $p < 0.05$ were considered significant.

Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of the vaccination self-report were calculated in relation to the vaccination status reported in the Information System of the National Immunization Program *(SIPNI)*.

Results

A total of 131 individuals participated in the survey. The mean age of the students was 17 ± SD (9.4), varying between 14 and 55 years. There was a predominance of women (81.7%), single (77.1%), with an income below 3x the minimum wage (55.7%) and who declared themselves to be mixed race (57.2%). With regard to parents' education, the majority (64.9%) had nine to 12 years of schooling and 78.6% reported having some religion. More than a third were studying Nutrition and Dietetics (Table 1).

Table 1: Sociodemographic profile of students of health sciences in Goiânia, Goiás, 2018.

Variable	Number	%
Sex		
Male	24	18.32
Female	107	81.68
Age (years)		
<18	73	55.72
18-30	33	25.19
31-40	14	10.69
> 40	11	8.40
Race / skin color self-reported		
White	37	28.24
Black	12	9.16
Mixed Race	75	57.25
Asian	4	3.05
Indigenous	1	0.77
No statement by the respondent	2	1.53
Education of parents / legal guardians (years)		
≤ 8	33	25.20
9-11	54	41.22
≥ 12	31	23.66
No statement by the respondent	13	9.92
Marital Status		
Married	26	19.85
Not married	101	77.10
Separated / divorced	3	2.29
No statement by the respondent	1	0.76
Religion		
None	27	20.62
Catholic	48	36.64
Evangelical	48	36.64
Spiritist	4	3.05
Other	3	2.29
No statement by the respondent	1	0.76
Family monthly income[1]		
<R $ 954.00	13	9.92
R $ 1,908.00-2,862.00	60	45.80
> R $ 2,862.00	41	31.30
No statement by the respondent	17	12.98

Variable	Number	%
Course		
Clinical analysis	28	21.37
Nursing	42	32.06
Nutrition and Dietetics	44	33.59
Health Surveillance	17	12.98

Legend: 1 Minimum wage in Brazil, year 2018: R$954.00 / about USD$270 per month.

Table 2 shows the percentages of participants who answered each question correctly and incorrectly. The HPV knowledge score was 67.4% (95% CI: 65.6-69.1). The average number of correct answers was 14.4 questions (SD ± 5.2), out of a total of 28. Most students (74.6%) knew the sexual route of HPV transmission; 40.3% believed that HPV infection can be asymptomatic. However, 70.8% of students knew that HPV is the main cause of cervical cancer and that HPV can affect both men and women (73.6%), and only 38.5% were aware that HPV has a cure. Overall, 48.5% of students said that HPV infection can cause cancer of the penis, mouth, anus and vulva.

Most participants (90.8%) reported that the HPV vaccine is offered by *SUS*, with two doses being recommended (42.6%). However, only 6.2% knew that the vaccine offered by *SUS* is quadrivalent. In addition, 20.6% of students were aware of the recommended age range (11 to 14 years) to receive the HPV vaccine in boys.

Table 2: Frequency of responses for each of the items in the knowledge questionnaire about HPV infection

