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What do university students know about cervical cancer and HPV vaccine?

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Abstract. – OBJECTIVE: Cervical cancer is one of the most common cancers in women. Infection with high-risk human papillomavirus (HPV) genotypes is responsible for most cervical cancer cases. This study aimed to assess the knowledge of undergraduate medical and non-medical students about cervical cancer and HPV vaccines.

MATERIALS AND METHODS: A cross-sectional questionnaire-based survey was distributed to 172 students in the final 2 years of an undergraduate program at the College of Medicine and the College of Business and Art at the King Saud University.

RESULTS: Thirty-one and 83 students (36% and 96.5%, respectively) in the non-medical and medical cohorts, respectively, answered that cervical cancer is preventable ($p < 0.001$). Further, there was a significant difference in the two cohorts regarding their responses to the etiology of cervical cancer ($p < 0.001$). Forty-five of the medical students answered correctly that the vaccine should be administered to boys and girls alike (52.3%), whereas only 19 (22.1%) non-medical students gave this answer. Moreover, 52 of the medical students (60.5%) expressed willingness to take the vaccine, whereas only 23 (26.7%) of the non-medical students were willing to receive the vaccination. The most common primary source of knowledge of the medical students was medical courses (96.5%), whereas for non-medical students was social media (66.28%). Vaccine availability was the commonest obstacle preventing medical students from receiving the vaccine, whereas that of non-medical students was inadequate information.

CONCLUSIONS: Medical students' knowledge about cervical cancer and vaccination was more accurate than that of non-medical students. We expect that the public will have an even lower level of knowledge. We recommend including necessary information about the vaccine in schools, colleges, and community education programs.

Key Words:

Cervical cancer, HPV vaccine, Knowledge, University students, Prevention of cervical cancer, Medical and arts and business students.

Introduction

Cervical cancer is one of the most common cancers among women worldwide, with an estimated 570,000 cases and 311,000 deaths in 2018[1]. Several studies have found a close correlation between cervical cancer and human papillomavirus (HPV) infection[2,3]. HPV is one of the most common sexually transmitted infections worldwide[4].

In Saudi Arabia, cervical cancer is the 8th leading cause of cancer in women, with approximately 358 new cases and 179 deaths annually[5]. Most cervical cancer cases in Saudi Arabia present at late stages, possibly due to a lack of public knowledge about cervical cancer and screening programs[6]. These late-stage cancers require extensive chemoradiation therapy. In addition, there is a concern that not all cases of cervical cancer are reported or receive early medical attention; therefore, the actual incidence may be higher[7].

Cervical cancer is one of the most preventable cancers owing to the availability of primary and secondary preventions (HPV vaccination and cervical cancer screening tests, respectively). There are two types of HPV vaccines available in major hospitals that are indicated for primary prevention[8]. For secondary prevention, cervical cancer screening is initiated in women at age 25 and occurs every 5 years until the age of 65[8]. In most countries, including the United States, there has been a transition from cytology to HPV testing (DNA-PCR testing). However, cytology testing, either alone or as part of co-testing, is expected to continue in clinical practice until access to widespread primary HPV testing has been established[8]. The recommendations for cervical cancer screening and HPV vaccination in Saudi Arabia are regularly updated and aligned with international recommendations and guidelines[9]. Educational interventions are required to raise public awareness, promote vaccine acceptance, and motivate people to seek medical attention[10].

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Despite the efforts and national programs to educate the public about HPV vaccination, 7.3 million HPV vaccine-eligible US adolescents were unvaccinated in 2017-2018[11]. A recent national report showed that only 54% of adolescents are current with HPV vaccination[12]. In contrast, the rates for tetanus, diphtheria, and pertussis vaccinations are in the range of 80-90%[12]. One study showed that only 16.5% of men reported receiving at least one dose of the HPV vaccine[13]. Similar low HPV vaccination rates have been reported in Japan[14] and Ireland[15]. Several local and regional studies have examined cervical cancer, HPV, and the challenges facing vaccination[16-18]. However, these studies had several limitations. For example, one local study focused only on female participants and failed to include males[17], despite males being known to play a role in transmitting HPV. Another study was limited to parents as the main participants[18].

