Knowledge differences between male and female university students about human papillomavirus (HPV) and cervical cancer: Implications for health strategies and vaccination

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A B S T R A C T

Knowledge about HPV and cervical cancer (CC) depends on several factors such as gender and education, which brings implications for health strategies and vaccination. A survey was conducted in Portugal with a representative sample of 1706 university students. Only 55.4% (n = 945) had already heard of HPV, although 88.3% (n = 834) from that know that is a risk factor for CC. 89% students (n = 841) wants to be vaccinated against it, but only 13.8% stated as main reason to be vaccinated “prevention of the disease”. Mean scores of knowledge were calculated. Statistical differences were found, regarding “CC knowledge”, in gender (p < 0.001) and between health sciences schools and non-health sciences schools (p < 0.001). Differences regarding the study area in “knowledge and beliefs of HPV” (p < 0.001) and in “relation between HPV and CC” (p < 0.001) were found. Therefore, these differences may help to develop effective strategies that lead to decline CC incidence and mortality.

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1. Introduction

Cervical cancer is an important global public health problem [1]. The degree of knowledge in general population is essential to determine the most appropriate strategy for planning an effective intervention. One can only take measures for health promotion, disease prevention and screening, regarding cervical cancer, with actual and accurate knowledge about the awareness and beliefs of the population towards this disease [1–3]. There are many known factors related to the development of cervical cancer but the infection with oncogenic types of human papillomavirus (HPV) is their major risk factor [4–17]. HPV is one of the most common sexually transmitted infections [3–5], and it’s highly prevalent within the sexual active population, specially the one between 16–25 years old [5,7,16]. Among university students, HPV infection is the most common sexually transmitted disease [3]. In this group its prevalence reaches near 50% [14], so the evaluation of knowledge in this area is fundamental and necessary. The probability of infection with HPV is not known, but affects both men and women, although men are usually asymptomatic carriers [2,14]. Thus is fundamental to assess the knowledge in both genders.

Primary prevention through HPV vaccination appears to be a promising tool to prevent cervical cancer [1,16–18]. Several studies indicate that HPV vaccines are safe and that its utilization reduces nearly 70% the probability to develop cervical cancer [1,2,7]. Several health publicity campaigns have been carried out, at this time, to sensitize the population towards this health problem and to promote HPV vaccination worldwide. Many countries have introduced HPV vaccination into their health-care systems [19].

Portugal has the highest incidence of cervical cancer within the European Union [20]. According to recent data, from the Portuguese Ministry of Health, 80% of the 15 year old girls are already vaccinated [21]. However, the intention to be vaccinated depends on several factors including the knowledge and beliefs of the population about HPV and cervical cancer and the type of health education given by health professionals [2,17–19,22].

On other hand, health professionals have an important role on the acceptance of HPV vaccination, because their knowledge and beliefs affects their recommendations to the general population [17,19,23]. It is important to perceive if the students of health sciences schools, future health professionals, have accurate knowl-
edge and beliefs, regarding this public health problem, so that they can provide reliable information that will lead to health gains.

Several studies have been carried out worldwide to examine male and female knowledge on HPV and its links to cervical cancer, before and after the introduction of HPV vaccine, and the majority reveals that the knowledge is generally poor [2,5,18,24]. However, most of these studies reveal that people are usually in favour of HPV vaccination. No studies have been developed yet to examine the knowledge of university students about HPV, cervical cancer and their implications concerning health strategies and vaccination in Portugal. To the best of our knowledge, to develop a report about the knowledge of future health professionals, male and female, towards HPV and cervical cancer and its implications in health strategies and vaccination, which establishes the differences of knowledge, of men and women, studying in health sciences schools and non-health sciences schools, is something not yet known. We consider that it is important to achieve and analyse these differences so that health education programs can be more effective. Therefore this project reports a population-based study of a large representative sample of Portuguese male and female university students from Health Sciences Schools and Non-health Sciences Schools, being gender and education the two variables statistically associated with the outcome. It was carried out before the introduction of HPV vaccine so that we can further evaluate and compare the results with studies made before and after its implementation.