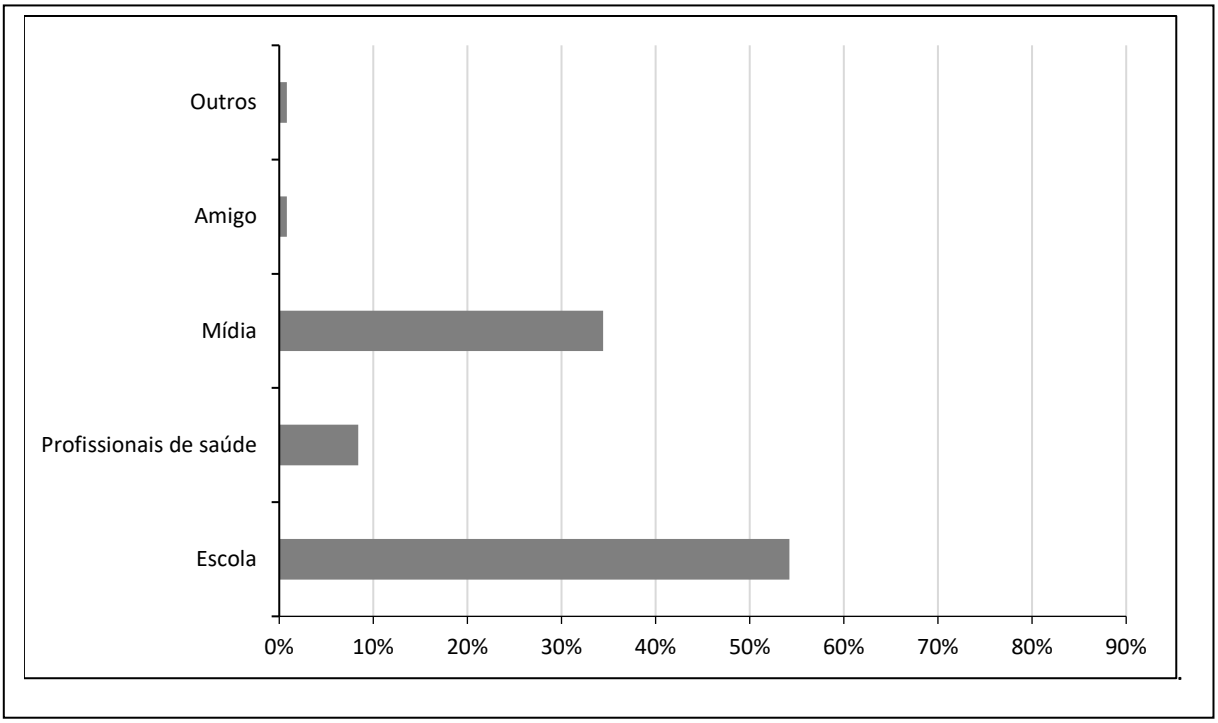
No.	Items	Total	True (n/%)	False (n/%)	Don't know (n/%)
	HPV infection				
1.	HPV infection is common in the population (T)	128	76 (59.38)	13 (10.16)	39 (30.46)
2.	There are many types of HPV (T)	129	42 (32.58)	14 (10.84)	73 (56.58)
3.	HPV is a sexually transmitted infection (T)	130	97 (74.62)	13 (10.00)	20 (15.38)
4.	HPV can be transmitted by oral, vaginal or anal sex (T)	130	64 (49.23)	27 (20.77)	39 (30.00)
5.	HPV can be transmitted by direct contact with the genitals (T)	130	88 (67.69)	10 (7.69)	32 (24.62)
6.	Having multiple sexual partners is a risk factor for HPV (T)	130	99 (76.15)	7 (5.38)	24 (18.47)
7.	The beginning of sexual life at an early age increases the risk of contracting HPV (T)	130	82 (63.08)	15 (11.54)	33 (25.38)
8.	HPV can be transmitted from mother to child (T)	130	49 (37.69)	23 (17.69)	58 (44.62)
9.	A person can have HPV for many years without knowing (T)	128	104 (81.25)	21 (16.41)	3 (2.34)
10.	HPV can be transmitted via the respiratory tract (F)	130	4 (3.08)	96 (73.85)	30 (23.07)
11.	Intimate contact with clothes, towels and the toilet can transmit HPV (T)	128	40 (31.25)	38 (29.69)	50 (39.06)
12.	Smoking and alcohol consumption are risk factors for HPV acquisition (T)	129	20 (15.50)	57 (44.19)	52 (40.31)
13.	The lack of intimate hygiene is a risk factor for contracting HPV (T)	130	62 (47.69)	25 (19.23)	43 (33.08)
14.	Condom use completely protects against HPV infection (F)	129	54 (41.86)	48 (37.21)	27 (20.93)
15.	Men and women can become infected with HPV (T)	129	95 (73.64)	28 (21.71)	6 (4.65)
16.	HPV infection can cause warts on genitals (T)	129	58 (44.96)	12 (9.30)	59 (45.74)
17.	HPV infection will always show signs and symptoms (F)	129	30 (23.26)	52 (40.31)	47 (36.43)
18.	HPV infection is curable (T)	130	50 (38.46)	24 (18.46)	56 (43.08)
19.	All types of HPV can cause cancer (F)	129	23 (17.83)	46 (35.66)	60 (46.51)
20.	HPV is primarily responsible for cervical cancer (T)	130	92 (70.77)	13 (10.00)	25 (19.23)
21.	HPV can cause cancer of the penis, mouth, anus and vulva (T)	130	63 (48.46)	10 (7.70)	57 (43.84)
	HPV Vaccine				
22.	The vaccine is offered by the Unified Health System (SUS) (T)	131	119 (90.84)	1 (0.76)	11 (8.40)
23.	The vaccine available in Brazil prevents against four types of HPV (T)	130	8 (6.15)	23 (17.69)	99 (76.16)
24.	Individuals who have already started sexual life can be vaccinated against HPV (T)	131	63 (48.09)	42 (32.06)	26 (19.85)