Because of the limitations of research in this critical area, the fact that no studies have examined undergraduate students' knowledge about cervical cancer and HPV, and the fact that cervical cancer is preventable, it is important to explore this topic further. Therefore, in this study, we included male and female students from medical and non-medical disciplines. However, it cannot be inferred that medical students represent a broader cohort of educated adolescents, as their responses could be a result of knowledge obtained from medical programs. Therefore, we include students from disciplines not related to health sciences, such as arts and business, who would not have such specific knowledge about cervical cancer and HPV in their university programs. The responses from medical students were used for comparison. By extrapolating these findings, we expect that the knowledge of the public (and age-matched non-university adolescents) would be lower than that of arts and business students. Our hypothesis is based on the fact that medical students study cervical cancer and HPV in medical programs, including virology, pathology, pathophysiology, family medicine, and gynecology. By contrast, students in the arts and businesses do not study these subjects, although they may have become aware of this information from social media or traditional news outlets.

Materials and Methods

This cross-sectional, questionnaire-based study was conducted in February 2020. This study aimed to assess the level of knowledge of cervical cancer and HPV vaccines among medical students in their clinical (fourth and fifth) years at the King Saud University, Riyadh and its hospital. Students from the arts and business colleges of King Saud University, Riyadh in the final 2 years of their undergraduate courses were included as the non-medical cohort. The sample size was calculated based on a population of 500 undergraduate students from each cohort[19].

Questionnaire and Measures

The questionnaire used in this study was adopted from that used by Pandey et al[20]. This questionnaire comprised 20 questions, 3 covering awareness of cervical cancer, 13 about HPV vaccination, and 4 evaluating the accessibility of the HPV vaccine among the population studied and current issues of concern. Because the original questionnaire was created in another country, minor modifications were made to ensure that the questions were relevant to the target population's culture. These changes were limited to the wording of two questions. In addition, as the questionnaire was used in non-medical colleges (arts and business), an Arabic translation, along with the English version of each question, was included. Additionally, a cover letter describing the aim of this project, indicating that this research was based at the King Saud University, and a simple language summary of the study were provided. Participants were informed in this cover letter that their participation was voluntary. The participants' names would not be identifiable, as the whole process was anonymous, and all information collected would be confidential. All participants had the right to drop out of the study at any stage.

The distribution of the questionnaires was carried out via the student body and not the research group.

Three researchers independently translated the questionnaire to Arabic. The three versions were then compared with the English version of each question, and the final version was approved. Further assessment of the Arabic translation was independently conducted by three professional translators, and their comments were used to make minor changes to the final version[21]. The final version included both English and Arabic questions. This version was further tested for face validity in a pilot study of third-year 10 medical students and three members of medical staff[22]. Minor changes regarding the required doses of the HPV vaccine were made following this pilot study.

Data Collection

Data were collected from the participants in February 2020. An online Google Form of the questionnaire was prepared and sent to the university emails of students in the targeted colleges and academic years at the same time. All questionnaires received were completed, and the online Google Form that was used did not allow the submission of an incomplete questionnaire. Based on our sample size calculation, we included the questionnaires that were first received by the system. In total, 172 completed responses were included in this study.

Statistical Analysis

The collected data were entered into Excel (Mac version 2016) and analyzed using Statistical Software SPSS version 25.0 (SPSS Inc., Armonk, NY, USA). Frequencies and percentages are used to describe the sociodemographic characteristics of the participants and their knowledge and views on cervical cancer and HPV vaccination. The chi-square test and Mann-Whitney U test were used to assess differences between subgroups, calculate the median and interquartile range, and test associations between variables. A $p < 0.05$ (two-tailed test) was considered statistically significant[23].

Results

A total of 172 students from the College of Medicine and the Arts and Business colleges in the final two years of their undergraduate course at the King Saud University participated in this study.

Knowledge About Cervical Cancer

Table I summarizes the students' knowledge of cervical cancer. The first question was "Are all cancers preventable?" Eighty (93%) of the medical students answered no, whereas only 28 (32.6%) of the non-medical students answered no, a significant difference ($p = 0.002$). Regarding cervical cancer being preventable, 83 (96.5%) medical students selected the correct answer. However, only 31 (36%) non-medical students believed that cervical cancer could be prevented; again, the difference was significant ($p < 0.001$). With regards to the etiology of cervical cancer, 83 (96.5%) of the medical students chose the correct answer, whereas the responses of the non-medical students were nearly equally distributed among viral, bacterial, and fungal etiologies. Interestingly, 32 (37.2%) non-medical students answered "none", whereas only 2 (2.3%) medical students chose this option. Regarding whether a vaccine is available for cervical cancer, 83 of the medical students (96.5%) answered yes, whereas the majority of the non-medical students (62, 72.1%) answered that they did not know. Furthermore, 72 of the medical students (83.7%) chose the option "the cervical cancer vaccine is available in the country," but 70 of the non-medical students (81.4%) answered that they did not know.