2. Method

2.1. Participants

The University of Porto in the year 2007/2008 had nearly 29,000 students [25]. Initially, it was determined to produce a sample size with 1700 women and men, for the statistical analysis. 2050 university students were contacted and 1835 surveys were obtained, that resulted in 1706 completed questionnaires. The final sample of the study includes 1706 male and female university students of the district of Porto, Portugal. The participants had ages ranging between 17 and 35 years old (17 because is the age that usually Portuguese students enter at the university and the age of 35 years old represents 95% of the initial sample in study). Six faculties of the University of Porto and 1 higher education nursing school were selected, attending different study areas: FMUP – Faculty of Medicine of the University of Porto, ICBAS – Abel Salazar Institute for Medical Sciences, F CDEF – Faculty of Sport Sciences and Physical Education, FLUP – Faculty of Arts of the University of Porto, FFUP – Faculty of Pharmacy of the University of Porto, FEP – Economics Faculty of the University of Porto and ESEP – Higher Education Nursing School of Porto. The schools were classified according to their subject of study: Health Sciences Schools (ICBAS, FMUP, FFUP and ESEP) and non-Health Sciences Schools (FCDEF, FLUP and FEP). This selection was made by convenience according to the goals of the study, the proximity to the researcher and the will of the subject to participate in the project.

Admitting a 3.02 margin of error and considering that 50% of population in study has accurate knowledge about the questions in query, the sample used in the study has a confidence level superior to 99.9% (calculated using the computer software online Sample Size Calculator RazoSoft, Inc.).

2.2. Materials

A questionnaire was used for this study. It had 32 questions, was anonymous, confidential and self-responded. It had five main themes: knowledge about cervical cancer, knowledge about HPV, knowledge about the relation between HPV and cervical cancer, attitudes and beliefs about HPV vaccination and attitudes and beliefs about sexual education. Demographic questions were made, including age, sex and year of study; two questions about sexual behavior of the subject were also included. The participants completed the survey responding individually at the end of a class in their school. A pilot study including 31 participants was carried out to test the survey instrument.

2.3. Procedure

The application of the survey was conducted from June 2007 to June 2008 by the researcher, following the students’ calendar of classes. The first approach was to send a written request to the director of each school explaining the aim of the project and all the procedures. After obtaining the authorizations to apply the survey a random number of classes were selected and the teachers were contacted so that at the end of the class the questionnaire could be applied. Before answering it a brief exposure was made to explain the aim of the study to all the students in each class. Also a detailed explanation was exposed attesting that it was a voluntary query, anonymous and self-responded, so that no one would feel obliged to participate. All the possible doubts and concerns that could rise while filling the survey were clarified at the end of the class. After the questionnaire each participant put it in a box at the teacher’s table, which was collected by the researcher at the end.

2.4. Statistical analysis

Analysis of data was performed using the computer software SPSS for Windows (version 16.0) and Epi Info (version 6.04a). Chi-square analysis was used to compare categorical variables and p-value was calculated in behalf of the total number of responses. A p-value <0.05 was considered statistically significant. The comparisons of knowledge were made by using chi-square test and ANOVA with post-hoc test (Hochberg’s GT2 and Games-Howell). Mann-Whitney test was used to compare the means of knowledge achieved in the study between genders.

3. Results

In the sample, we observed that only the students of the health sciences schools have formation at curricular level about HPV and cervical cancer. For that, and attending to the aim and goals of this project, it was decided to compare the answers among male and among female, according to their study area (health sciences students vs non-health sciences students). To perceive if there were differences of knowledge between men and women it was chosen to make the analysis of the answers in each area separately. We divided our sample into four categories: male health sciences students, male non-health sciences students, female health sciences students and female non-health sciences students.

3.1. Sample characteristics

From the 1706 university students, 622 were male and 1084 were female; from that 1113 were health sciences students (802 female and 311 male) and 593 were non-health sciences students (282 female and 311 male). The mean age is 20.57 years, with a standard deviation (SD) of 2.57 and the median is 20 years old.

Regarding the data, most students have had sexual intercourse experiences (74.4% from male and 61.2% from female). The mean age of beginning sexual activity is 17 years old for men and 18 years old for women. The mean number of sexual partners of the students was two regarding male and one regarding female.
3.2. Knowledge of cervical cancer

