

# Awareness of HPV-related cancers among university students: a cross-sectional study

## ABSTRACT

**Background:** HPV is associated with some malignant neoplasms, especially cancers of the cervix, oropharynx, penis, anus and vulva.

**Aims:** The aim of this study was to analyze the awareness of Human Papillomavirus-associated cancers among university students.

**Methodology:** We conducted a cross-sectional research among medical students and student nurses from four institutions from June to December 2020. A questionnaire was utilized to obtain information about sexual behavior and awareness of HPV among those students.

**Results:** A total of 201 undergraduates participated in the study. Of those 147 were medical students and 54 were student nurses. The majority were female 133 (66.17%), and the most frequent age group was 20-24 years old, amounting to 121 (60.20%) students. All participants knew that HPV causes cervical cancer. A little over half of the participants 107 (53.23%) knew the relation between HPV and penile cancer. Less than half 95 (47.26%) knew that HPV causes oropharyngeal cancer. However, only 10 (4.98%) knew that HPV causes anal cancer.

**Conclusion:** In this study, medical and student nurses showed good awareness of the link between HPV and cervical cancer but limited knowledge of the causal link between HPV and oropharyngeal, penile and anal cancers.

*Keywords: HPV, Human papillomavirus, knowledge, awareness, Health students, University students, cervical cancer, Oropharyngeal cancer*

## 1. INTRODUCTION

The Human Papilloma Virus infection (HPV) is the most common sexually transmitted infection in the world [1] with an estimated 291,000,000 HPV-positive women worldwide [2].

In addition to cervical cancer, this virus is associated with other malignant neoplasms, especially **cancers of the oropharynx, penis, anus and vulva** [3-7]

The population's awareness of protective measures and vaccination is important to reduce the spread of HPV and prevent certain types of cancer. In this context, university students may be at risk of HPV-associated cancers due to their age and sexual behaviour [8]. Therefore, it is important to investigate the level of awareness that university students have of HPV-associated cancers, as well their perception and attitudes towards them.

Although this virus is linked to several types of cancer, few people link it to non-gynecological cancers. That fact is important because most awareness campaigns focus mainly on the prevention of cervical cancer and ignore the fact that HPV can cause other types of cancers [9]. Much of the literature demonstrates that there is a link between HPV

and cancer of the cervix [10]. Fewer studies were published concerning the awareness of other HPV-related cancers by university students. Osazuwa-Peters and Tutlam (2016) studied 100 university students from non-health related courses. Eighty-one percent (81%) had low awareness of oral cavity and oropharyngeal cancer; and only 2% perceived that the risk of cancer of the oral cavity and oropharynx was high. In another research, Der (2018) studied 300 female university students and found awareness of the link between cervical cancer with HPV infection to be 75.0%. Alzabibi (2022) revealed a gap in knowledge among students about the anatomical sites for cancers of the mouth, as only 27.5% of the participants knew that the tongue and the floor of the mouth are the most common sites for oral cancer.

Although there is a vast amount of literature on HPV, this study is unique in its ability to gain a better understanding of the awareness of HPV-related cancers among university students. This, in turn, can contribute to the prevention of various cancers caused by the HPV virus.

The present study aimed to establish the awareness of HPV-related cancers among university students.

## **2. METHODOLOGY**

### **2.1 Study design**

We conducted a cross-sectional study with medical students and student nurses from four institutions in Brazil from June to December 2020. A questionnaire was utilized to obtain information about sexual behavior and awareness of HPV among students from three private institutions as well as one public institution. Students under 18 years old were excluded from the study. All medical and nursing students from the Federal University of Rondonia, Faculdades Integradas Aparicio Carvalho, Centro Universitario São Lucas and Faculdade Metropolitana were invited to participate the study (1120 students). A total of 201 students agreed to take part. The questionnaire was developed by the authors via extensive review of the relevant literature.

### **2.2 Statistical Analysis**

The analyses were carried out using the software SPSS version 21 (SPSS, Inc., Chicago, Illinois) and Microsoft Excel 2010.