No.	Items	Total	True (n/%)	False (n/%)	Don't know (n/%)
25.	The HPV vaccine is more effective in people who have not started sex (T)	130	86 (66.15)	14 (10.77)	30 (23.08)
26.	The HPV vaccine is offered by SUS for girls between 9 and 14 years old (T)	131	105 (80.15)	10 (7.63)	16 (12.22)
27.	The HPV vaccine is offered by SUS for boys between 11 and 14 years old (T)	130	27 (20.77)	55 (42.31)	48 (36.92)
28.	Two doses of the HPV vaccine (T) are recommended	129	55 (42.64)	54 (41.86)	20 (15.50)

Legend: T= true; F= false.

The main sources of information about HPV reported by the participants were: "School" (54.2%, n=71), "Media (internet, TV, radio, newspaper)" (34.4%, n=45), "Health professionals" (8.4%, n=11), "Friends" (0.8%, n=1) and "Others" (0.8%, n=1) (Figure 1).

Figure 1: Sources of information on HPV



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In the bivariate analysis, the following variables showed a p value ≤ 0.10: sex, age, parental education, marital status, employment and course (Table 3).

Table 3: Bivariate analysis of factors associated with non-adherence to the HPV vaccine among health science students in Goiânia, Goiás, 2018

Variables	Total[1]	Vaccine HPV				p-Value
		Yes	%	No	%	
Sex						
Male	24	2	8.33	22	91.67	
Female	107	57	53.27	50	46.73	**<0.001**
Age (years)						
≤ 18	87	58	66.67	29	33.33	

Variables	Total[1]	Vaccine HPV				p-Value
		Yes	%	No	%	
> 18	44	1	2.27	43	97.73	**<0.001**
Race / skin color self-reported						
White	37	15	40.54	22	59.46	
Not White	93	44	47.31	49	52.69	0.484
Education of parents / legal guardians (years)						
≤ 8	33	5	15.15	28	84.85	
> 8	85	50	58.82	35	41.18	**<0.001**
Marital Status						
Single / Divorced / Separated	104	58	55.77	46	44.23	
Married	26	1	3.85	25	96.15	**<0.001**
Religion						
Yes	103	46	44.66	57	55.34	
No	27	13	48.15	14	51.85	0.746
Employed						
Yes	25	2	8.00	23	92.00	
No	105	57	54.29	48	45.71	**<0.001**
Family monthly income[2]						
≤ R $ 954	13	4	30.77	9	69.23	
> R $ 954	101	46	45.54	55	54.46	0.312
Course						
Clinical analysis	28	17	60.71	11	39.29	
Nursing	42	1	2.38	41	97.62	**<0.001**
Nutrition and Dietetics	44	30	68.18	14	31.82	
Health surveillance	17	11	64.70	6	35.30	
Medical consultation in the last year						
Yes	99	46	46.46	53	53.54	
No	28	12	42.86	16	57.14	0.735
Habit of reading / watching newspaper or health news						
Yes	91	39	42.86	52	57.14	
No	40	20	50.00	20	50.00	0.449
Have you heard about the HPV vaccine						
Yes	124	58	46.77	66	53.23	
No	6	1	16.67	5	83.33	0.220

Legend: [1]Number of valid responses. [2] Minimum wage in Brazil, year 2018: R$ 954.00 / about USD$270 per month.