Students’ knowledge about cervical cancer was assessed by using two questions to which they had to select the right answer and another question with a list of 12 items in which they had to choose the answer “true”, “false”, or “don’t know” about the risk factors for developing cervical cancer \( n = 1706 \). According to Pitts (2009) \[2\] cervical cancer knowledge score was computed with one point given for each correct answer to these questions (see Table 1). From a possible total of 14, the mean score was 6.32 (SD = 2.88). Regarding gender, the mean score in men was 5.78 (SD = 3.03) and in women 6.62 (SD = 2.75). Regarding the subject of study the mean score in health sciences students was 7.24 (SD = 2.61); 7.33 (SD = 2.48) in female and 7.04 (SD = 2.92) in male. In non-health sciences students the mean score was 4.58 (SD = 2.55): 4.63 (SD = 2.50) in female and 4.53 (SD = 2.59) in male. Attending the mean scores of knowledge of cervical cancer statistical differences were found, regarding gender \((p < 0.001,\) Mann–Whitney test), and regarding the study area (male health science student vs male non-health sciences student: \(p = 0.001,\) Hochberg’s GT2 and \(p < 0.001,\) Games–Howell post hoc tests; female health science student vs female non-health sciences student: \(p < 0.001,\) Hochberg’s GT2 and \(p < 0.001,\) Games–Howell post hoc tests).

For the first question “What is the incidence of cervical cancer in Portugal?”, only 17.1% of students correctly answered. For the second question “What is the mortality caused by cervical cancer in Portugal?”, only 17.1% of students correctly answered. For the third question “what are the risk factors for developing cervical cancer?”, 40.1% \((n = 684)\) selected smoking, 64.1% \((n = 1093)\) selected the HPV infection, the use of oral contraception was selected by 28.3% \((n = 482)\), 62.4% \((n = 1064)\) selected having multiple sexual partners, 43% \((n = 733)\) selected sexual intercourse at an early age, 68.7% \((n = 1172)\) selected genetic factors, 68.2% \((n = 1164)\) selected the sexual transmitted diseases \(\text{(STD's)}\) and 27.3% \((n = 465)\) selected the type of diet as risk factors for the development of cervical cancer.

To determine the extent to which students’ knowledge about cervical cancer varied with gender and education chi-square test was used (see Table 2). In health sciences students, a significant association was found between being a female student and selecting as risk factors for developing cervical cancer: the HPV infection \((p < 0.001)\), having multiple sexual partners \((p < 0.001)\), the STD’s \((p = 0.016)\), sexual intercourse at an early age \((p = 0.002)\) and the type of diet \((p = 0.027)\). In non-health sciences students, a significant association was found between being a female student and selecting as risk factor for developing cervical cancer the use of oral contraception \((p = 0.012)\) and between being a male student and selecting as risk factor for developing cervical cancer the type of diet \((p = 0.022)\).

In male, a significant association was found between being a health sciences student and selecting as risk factors for developing cervical cancer: smoking \((p = 0.013)\), HPV infection \((p < 0.001)\), use of oral contraception \((p = 0.017)\), having multiple sexual partners \((p < 0.001)\), the STD’s \((p < 0.001)\), sexual intercourse at an early age \((p = 0.001)\) and the genetic factors \((p < 0.001)\). In female, it was found a significant association between being a health sciences student and selecting as risk factors for developing cervical cancer: smoking \((p < 0.001)\), HPV infection \((p < 0.001)\), having multiple sexual partners \((p < 0.001)\), the STD’s \((p < 0.001)\), sexual intercourse at an early age \((p < 0.001)\) and the genetic factors \((p < 0.001)\). In health sciences students, male students selected that the genetic factors are the main risk factor for developing cervical cancer \(75.6\%\), followed by STD's \(73\%\) and HPV infection \(72.3\%\); and female students selected that the HPV infection is the main risk factor for developing cervical cancer \(83.7\%\) followed by having multiple sexual partners \(81.4\%\) and STD’s \(79.7\%\). In non-health sciences, male students also selected the genetic factors as the main risk factor for developing cervical cancer \(59.5\%\), followed by STD’s \(47.6\%\) and the type of diet \(35.7\%\); and female students selected that the genetic factors are the main risk factor for developing cervical cancer \(57.8\%\) followed by STD’s \(53.2\%\) and having multiple sexual partners \(35.8\%\).

3.3. Awareness of human papillomavirus

Of our sample, 55.4\% \((n = 945)\) students had already heard of HPV and 95\% from that knows that HPV means human papillomavirus. Having heard of HPV corresponded to 40.2\% of the total selections in male students and 64.1\% in female students. Despite that, 66.2\% of male health sciences students had already heard about HPV against only 20.2\% male non-health sciences students. These differences were also found in women: 79.3\% of female health sciences students had already heard about HPV against only 14.1\% female non-health sciences students. It was found a significant association between being a health sciences student and having heard about HPV: in male students \(p < 0.001\) and in female students \(p = 0.001\). We also found a significant association between being a female student and having heard about HPV: in health sciences students \(p < 0.001\), and in non-health sciences students \(p = 0.049\).