## **3. RESULTS**

In the period from June to December 2020, we included a total of 201 students, of these 147 were medical students and 54 were student nurses. The sociodemographics and sexual behavior characteristics are summarized in Table 1. The majority were female 133 (66.17%), and the most frequent age group was comprised of 20-24 year-olds, with 121 (60.20%) students. The majority of the respondents 143 (71.14%) studied at private institutions and a large percentage were from the final years of the courses 135 (67.16%).

Regarding sexual behavior, when asked about the use of condoms, 85 (42.29%) always use condoms during sexual intercourse; when asked about the number of sexual partners in the previous year, a little over half of the participants 111 (55.22%) had only had one partner over that year.

**Table 1. Epidemiological characteristics of the students**

| Variables  | Medical students |       | Student Nurses |       | Total |       |
|--|------------------|-------|----------------|-------|-------|-------|
|  | n                | (%)   | n              | (%)   | n     | (%)   |
| <b>Sex</b>   |                  |       |                |       |       |       |
| Male   | 63               | 42,86 | 5              | 9,26  | 68    | 33,83 |
| Female   | 84               | 57,14 | 49             | 90,74 | 133   | 66,17 |
| <b>Age</b>   |                  |       |                |       |       |       |
| <20  | 5                | 3,40  | 4              | 7,41  | 9     | 4,48  |
| 20-24  | 88               | 59,86 | 33             | 61,11 | 121   | 60,20 |
| 25-29  | 29               | 19,73 | 9              | 16,67 | 38    | 18,91 |
| 30-34  | 13               | 8,84  | 4              | 7,41  | 17    | 8,46  |
| 35-39  | 7                | 4,76  | 3              | 5,56  | 10    | 4,98  |
| >39  | 5                | 3,40  | 1              | 1,85  | 6     | 2,99  |
| <b>Institution</b>   |                  |       |                |       |       |       |
| Public   | 54               | 36,73 | 4              | 7,41  | 58    | 28,86 |
| Private  | 93               | 63,27 | 50             | 92,59 | 143   | 71,14 |
| <b>Academic year</b>                                       |                  |       |                |       |       |       |
| First 2 years  | 46               | 31,29 | 20             | 37,04 | 66    | 32,84 |
| Final years  | 101              | 68,71 | 34             | 62,96 | 135   | 67,16 |
| <b>Do you use a condom when having sexual intercourse?</b> |                  |       |                |       |       |       |
| Did not answer   | 20               | 13,61 | 11             | 20,37 | 31    | 15,42 |
| Never  | 16               | 10,88 | 5              | 9,26  | 21    | 10,45 |
| Sometimes  | 17               | 11,56 | 10             | 18,52 | 27    | 13,43 |
| Often  | 30               | 20,41 | 7              | 12,96 | 37    | 18,41 |
| Always   | 64               | 43,54 | 21             | 38,89 | 85    | 42,29 |
| <b>Number of sexual partners in the previous year</b>      |                  |       |                |       |       |       |
| Missing - prefer not to say                                | 7                | 4,76  | 6              | 11,11 | 13    | 6,47  |
| None   | 18               | 12,24 | 7              | 12,96 | 25    | 12,44 |
| 1  | 82               | 55,78 | 29             | 53,70 | 111   | 55,22 |
| 2 to 4   | 33               | 22,45 | 10             | 18,52 | 43    | 21,39 |
| >4   | 7                | 4,76  | 2              | 3,70  | 9     | 4,48  |

When asked about the link between HPV and cervical and penile cancers, all participants knew that HPV causes cervical cancer. A little over half of the participants 107 (53.23%)

knew that HPV causes penile cancer. Only 10 (4.98%) students knew that HPV causes anal cancer.

Fewer than half of the students 95 (47.26%) knew that HPV causes oropharyngeal cancer. In the group of medical students 82 (55.78%) knew that HPV can cause oropharyngeal cancer, whereas only 13 (24.07%) in the group of student nurses knew this correlation.