The majority of medical students correctly selected the indicated age group for the HPV vaccine, which is between 10 and 30 years, whereas 51.2% of the non-medical students chose incorrect age groups. Regarding whether the vaccine should be administered to boys, 45 medical students (52.3%) chose the correct answer and 23 (26.7%) were not sure. Only 19 (22.1%) non-medical students responded that the vaccine should be administered to boys; 57 (66.3%) responded that they did not know. Seventy-five (87.2%) medical students selected the correct answer for whether the vaccine could be administered to a sexually active girl, whereas 60 (69.8%) non-medical students stated that they did not know. The question regarding the need for screening for HPV before vaccination was difficult to answer correctly for both medical and non-medical students, as the distribution of answers was equal between yes, no, and "I don't know." Answering whether the vaccine could be administered to women with HPV infection was also difficult for both medical and non-medical students. Other differences between the two groups are presented in Table I.

From these results, we can assume a knowledge gap in non-medical students and medical students, as per our earlier hypothesis.

Comparing Knowledge About Cervical Cancer: Male vs. Female Students

Table II summarizes a comparison of knowledge about cervical cancer between men and women. We compared the knowledge about cervical cancer according to gender in the entire study population, regardless of college. As expected, there were no significant differences in the knowledge of the two groups except for two questions. The first of these questions was the age group in which the HPV vaccine was administered: 63 of the male students (72.4%) answered correctly, whereas only 47 of the female students (55.3%) answered correctly. The other question was whether women who had already received the HPV vac-

Table I. Summarized knowledge about cervical cancer: Medical *vs.* Non-medical students.

Item	Medical students (n=86)			Non-Medical students (n=86)			*p*-value	Mann-Whitney U
	Answer	Frequency (%)	Median (Q1-Q3)	Answer	Frequency (%)	Median (Q1-Q3)		
All cancers are preventable	Wrong answer Correct answer Don't know	5 (5.8) 80 (93) 1 (1.2)	2 (3-42.5)	Wrong answer Correct answer Don't know	20 (23.3) 28 (32.6) 38 (44.2)	2 (24-33)	0.002	2837.0
Cervical cancer is preventable	Wrong answer Correct answer Don't know	3 (3.5) 83 (96.5) 0 (0.0)	1 (1.5-43)	Wrong answer Correct answer Don't know	4 (4.7) 31 (36) 51 (59.3)	3 (17.5-41)	<0.001	1385.5
Cervical cancer is caused by…	Wrong answer Correct answer Don't know	3 (3.5) 83 (96.5) 0 (0.0)	1 (1.5 - 43)	Wrong answer Correct answer Don't know	66 (76.8) 20 (23.3) 0 (0.0)	3 (10-43)	<0.001	998.5
Is there any vaccine available for cervical cancer?	Wrong answer Correct answer Don't know	2 (2.3) 83 (96.5) 1 (1.2)	1 (1.5-42.5)	Wrong answer Correct answer Don't know	6 (7) 18 (20.9) 62 (72.1)	3 (12-40)	<0.001	844.0
Is the cervical cancer vaccine available in Saudi Arabia?	Wrong answer Correct answer Don't know	6 (7) 72 (83.7) 8 (9.3)	1 (7-40)	Wrong answer Correct answer Don't know	4 (4.7) 12 (14) 70 (81.4)	3 (8-41)	<0.001	924.0
Which age group HPV vaccine should be given?	Wrong answer Correct answer Don't know	18 (20.9) 68 (79.1) 0 (0.0)	2 (9-43)	Wrong answer Correct answer Don't know	44 (51) 42 (48.8) 0 (0.0)	2 (21-43)	0.009	2974.0
Can it be given to boys?	Wrong answer Correct answer Don't know	18 (20.9) 45 (52.3) 23 (26.7)	1 (20.5 - 34)	Wrong answer Correct answer Don't know	10 (11.6) 19 (22.1) 57 (66.3)	3 (14.5-38)	<0.001	2182.0
Can it be given to a sexually active girl?	Wrong answer Correct answer Don't know	5 (5.8) 75 (87.2) 6 (7)	1 (5.5-40.5)	Wrong answer Correct answer Don't know	5 (5.8) 21 (24.4) 60 (69.8)	3 (13-40.5)	<0.001	1241.0
Do girls/women need to be screened for HIV before getting vaccinated?	Wrong answer Correct answer Don't know	27 (31.4) 31 (36) 28 (32.6)	2 (27.5-29.5)	Wrong answer Correct answer Don't know	37 (43) 5 (5.8) 44 (51.2)	3 (21-40.5)	0.549	3516.0
Can it be given in a woman already having HPV infection?	Wrong answer Correct answer Don't know	29 (33.7) 32 (37.2) 25 (29.1)	2 (27-30.5)	Wrong answer Correct answer Don't know	21 (24.4) 5 (5.8) 60 (69.8)	3 (13-40.5)	<0.001	1929.5
Do girls/women who have already been vaccinated, require cervical cancer screening?	Wrong answer Correct answer Don't know	5 (5.8) 69 (80.2) 12 (14)	1 (8.5-40.5)	Wrong answer Correct answer Don't know	7 (8.1) 37 (43) 42 (48.8)	2 (22-39.5)	<0.001	2259.0
Is it safe for people have sexual relations without condoms after HPV vaccine?	Wrong answer Correct answer Don't know	18 (20.9) 48 (55.8) 20 (23.3)	2 (19-34)	Wrong answer Correct answer Don't know	10 (11.6) 20 (23.3) 56 (65.1)	3 (15-38)	<0.001	2210.0
Protection provided by HPV vaccine is approximately…	Wrong answer Correct answer Don't know	72 (83.7) 14 (16.3) 0 (0.0)	2 (7-43)	Wrong answer Correct answer Don't know	45 (52.3) 41 (47.7) 0 (0.0)	3 (20.5-43)	<0.001	1388.0