Only 16.8% students \((n = 287)\) selected the infection with HPV as being the most frequently sexual transmitted infection. In health sciences students HPV was selected as the most frequently sexual transmitted infection by 20.3\% of male students and by 24.8\% of female students; in non-health sciences students it was selected by 3.2\% of male students and 5.3\% of female students. A significant association was found between being a health sciences student and selecting the HPV infection as the most frequently sexual transmitted disease: in male students \(p < 0.001\) and in female students \(p < 0.001\).

In male health sciences students 32\% \((\text{of those who had heard about HPV})\) selected that their main source of information was a school/teaching place, followed by the media \(14.6\%\). In male non-health sciences students 52.3\% of those who had heard about HPV selected the media as their main source of information and only 2.3\% selected that it was a school/teaching place. 27.5\% female health sciences students selected that a school/teaching place was their main source of information about HPV, followed by the media \(9.6\%\), and only 1.4\% selected the health professionals. On another hand, the female non-health sciences students selected that the health professionals were their main source of information \(24.1\%\), followed by the media \(22.4\%\), and only 3.4\% selected a school/teaching place. A significant association was found between being a health sciences student and selecting a school/teaching place as their main source of information about HPV \(p < 0.001\), and being a male non-health sciences student and selecting the media as their main source of information about HPV \(p < 0.001\). In women a significant association was found between being a female health sciences student and selecting a school/teaching place as their main source of information about HPV \(p < 0.001\) and being a female non-health sciences student and selecting the media as their main source of information about HPV \(p < 0.001\) and in female students \(p = 0.001\).

In our study, only 16.8\% \((n = 287)\) students reported that it was the school/teaching place, followed by the media \(14.6\%\). In male non-health sciences students 52.3\% of those who had heard about HPV selected the media as their main source of information and only 2.3\% selected that it was a school/teaching place. 27.5\% female health sciences students selected that a school/teaching place was their main source of information about HPV, followed by the media \(9.6\%\), and only 1.4\% selected the health professionals. On another hand, the female non-health sciences students selected that the health professionals were their main source of information \(24.1\%\), followed by the media \(22.4\%\), and only 3.4\% selected a school/teaching place. A significant association was found between being a health sciences student and selecting a school/teaching place as their main source of information about HPV \(p < 0.001\), and being a male non-health sciences student and selecting the media as their main source of information about HPV \(p < 0.001\). In women a significant association was found between being a female health sciences student and selecting a school/teaching place as their main source of information about HPV \(p < 0.001\) and being a female non-health sciences student and selecting the media as their main source of information about HPV \(p < 0.001\) and in female students \(p = 0.001\).
3.4. Knowledge about human papillomavirus

Those students who had already heard about HPV \((n = 945)\) were asked to answer a list of questions to assess their overall knowledge about HPV. Their knowledge was assessed by using 8 questions in which they had to select the right answer and 3 other questions with 8, 9 and 7 items respectively, in which they had to choose the answer “true”, “false”, or “don’t know” about the transmission, prevention and symptomatology of HPV. From a possible total of 32 the mean score was 15.56 (SD = 4.91) (see Table 1). Regarding gender, the mean score in men was 15.48 (SD = 4.75) and in women 15.59 (SD = 4.75). Regarding the study area the mean score in health sciences students was 16.07 (SD = 4.77); 15.98 (SD = 4.64) in female students and 16.34 (SD = 5.17) in male students. In non-health sciences schools the mean score was 11.35 (SD = 3.95): 11.29 (SD = 3.80) in female students and 11.43 (SD = 4.18) in male students. Analyzing the mean scores of students’ knowledge about HPV no statistical differences were found regarding gender. Regarding the study area statistical differences were found between being a health sciences student and being a non-health sciences student \((p < 0.001)\), Hochberg’s GT2 and \(p < 0.001\), Games–Howell post hoc tests; female health science student vs female non-health sciences student: \(p = 0.006\), male health science student and being a non-health sciences student: \(p < 0.001\), Hochberg’s GT2 and \(p < 0.001\), Games–Howell post hoc tests).