Regarding awareness of HPV vaccination, the vast majority 182 (90.55%) of participants knew that both genders are eligible to have the HPV vaccine. Furthermore, when asked about HPV treatment only 70 (34.83%) knew that there is no treatment for HPV at the moment.

**Table 2. Students' knowledge of HPV**

|   | Medical students |        | Student Nurses |       | Total |        |
|---|------------------|--------|----------------|-------|-------|--------|
|   | n                | (%)    | n              | (%)   | n     | (%)    |
| <b>Do you think HPV can cause cervical cancer?</b>      |                  |        |                |       |       |        |
| Yes   | 147              | 100,00 | 54             | 100   | 201   | 100,00 |
| No  | 0                | 0,00   | 0              | 0     | 0     | 0,00   |
| <b>Do you think HPV can cause penile cancer?</b>        |                  |        |                |       |       |        |
| Yes   | 85               | 57,82  | 22             | 40,74 | 107   | 53,23  |
| No  | 62               | 42,18  | 32             | 59,26 | 94    | 46,77  |
| <b>Do you think HPV can cause anal cancer?</b>          |                  |        |                |       |       |        |
| Yes   | 9                | 6,12   | 1              | 1,852 | 10    | 4,98   |
| No  | 138              | 93,88  | 53             | 98,15 | 191   | 95,02  |
| <b>Do you think HPV can cause oropharyngeal cancer?</b> |                  |        |                |       |       |        |
| Yes   | 82               | 55,78  | 13             | 24,07 | 95    | 47,26  |
| No  | 65               | 44,22  | 41             | 75,93 | 106   | 52,74  |
| <b>Who is eligible to have the HPV vaccine?</b>         |                  |        |                |       |       |        |
| Only females  | 14               | 9,52   | 5              | 9,259 | 19    | 9,45   |
| Both genders  | 133              | 90,48  | 49             | 90,74 | 182   | 90,55  |
| <b>What is the treatment for HPV?</b>                   |                  |        |                |       |       |        |
| I don't know  | 9                | 6,12   | 3              | 5,556 | 12    | 5,97   |
| Antibiotics   | 1                | 0,68   | 6              | 11,11 | 7     | 3,48   |
| Antifungal  | 1                | 0,68   | 0              | 0     | 1     | 0,50   |
| Antiviral   | 75               | 51,02  | 27             | 50    | 102   | 50,75  |
| Does not exist  | 61               | 41,50  | 9              | 16,67 | 70    | 34,83  |

#### 4. DISCUSSION

The current study investigated the level of awareness of HPV and associated cancers among medical students and student nurses in four institutions in Brazil. It was found that medical students and student nurses showed high level awareness of the link between HPV and cervical cancer but limited knowledge of the relationship between HPV and oropharyngeal, penile and anal cancers.

All participants knew that HPV causes cervical cancer and this result may be explained by the fact that all respondents were medical students and student nurses. In contrast, Khan et al [14] found that only 55% of his sample knew the correlation between HPV and cancer of the cervix. Khan et al [14] studied 390 students, most of whom were in the Pharmacy course; this is possibly the explanation for the lower awareness of the link between HPV and cancer of the cervix. Another study [15] comprising 318 dental students found that 69.5% knew about the link between HPV and cancer of the cervix.

The relationship between cervical cancer and HPV infection is well established. High-risk HPV DNA is detected in most specimens (92.9% to 99.7%) of invasive cancer of the cervix [16]. This study showed that 100% of the students knew about the relationship between HPV and cervical cancer. This is very important because, as future health professionals, they are disseminators of scientific knowledge.

A little over half of the participants knew that HPV causes penile cancer. Our findings agree with Khan et al [14] who conducted a cross-sectional study among 390 students in Pakistan and found 47%. In contrast, the study conducted by McBride et al [17] verified that only 27.11 % of men and 14.97% of women were aware of the link between HPV and penile cancer. An explanation for the low level of knowledge of the students regarding that link is the lack of awareness of its potential impact on men's health and the stigma surrounding sexually transmitted infections (STIs). Another possible justification for such findings is the limited number of public health campaigns: while public health campaigns exist to raise awareness of HPV and its link to cervical cancer, there does not seem to be much priority given to the impact of HPV on men's health.