cine should be screened regularly for cervical cancer. Sixty-one female students (71.8%) answered correctly, whereas only 45 male students (51.7%) answered correctly.

Students' Opinions About HPV Vaccination

Tables III and IV compare the opinions of medical and non-medical students about HPV vaccination. The first question explored participants' willingness to receive the HPV vaccine. Fifty-two (60.5%) of the medical students said they were willing to receive the vaccine, 22 (25.6%) said they were unwilling, and 12 (14%) did not know. Among the non-medical students, only 23 (26.7%) were willing to receive the vaccine, 15 (17.4%) were unwilling, and 48 (55.8%) said they did not know. This difference was significant ($p < 0.001$).

The majority of students (66 of the medical students [76.7%] and 54 of the non-medical students [62.8%]) said they would not like to be educated by experts. The difference between the two groups was not significant. Table IV summarizes the students' responses based on their gender.

Regarding the question, "Has anyone sought your opinion regarding HPV vaccination?" 18 medical students (20.9%) said yes, and 68 medical students (79.1%) said no. Among non-medical students, 15 (17.4%) said yes and 71 (82.6%) said no. This difference was also not significant.

Sources of Knowledge About HPV Vaccination

Figure 1 summarizes the sources of knowledge regarding HPV vaccination among medical and non-medical students. As predicted, the majority of medical students (83, 96.51%) said that the source of their knowledge was school or college education. By contrast, 57 (66.28%) non-medical students reported social media as their primary source of knowledge.

Challenges to Receiving Vaccination

Table V summarizes the challenges of HPV vaccination. The major obstacle to receiving the vaccine for medical students was the availability of the vaccine (41, 47.7%), whereas only 10 (11.6%) non-medical students cited this as a major obstacle. By contrast, the majority of non-medical students indicated that inadequate information was their main challenge (58, 67.4%), whereas only 34 medical students (39.5%) selected that answer. There was no significant difference in the proportions of medical and non-medical students who stated that their parents had stopped them from receiving the vaccination. Additionally, concerns about efficacy were higher among non-medical students than among medical students, and cost was a concern for similar proportions of medical and non-medical students.