A significant association was found between being a health sciences student and responding that the likelihood of contagion with HPV is not known \((in female students \(p = 0.022\))\), the range between 18 and 25 years old is where most frequently occurs HPV infection \((in male students \(p < 0.001)\), HPV affects men and women \((in male students \(p = 0.010)\), men can be asymptomatic carriers of HPV \((in male students \(p < 0.001)\) and in female students \(p < 0.001\)) and that the infection with HPV doesn’t involves immediate treatment \((in male students \(p < 0.001)\) and in female students \(p < 0.001\)) (see Table 3). Regarding gender, a significant association was found between being a female student and responding that the likelihood of contagion with HPV is not known \((in health sciences students \(p = 0.006)\) and in non-health sciences students \(p = 0.003\)). We also found a significant association between being a male student and responding that HPV affects men and women \((in health sciences students \(p = 0.016),\) that men can be asymptomatic carriers of HPV \((in health sciences students \(p < 0.007)\) and that HPV infection cannot be diagnosed by Pap tests \((in health sciences students \(p < 0.001)\).

On the data from “students’ knowledge and beliefs about HPV: transmission, prevention and symptoms” a significant association was found between being a health sciences student and responding that HPV transmission can occur through the vaginal route \((in male students \(p = 0.015)\) and in female students \(p = 0.001)\), by skin contact \((in male students \(p = 0.006)\) and by the contact of mucous \((in male students \(p = 0.006)\) and in female students \(p = 0.001)\). We also found a significant association between being a non-health sciences student and responding that HPV transmission can occur by blood transfusion \((in male students \(p = 0.020\) and in female students \(p = 0.022)\).

### Table 1
Mean scores of knowledge of the university students.

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>(J) Grupos</th>
<th>N</th>
<th>Mean score of knowledge</th>
<th>Std. deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students knowledge about Cervical Cancer (total score = 14)</td>
<td>Male health science student</td>
<td>311</td>
<td>7.0418</td>
<td>2.92512</td>
</tr>
<tr>
<td></td>
<td>Male non-health science student</td>
<td>311</td>
<td>4.5370</td>
<td>2.59735</td>
</tr>
<tr>
<td></td>
<td>Female health science student</td>
<td>802</td>
<td>7.3304</td>
<td>2.48125</td>
</tr>
<tr>
<td></td>
<td>Female non-health science student</td>
<td>282</td>
<td>4.6348</td>
<td>2.50365</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1706</td>
<td>6.3230</td>
<td>2.88662</td>
</tr>
<tr>
<td>Students knowledge about the relation between HPV and cervical cancer (total score = 2)</td>
<td>Male health science student</td>
<td>206</td>
<td>1.2524</td>
<td>0.62028</td>
</tr>
<tr>
<td></td>
<td>Male non-health science student</td>
<td>44</td>
<td>0.7045</td>
<td>0.50942</td>
</tr>
<tr>
<td></td>
<td>Female health science student</td>
<td>637</td>
<td>1.1617</td>
<td>0.55562</td>
</tr>
<tr>
<td></td>
<td>Female non-health science student</td>
<td>58</td>
<td>0.8448</td>
<td>0.64350</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>945</td>
<td>1.1407</td>
<td>0.58791</td>
</tr>
<tr>
<td>Students knowledge about HPV (total score = 32)</td>
<td>Male health science student</td>
<td>206</td>
<td>16.3495</td>
<td>5.17538</td>
</tr>
<tr>
<td></td>
<td>Male non-health science student</td>
<td>44</td>
<td>11.4138</td>
<td>4.18968</td>
</tr>
<tr>
<td></td>
<td>Female health science student</td>
<td>637</td>
<td>15.9890</td>
<td>4.64273</td>
</tr>
<tr>
<td></td>
<td>Female non-health science student</td>
<td>58</td>
<td>11.2931</td>
<td>3.80216</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>945</td>
<td>15.5672</td>
<td>4.91775</td>
</tr>
</tbody>
</table>