According to the data collected by this study, little of the students knew that HPV causes anal cancer. In a study carried out with data collected from a cross-sectional survey of adults in the USA (N = 3,103), McBride et al [17] found that 29.92% of male respondents were aware of the relationship between HPV and anal cancer and 28.92 % of the female sample were aware of the relationship between HPV and anal cancer. The explanation for the little knowledge of this relationship may be the few public health campaigns to raise awareness of HPV and anal cancer. There is also a stigma attached to anal cancer due to its association with sexual behavior [18].

Worldwide, up to 4.5% of new cancers, including cervical, anogenital, and head and neck cancers, are associated with HPV infections[19]. This study concluded that just over half of the participants knew that HPV causes penile cancer and only 4.98% of students knew that HPV causes anal cancer. That constitutes a problem because these students are future health professionals and, consequently, responsible for educating the population.

Relative to this research, less than half of students knew that HPV causes oropharyngeal cancer. Our study corroborates Alzabibi et al [13] which found that 49.1% of students of a medical school knew the link between HPV and oropharyngeal cancer. In contrast Dodd (2021) found 26.7% and in Du (2022) 21.5% of their respondents were aware of that link. A possible explanation for this might be that in Alzabibi et al [13], the population researched

comprised of students of non-health related courses and in the study of Du et al [21] only young students limited to the age of 26 years old were surveyed.

The most important risk factors for head and neck cancers are smoking and alcohol consumption. However, many patients with oropharyngeal squamous cell carcinoma do not present with any of the aforementioned traditional risk factors. Several studies have correlated HPV, mainly type 16, as an etiological agent in many of these patients [22].

The majority of studies on HPV awareness among university students do not investigate the knowledge of non-cervical cancers [12], [23]–[27]. One of the differentials of this study is the fact that a questionnaire on sexual behaviour was used to demonstrate knowledge of HPV and Human Papillomavirus-associated cancers amongst medical students and student nurses.

This study has some limitations. We chose to carry out a cross-sectional research using Google forms. By inviting students by email for this type of study we may have had a number of students who either did not respond to the questionnaire or some students may have had incomplete or inaccurate information about HPV. On the other hand, the use of Google forms facilitated the research mainly because in 2021 and 2022 the world was experiencing a moment of isolation due to the COVID-19 pandemic.

Through this study, it was observed that more awareness campaigns regarding HPV related cancers are needed, mainly to inform young university students about the link to oropharyngeal, anus and penis cancers [28].

## 5. CONCLUSIONS

According to the results of this study, medical students and student nurses showed awareness of the link between HPV and cancer of the cervix with limited knowledge of the connection between HPV and oropharyngeal, penile and anal cancers. Therefore, there is a need to provide the younger generation with educational campaigns about HPV and related cancers so that the amount of HPV infections does not increase exponentially.

### Ethics Approval and Consent

Permission to conduct this study was obtained from the four institutions: the Federal University of Rondonia, Faculdades Integradas Aparicio Carvalho, Centro Universitario São Lucas and Faculdade Metropolitana. The questionnaire was distributed utilizing the electronic format Google Forms. The link to the survey and the consent form was sent to the students via email. Informed consent was obtained from all study participants.

Google forms is a tool already widespread and widely accepted in the academic world, providing very well for this purpose.

The study was approved by the Medical Ethics Committee of the Federal University of Rondonia under number 4,871,711.