These variables were included in a Poisson regression model with robust variance and after controlling for confounding variables, gender, age and parents' education were shown to be factors independently associated with non-adherence to the HPV vaccine (Table 4). The prevalence ratio for non-adherence to the HPV vaccine was 4.60 (95% CI: 2.82 - 7.49) times higher in individuals over 18 years of age. The model also pointed out a higher proportion of those not vaccinated against HPV in male participants (PRaj: 3.04; 95% CI: 2.05 - 4.49) and whose parents had at most eight years of formal study (PRaj: 1, 38; 95% CI: 1.01 - 1.88).

Table 4: Multivariate analysis of factors associated with non-adherence to the HPV vaccine among students of health sciences in Goiânia, Goiás, 2018

Variables	Adjusted PR [1] (95% CI)[2]	p-Value
Sex		
Female	1.00	
Male	3.04 (2.05 – 4.49)	**<0.001**
Age (years)		
≤ 18	1.00	
> 18	4.60 (2.82 – 7.49)	**<0.001**
Education of parents / legal guardians (years)		
> 8	1.00	
≤ 8	1.38 (1.01 – 1.88)	**0.045**

Legend: [1]PR: Prevalence Ratio. 95% CI: 95% confidence interval.

The sensitivity and specificity of the vaccination self-report when compared to the immunization records at *SIPNI* were 97.0% and 75.5%, respectively. PPV was 61.0% and NPV was 98.6%. Of all participants, 59 (45.0%; 95% CI: 36.7-53.6) self-reported HPV vaccination (data not shown in the table).

Discussion

The sample of this study was composed, predominantly, of young, female, single, mixed race, and low-income individuals, these characteristics being similar to that of students from other regions of Brazil[14].

This research, as well as others, has shown that insufficient knowledge about HPV infection is a common finding among future health professionals[10-13]. The lower the level of knowledge, the greater the chance of not being vaccinated[9,10]. Similar to what was shown in this study, Biselli-Monteiro et al.[13] found that although most students knew about the relationship between HPV infection and cervical cancer, most were unable to identify the association between this pathogen and other cancers, such as vulvar, anal, oral and penile. Likewise, few students knew that there is a cure for this infection, and in this context, it is important to investigate the degree of knowledge of students in the health field, in order to support inclusion of activities that promote the prevention, diagnosis and treatment of this condition into the curriculum[15].

Other investigations have also identified the school and media as the main sources of information.[16,17]. This can be attributed not only to formal exposure to information related to HPV as part of the curriculum of their courses, but also to the acquisition of information through TV and internet.

It is worth mentioning that in Brazil, the initial vaccination strategy was the result of a partnership between health services and public and private schools[2]. At the same time, an advertising campaign was carried out to guide the population on the importance of the prevention of cervical cancer on TV, radio, newspapers and social networks[18], which may have contributed to these sources of information being the most cited.

Worldwide, a wide variation in vaccination rates has been observed among students. In that study, the HPV vaccination rate was 45.0% (95% CI: 36.7-53.6) six times higher than that estimated in young Brazilian adults (7.5%; 95% CI: 6, 7-8.3)[5] and twice as high as that found in medical students in Brasilia (21.1%; 95% CI: 17.2-25.4)[7] and São Paulo (18.5%; 95% CI: 15.0-22.0)[10].

Insufficient knowledge about HPV infection may have contributed to low adherence to the vaccine, confirming the finding by Farias et al[9]. In addition, the majority (52.7%) of the participants were outside the target age range for vaccination. In Brazil, a study carried out among girls aged 15 years and over identified approximately four times less vaccination

coverage when compared to those who were within the recommended age range for vaccination[19]. Still, 41.9% of students believed that the use of condoms would completely eliminate the risk of infection by HPV, which may have made vaccination unnecessary as a form of prevention.