### Table 2
Students knowledge: risk factors for developing cervical cancer \(n = 1706\).

<table>
<thead>
<tr>
<th>Knowledge items</th>
<th>Male</th>
<th>Female</th>
<th>(p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health sciences students ((n = 311))</td>
<td>Non-health sciences students ((n = 311))</td>
<td>Health sciences students ((n = 802))</td>
<td>Non-health sciences students ((n = 282))</td>
</tr>
<tr>
<td>Smoking</td>
<td>136 (43.7%)</td>
<td>106 (34.1%)</td>
<td>0.013</td>
</tr>
<tr>
<td>HPV infection</td>
<td>225 (72.3%)</td>
<td>105 (33.8%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Sun exposure</td>
<td>11 (3.5%)</td>
<td>18 (5.8%)</td>
<td>0.183</td>
</tr>
<tr>
<td>Consumption of cannabinoids</td>
<td>38 (12.2%)</td>
<td>46 (14.8%)</td>
<td>0.347</td>
</tr>
<tr>
<td>Use of oral contraception</td>
<td>84 (27%)</td>
<td>59 (19%)</td>
<td>0.017</td>
</tr>
<tr>
<td>Heterosexual orientation</td>
<td>63 (20.3%)</td>
<td>23 (7.4%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Multiple partners</td>
<td>212 (68.2%)</td>
<td>98 (31.5%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Prolonged consumption of acetylsalicylic acid</td>
<td>21 (6.8%)</td>
<td>50 (16.3%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>STD's</td>
<td>227 (73%)</td>
<td>148 (47.6%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Sexual intercourse at an early age</td>
<td>155 (49.8%)</td>
<td>46 (14.8%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Genetic factors</td>
<td>235 (75.6%)</td>
<td>185 (59.5%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Type of diet</td>
<td>92 (29.6%)</td>
<td>113 (35.7%)</td>
<td>0.104</td>
</tr>
</tbody>
</table>

* Frequency of affirmative answers in the total of responses.
3.5. Knowledge and beliefs about the relation between HPV and cervical cancer

To assess the knowledge and beliefs about the relation between HPV and cervical cancer the students responded to 2 questions in which they had to select the right answer from a list of items. From a possible total of 2 the mean score was 1.14 (SD = 0.58) (see Table 1). Regarding gender, the mean score in male students was 1.15 (SD = 0.63) and in female students was 1.13 (SD = 0.56). Regarding the study area, the mean score in health sciences students was 1.15 (SD = 0.63) and in female students was 1.13 (SD = 0.56). In non-health sciences students the mean score was 0.78 (SD = 0.59); 0.84 (SD = 0.64) in female students and 0.70 (SD = 0.50) in male students. Regarding the mean scores of knowledge statistical differences were found between the two study areas (male health science student vs male non-health sciences student: p < 0.001, Hochberg’s GT2 post hoc test and p < 0.001, Games–Howell post hoc test; female health science student vs female non-health sciences student: p < 0.001, Hochberg’s GT2 post hoc test and p < 0.003, Games–Howell post hoc test).

In the first question “what is the relation between HPV and cervical cancer?” from does students who had heard about HPV (n = 945), 88.3% (n = 834) answered “HPV is a risk factor to develop cervical cancer”. A significant association was found between being a health sciences student and selecting this answer (in male students p < 0.001 and in female students p < 0.001) (Table 3). For the second question “percentage of HPV infection in cervical cancer?” the students (n = 1706) revealed to have lower knowledge. Only 14.8% (n = 82) of students answered “>90%”. A significant association was found between being a health sciences student and selecting this answer (in male students p < 0.001 and in female students p < 0.001) (Table 3).

3.6. Attitudes and beliefs about human papillomavirus vaccination

The university students who had heard of HPV (n = 945) were asked to state if they would, or would not, wanted to be vaccinated against HPV, if a reliable vaccine existed, and to express the main reasons for that statement (see Table 4). 89% of the participants gave a positive response to this question (corresponding to 93.8% of the total responses in female students and 75.6% of the total responses in male students). A significant association was found between being a non-health sciences student and responding that would like to be vaccinated against HPV (p = 0.009). In female no statistical differences were found regarding the study area. In health sciences students a significant association was found between being a female health sciences student and responding that would like to be vaccinated against HPV (p < 0.001) (Table 4).

The main stated reasons for accepting to be vaccinated presented were “prevention of the disease” (13.8%), “prevention” (8%),

Table 3
Students knowledge and beliefs: percentage of correct responses to HPV questions by students who had heard of HPV (n = 945).

<table>
<thead>
<tr>
<th>Knowledge items</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Health sciences students</td>
<td>Non-health sciences students</td>
</tr>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Likelihood of contagion is not known</td>
<td>115 (55.8%)</td>
<td>24 (54.5%)</td>
</tr>
<tr>
<td>The 18–25 years is the most frequent range of infection with HPV</td>
<td>116 (56.3%)</td>
<td>25 (56.8%)</td>
</tr>
<tr>
<td>HPV affects men and women</td>
<td>156 (75.7%)</td>
<td>23 (52.3%)</td>
</tr>
<tr>
<td>Men can be asymptomatic carriers</td>
<td>170 (82.5%)</td>
<td>33 (16%)</td>
</tr>
<tr>
<td>Infection occur anywhere if contact with virus and there gateway</td>
<td>3 (6.8%)</td>
<td>0.114</td>
</tr>
<tr>
<td>HPV infection cannot be diagnosed by Pap tests</td>
<td>78 (37.9%)</td>
<td>144 (22.6%)</td>
</tr>
<tr>
<td>Infection doesn’t involve immediate treatment</td>
<td>45 (21.8%)</td>
<td>119 (18.7%)</td>
</tr>
<tr>
<td>HPV cannot be cured</td>
<td>184 (89.3%)</td>
<td>581 (91.2%)</td>
</tr>
<tr>
<td>HPV is a risk factor to develop cervical cancer</td>
<td>76 (24.4%)</td>
<td>163 (20.4%)</td>
</tr>
<tr>
<td>HPV % in cervical cancer is over 90%</td>
<td>111 (55.8%)</td>
<td>26 (54.5%)</td>
</tr>
</tbody>
</table>