## REFERENCES

- [1] Cohen PA, A. Jhingran, Oaknin A, and Denny L, "Cervical cancer," *The Lancet*, vol. 393, no. 10167. Lancet Publishing Group, pp. 169–182, Jan. 12, 2019. doi: 10.1016/S0140-6736(18)32470-X.
- [2] De Sanjosé S et al., "Review Worldwide prevalence and genotype distribution of cervical human papillomavirus DNA in women with normal cytology: a meta-analysis," 2007. [Online]. Available: <http://infection.thelancet.com/Vol>
- [3] Muñoz N, Castellsagué X, de González AB, and Gissmann L, "Chapter 1: HPV in the etiology of human cancer," *Vaccine*, vol. 24, no. SUPPL. 3, Aug. 2006, doi: 10.1016/j.vaccine.2006.05.115.
- [4] Muñoz N et al., "Epidemiologic Classification of Human Papillomavirus Types Associated with Cervical Cancer," 2003. [Online]. Available: [www.nejm.org](http://www.nejm.org)
- [5] Araldi RP et al., "The human papillomavirus (HPV)-related cancer biology: An overview," *Biomedicine and Pharmacotherapy*, vol. 106. Elsevier Masson SAS, pp. 1537–1556, Oct. 01, 2018. doi: 10.1016/j.biopha.2018.06.149.
- [6] Timbang MR, Sim MW, Bewley AF, Farwell DG, Mantravadi A, and Moore MG, "HPV-related oropharyngeal cancer: a review on burden of the disease and opportunities for prevention and early detection," *Human Vaccines and Immunotherapeutics*, vol. 15, no. 7–8. Taylor and Francis Inc., pp. 1920–1928, Aug. 03, 2019. doi: 10.1080/21645515.2019.1600985.
- [7] Kreimer AR et al., "Case-Control Study of Human Papillomavirus and Oropharyngeal Cancer Abstract," 2007. [Online]. Available: [www.nejm.org](http://www.nejm.org)
- [8] Ferreira CDC et al., "Correlation of p16 immunohistochemistry with clinical and epidemiological features in oropharyngeal squamous-cell carcinoma," *PLoS One*, vol. 16, no. 6 June, Jun. 2021, doi: 10.1371/journal.pone.0253418.
- [9] Balla BC, Terebessy A, Tóth E, and Balázs P, "Young Hungarian students' knowledge about HPV and their attitude toward HPV vaccination," *Vaccines (Basel)*, vol. 5, no. 1, Mar. 2017, doi: 10.3390/vaccines5010001.
- [10] Andrew T et al., "Knowledge and Risk Factors of Cervical Cancer among Women in Towns of Fako Division- Cameroon," *J Adv Med Med Res*, pp. 81–91, Jul. 2021, doi: 10.9734/jammr/2021/v33i1631004.
- [11] Osazuwa-Peters N and Tutlam NT, "Knowledge and risk perception of oral cavity and oropharyngeal cancer among non-medical university students," *Journal of Otolaryngology - Head and Neck Surgery*, vol. 45, no. 1, Jan. 2016, doi: 10.1186/s40463-016-0120-z.
- [12] Der E, Aduah R, Iddisa B, Awinboya G, and Nakong N, "The Knowledge and Acceptability of Cervical Cancer Screening among Female Students in University for Development Studies (Uds) Tamale Campus-Dungu," *J Adv Med Med Res*, vol. 27, no. 4, pp. 1–9, Aug. 2018, doi: 10.9734/jammr/2018/40783.
- [13] Alzabibi M. A et al., "Oral cancer knowledge and practice among medical students: A cross-sectional study during the Syrian crisis," *Annals of Medicine and Surgery*, vol. 77, May 2022, doi: 10.1016/j.amsu.2022.103504.