Considering studies carried out in other countries, the vaccination rate was similar to that reported among adolescents in Florida (57.0%; 95% CI: 49.4-64.6)[20], California high school students (37.8%; 95% CI: 30.5-45.6)[21], and university students in Nebraska (51.0%; 95% CI: 41.2-59.1)[22].

However, it was higher than estimated among students in Italy (26.7%; 95% CI: 25.9-27.6)[8], Latvia (3.3%; 95% CI: 1.0-7.8)[17], China (8.8%; 95% CI: 5.9-12.5)[23], India (6.8%; 95% CI: 5.3-8.5)[24], Turkey (1.5%; 95% CI: 1.0-2.2)[25] and Hong Kong (23.3%; 95% CI: 19.5-27.6)[26]. The difference between prevalence rates can perhaps be explained by looking at the characteristics of the country in question. In China the vaccine is only available to women[23], in Latvia only girls aged 12 are eligible for vaccination[17], whereas in India[24] and Turkey[25] the vaccine is not included in the national vaccination program, resulting in lower vaccination rates.

Although, the male gender has been identified as a risk factor for non-adherence to the HPV vaccine, it is worth mentioning that the frequency of female participants was higher (81.7%) than that of men (18.3%). In this investigation, vaccination coverage was significantly lower among men (8.3%) compared to women (53.3%) ($p < 0.001$), corroborating data found among university students in Nebraska[22] and Hong Kong[26]. In addition, a study carried out among university students in Switzerland showed that women were five times more likely to be vaccinated than men (Adjusted odds ratio: 5.8; 95% CI: 4.1-8.2)[11].

In Brazil, only starting in 2017, boys from 11 to 14 years of age were included in the national vaccination program[2]. According to Daley et al.[27], the feminization of the vaccine issue and a focus on the prevention of cervical cancer led men to be included later in vaccination programs, which may have contributed to lower adherence rates in this segment.

In addition, the predominance of traditional gender relations is a persistent challenge to male education on issues related to sexual and reproductive health. Men maintain a more distant posture and are resistant to preventive behavior. Thus, health actions tend to direct their initiatives predominantly towards women[16].

A retrospective cohort study conducted in Brazil, found that 80.3% of the identified types of HPV (16, 18, 6 and 11) in individuals with penile carcinoma were immunopreventable, which emphasizes the importance of vaccination in male individuals[28].

It was found that individuals over the age of 18 were independently associated with non-adherence to the HPV vaccine. This result is consistent with that found by other studies[19,29], who identified a lower chance of being vaccinated with increasing age. In addition, older individuals may feel less convinced about the practicality and effectiveness of vaccination for themselves, due to a longer sexual history.[7]

The association between schooling of parents / legal guardians (proxy of socioeconomic level) and non-adherence to the HPV vaccine was also observed by Faisal-Cury et al.[19]. A study carried out in Germany identified that girls whose mothers had higher education were more likely to have been vaccinated when compared to those whose mothers had a basic education (Odds ratio: 1.5; 95% CI 1.0–2.3)[30]. In fact, individuals with a low educational level have less knowledge about HPV infection, which can compromise adherence to the vaccine[5,16].

This is the first study in the Midwest region of Brazil to identify factors associated with non-adherence to the vaccine, vaccination status, and knowledge about HPV among high school health sciences students, however it has some

limitations that need to be addressed. The first one concerns the design of the study, being of the cross-sectional type, no causal relationship can therefore be confirmed. Second, it was carried out in a single educational institution with a relatively small sample size, which limits the generalization of these results to the general population.

Conclusion

The factors associated with non-adherence to the HPV vaccine were being over 18 years of age, being male, and having parents who had at most eight years of formal study. In addition, insufficient knowledge about HPV infection may have contributed to low adherence to the vaccine. Therefore, this study shows the need for intersectoral actions to promote vaccination, involving educational institutions and health services, in order to provide a dialogue between students, parents, teachers and health professionals. It is believed that access to qualified information can contribute to behavioral changes and improved decision making, leading students to reflect on their attitudes and the risks inherent to HPV infection.

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