p < 0.001. Regarding gender, a significant association was found between being a male student and selecting that the transmission of HPV can occur by skin contact (in health sciences students p = 0.013) and by blood transfusion (in health sciences students p = 0.010).

On the data of students’ knowledge about the prevention of HPV we found a significant association between being a health sciences student and responding that HPV transmission can be prevented by the reduction of sexual partners (in male students p = 0.001 and in female students p < 0.001) by avoiding early sexual initiation (in male students p < 0.001 and in female students p < 0.001) and by sexual abstinence (in male students p < 0.001 and in female students p < 0.001) and by sexual abstinence (in male students p < 0.001 and in female students p < 0.001). A significant association was found between being a female student and responding that HPV transmission can be prevented by the reduction of sexual partners (in health sciences students p = 0.002) and by avoiding early sexual initiation (in health sciences students p = 0.027).

Regarding the data collected from students knowledge about the symptomatology of HPV infection, a significant association was found between being a health sciences student and responding that genital warts are symptoms of HPV Infection (in male students p < 0.001 and in female students p < 0.001), selecting the nonspecific signs (in female students p = 0.002) and in selecting the option “asymptomatically” (in male students p < 0.001 and in female p < 0.001). Regarding gender, a significant association was found between being a female student and selecting the nonspecific signs as symptoms of HPV infection (p < 0.001 in health sciences students).
after its implementation [3,22–24]. Several studies have reported developed in Portugal, in general population [14], which unbias the sample, most students have had sexual intercourse experiences. HPV education, prevention and vaccination programs [23]. I no u r understand the role of these influences can aid to plan successful sciences students, it’s important to develop more effective health

analyze the differences of knowledge between them and non-health sciences students. In male students, a significant association was found between being a health sciences student and selecting “prevention of the infection” (p = 0.006) as the main reason to be vaccinated. In health sciences students a significant association was found between being a female student and selecting as main reason for the vaccination against HPV “prevention of the disease” (p < 0.001).

4. Discussion

Several studies have been conducted to assess the knowledge and beliefs related to cervical cancer, HPV and HPV vaccination, before and after the introduction of HPV vaccine. Most studies focus on females’ knowledge [3,22–24,26,15,27] and do not include comparisons of knowledge among men and women. In our knowledge, there are few studies carried out that focus in evaluating the knowledge of health sciences students [23] or health professionals [16,28–30]. We believe that to assess the knowledge of health sciences students about this problematic, and to analyze the differences of knowledge between them and non-health sciences students, it’s important to develop more effective health strategies and education.

The knowledge and beliefs affects the sexual behavior. To understand the role of these influences can aid to plan successful HPV education, prevention and vaccination programs [23]. In our sample, most students have had sexual intercourse experiences. Despite that, the mean age of beginning sexual activity and the number of sexual partners are in agreement with other studies developed in Portugal, in general population [14], which unbias the fact that this is a study developed in university students, regarding this matter.

In our sample university students displayed limited knowledge of cervical cancer and low awareness and knowledge of HPV. These results are consistent with some reports developed before the implementation of HPV vaccine [5,8,31] and others carried out after its implementation [3,22–24]. Several studies have reported lower levels of having heard of HPV than ours, before and after the introduction of HPV vaccine, based on the knowledge of general population [3,4,8,21]. Our data are according to other studies developed in university students [30,31], which according to Sauvageau et al., lead us to believe that higher education is associated with more awareness about this virus [4]. Regarding the mean scores of knowledge, the female students revealed to have more and accurate knowledge’s than male students; analyzing the study area, health sciences students also have higher knowledge than non-health sciences students. This mirrored the review study developed by Dinas et al. [32]. We believe that female students have higher knowledge than male students because cervical cancer is developed in women, and they have access to more accurate information given by physicians. Most of health sciences students have at curricular level formation about this disease. Therefore we believe that these are the major reasons for them having higher knowledge about this subject. These assumptions are corroborated by the presented main source of information about HPV selected by each group. The health sciences students selected that their main source of information was a school/teaching place; the male non-health sciences students selected that were the media, and the female non-health sciences students selected that were the health professionals followed by media. We also believe that non-health sciences students have a similar knowledge to general young people of Portugal, about HPV, once they receive the same type of information and trough the same means. This is corroborated by other studies developed in general population in other countries in Europe [33,34].