- [14] Khan TM, Buksh MA, Rehman IU, Saleem and A, "Knowledge, attitudes, and perception towards human papillomavirus among university students in Pakistan," *Papillomavirus Research*, vol. 2, pp. 122–127, Dec. 2016, doi: 10.1016/j.pvr.2016.06.001.
- [15] Keser G, Yilmaz G, and Pekiner F. N., "Assessment of Knowledge Level and Awareness About Human Papillomavirus Among Dental Students," *Journal of Cancer Education*, vol. 36, no. 4, pp. 664–669, Aug. 2021, doi: 10.1007/s13187-019-01683-3.
- [16] Bosch FX, Lorincz A, Muñoz N, and Meijer LM, "The causal relation between human papillomavirus and cervical cancer," 2002. [Online]. Available: <http://www.ipvsoc.org>
- [17] McBride KR and Singh S, "Predictors of Adults' Knowledge and Awareness of HPV, HPV-Associated Cancers, and the HPV Vaccine: Implications for Health Education," *Health Education and Behavior*, vol. 45, no. 1, pp. 68–76, Feb. 2018, doi: 10.1177/1090198117709318.
- [18] Lupi M, Brogden D, Howell AM, Tekkis P, Mills S, and Kontovounisios C, "Anal Cancer in High-Risk Women: The Lost Tribe," *Cancers*, vol. 15, no. 1. MDPI, Jan. 01, 2023. doi: 10.3390/cancers15010060.
- [19] Martel C de, Plummer M, Vignat J, and Franceschi S, "Worldwide burden of cancer attributable to HPV by site, country and HPV type," *Int J Cancer*, vol. 141, no. 4, pp. 664–670, Aug. 2017, doi: 10.1002/ijc.30716.
- [20] Dodd RH et al., "Awareness of the link between human papillomavirus and oral cancer in UK university students," *Prev Med (Baltim)*, vol. 150, Sep. 2021, doi: 10.1016/j.ypmed.2021.106660.
- [21] Du EY et al., "Medical students' knowledge of HPV, HPV vaccine, and HPV-associated head and neck cancer," *Hum Vaccin Immunother*, vol. 18, no. 6, 2022, doi: 10.1080/21645515.2022.2109892.
- [22] Vokes EE, Agrawal N, and Seiwert TY, "HPV-Associated Head and Neck Cancer," *Journal of the National Cancer Institute*, vol. 107, no. 12. p. djv344, Dec. 01, 2015. doi: 10.1093/jnci/djv344.
- [23] Chiang VCL et al., "Attitude, acceptability and knowledge of HPV vaccination among local university students in Hong Kong," *Int J Environ Res Public Health*, vol. 13, no. 5, May 2016, doi: 10.3390/ijerph13050486.
- [24] Eche MT and Vermaak K, "Knowledge, attitude and practice of female university students regarding human papillomavirus and self-sampling in KwaZulu-Natal, South Africa: a cross-sectional survey," *BMC Womens Health*, vol. 22, no. 1, Dec. 2022, doi: 10.1186/s12905-022-01634-z.
- [25] Farsi NJ, Baharoon AH, Jiffri AE, Marzouki HZ, Merdad MA, and Merdad LA, "Human papillomavirus knowledge and vaccine acceptability among male medical students in Saudi Arabia," *Hum Vaccin Immunother*, vol. 17, no. 7, pp. 1968–1974, 2021, doi: 10.1080/21645515.2020.1856597.
- [26] Di Giuseppe G, Abbate R, Liguori G, Albano L, and Angelillo IF, "Human papillomavirus and vaccination: Knowledge, attitudes, and behavioural intention in

adolescents and young women in Italy,” *Br J Cancer*, vol. 99, no. 2, pp. 225–229, Jul. 2008, doi: 10.1038/sj.bjc.6604454.

[27] El Mansouri N et al., “Awareness and knowledge associated to Human papillomavirus infection among university students in Morocco: A crosssectional study,” *PLoS One*, vol. 17, no. 7 July, Jul. 2022, doi: 10.1371/journal.pone.0271222.

[28] Wells JS, L. Flowers, S. Paul, M. L. Nguyen, A. Sharma, and M. Holstad, “Knowledge of Anal Cancer, Anal Cancer Screening, and HPV in HIV-Positive and High-Risk HIV-Negative Women,” *Journal of Cancer Education*, vol. 35, no. 3, pp. 606–615, Jun. 2020, doi: 10.1007/s13187-019-01503-8.

UNDER PEER REVIEW