Besides the low knowledge and awareness revealed by the students our concerns are also in the gaps and misunderstandings, about HPV, that can lead to risk behavior for developing cervical cancer. In terms of risk factors it is worrying to achieve that the family history (genetic factors) is the major risk factor presented by male students (in both study areas) and by female non-health sciences students. Only female health sciences students selected the HPV infection as the major risk factor for the development of cervical cancer. This overestimation of the importance of family history is consistent with other studies [8]. According to Waller et al., we also believe that there is much publicity about the importance of the family cancer history in other diseases, as breast and colorectal cancers that can lead to this belief. Therefore the level of awareness of HPV was low.

The students also revealed to have low knowledge about how can occur HPV infection, how can be diagnosed and if it is a curable infection. In all of these subjects there aren't statistical differences of knowledge between all groups, which lead as to believe that exists a lack of information that is fundamental to eliminate. Health education strategies are needed with this purpose.

There is much unclear information, and the reported results reflect this problematic. The transmission of HPV infection can occur anywhere if exists contact with a virus and a gateway, but requires the availability of epidermal or mucosal epithelial cells that are still able to proliferate, so it cannot occur by blood transfusion [12]. In our study there are many students that think that HPV
infection can occur by blood transfusion, especially among non-
health sciences students, which demonstrates the low knowledge of
HPV transmission. The use of condoms offers only limited pro-
tection in view of the common presence of virus infected cells at
external genital sites [12] and the majority of students believe that
its use is a good measure to prevent getting infected.

Despite low awareness of HPV infection, the results suggested
that most of the students who had heard of HPV would accept
to be vaccinated if a reliable vaccine existed. These results are in
agreement with published literature regarding HPV vaccination
[3, 18, 24]. Walsh et al. also reported similar results about public
knowledge and attitudes towards HPV vaccination in Birmingham:
although 81% of participants had knowledge score of 0, the major-
ity (88%) of them were in favour of vaccination [33]. And Gottvall
et al. also achieved similar results in Sweden: although only 13.5% of
participants who had heard about HPV the majority (84%) would like
to be vaccinated against HPV [34].

Regarding our results, we believe that female students were
more willing to be vaccinated than male students, especially
because they are who develop this disease. Male non-health sci-
ences students had higher willingness to be vaccinated than male
health sciences students. We believe that this can be justified by the
fact that, as men from health sciences schools have higher knowl-
edge of HPV and cervical cancer, they might know that only in
lower levels HPV infection has links with anogenital, penile and anal
cancer in men, and a subset of head and neck cancers [3, 7, 12], other-
wise most genital HPV infections are transient and resolve without
symptoms or signs of disease, becoming undetectable within 1–2
years [1, 9–12]. The main reasons given by male students “preven-
tion of the infection” and by female students “prevention of the
disease” corroborates these assumptions.

In conclusion, according to the literature, gender and educa-
tion may produce different patterns of knowledge and attitudes
among male and female [3]. These differences of knowledge need
to be analyzed when developing and planning appropriate edu-
cation campaigns that aim the reduction of HPV infection and
consequently the incidence and mortality caused by cervical
cancer. It’s important to remark the importance that media, the
school/teaching place, and health professionals have to raise aware-
ness and promote HPV vaccination [21], and what implications do
they have in to the differences of knowledge of the population.

All the efforts carried out with health education cam-
paigns, through media, health professionals, school/teaching place,
etc., general population still have lack of information about cervical
cancer and HPV. Despite higher levels of acceptance of HPV vaccina-
tion lower knowledge about this sexual transmitted disease leads
to the maintenance of this health problem. Health professionals
have an important role as educators and to assess the knowledge of
the health sciences students is fundamental to increase discus-
sion in the field to achieve accurate and effective measures in health
education programs that aim the reduction of HPV once and for all.
More effective measures of health education programs need to be
applied worldwide to increase awareness and knowledge towards
this health problem.

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