Discussion

In this study, the level of knowledge about cervical cancer and HPV vaccines was higher among undergraduate medical students than among arts and business students. Most medical students were aware that cervical cancer is preventable. In contrast, the majority of non-medical students in this study indicated that they were not sure. With regard to the etiology of cervical cancer, most medical students chose the correct answer, whereas the majority of non-medical students did not. A study from Turkey indicated that 58.2% of healthcare students were aware of the relationship between HPV and cervical cancer[24]. In Belgium, Deriemaeker et al[25] showed that 90% of medical students were aware of the viral etiology of cervical cancer, whereas only 74% of non-medical students were aware of the viral etiology.

Most medical students in this study recognized the existence of a vaccine for cervical cancer. This is similar to the results of the Belgian study, in which 92% of medical students were aware of the existence of a vaccine, compared to only 72% of non-medical students[25]. In this study, more than half of the medical students answered that the vaccine could be administered to boys, but more than half of the non-medical students were unsure. Similarly, Pandy et al[20] found that only 31.4% of medical students knew that the HPV vaccine could be administered to boys. Interestingly, both medical and non-medical students had difficulty regarding the question about need for screening before receiving the HPV vaccine and the eligibility to administer the vaccine to HPV-positive females. Medical students gave varying answers and nearly equally chose yes, no, and "I don't know," whereas most of the non-medical students chose "I don't know." This indicates a lack of understanding in this area, even among medical students. We reviewed the lectures and recommended textbooks related to these topics to understand why medical students did not answer these questions correctly. We believe these specific details have not been adequately addressed or explained in this material.

Table II. Comparing knowledge about cervical cancer in both groups: Female *vs.* Male students.

Item	Female students (n=85)			Male students (n=87)			p-value	Mann-Whitney U
	Answer	Frequency (%)	Median (Q1-Q3)	Answer	Frequency 10(%)	Median (Q1-Q3)		
All cancers are preventable	Wrong answer Correct answer Don't know	9 (10.6) 57 (67.1) 19 (22.4)	2 (14-38)	Wrong answer Correct answer Don't know	16 (18.4) 51 (58.6) 20 (23)	2 (18-35.5)	0.469	3494.5
Cervical cancer is preventable	Wrong answer Correct answer Don't know	4(4.7) 61 (71.8) 20 (23.5)	1 (12-40.5)	Wrong answer Correct answer Don't know	3 (3.4) 53 (60.9) 31 (35.6)	1 (17-42)	0.109	3264.5
Cervical cancer is caused by….	Wrong answer Correct answer Don't know	37 (43.6) 48 (56.5) 0 (0.0)	1 (18.5-42.5)	Wrong answer Correct answer Don't know	32 (36.7) 55 (63.2) 0 (0.0)	1 (16-43.5)	<0.300	3399.5
Is there any vaccine available for cervical cancer?	Wrong answer Correct answer Don't know	6 (7.1) 48 (56.5) 31 (36.5)	1 (18.5-39.5)	Wrong answer Correct answer Don't know	2 (2.3) 53 (60.9) 32 (36.8)	1 (17-42.5)	0.725	3598.0
Is the cervical cancer vaccine available in Saudi Arabia?	Wrong answer Correct answer Don't know	6 (7.1) 42 (49.4) 37 (43.5)	2 (21.5-39.5)	Wrong answer Correct answer Don't know	4 (4.6) 42 (48.3) 41 (47.1)	2 (22.5-41.5)	0.754	3606.5
Which age group HPV vaccine should be given?	Wrong answer Correct answer Don't know	38 (44.7) 47 (55.2) 0 (0)	2 (19-42.5)	Wrong answer Correct answer Don't know	24 (27.5) 63 (72.4) 0 (0.0)	2 (12-43.5)	0.719	3589.5
Can it be given to boys?	Wrong answer Correct answer Don't know	17 (20) 31 (36.5) 37 (43.5)	2 (24-34)	Wrong answer Correct answer Don't know	11 (12.6) 33 (37.9) 43 (49.4)	2 (22-38)	0.719	3589.5
Can it be given to a sexually active girl?	Wrong answer Correct answer Don't know	7 (8.2) 48 (56.5) 30 (35.3)	1 (18.5-39)	Wrong answer Correct answer Don't know	3 (3.4) 48 (55.2) 36 (41.4)	1 (19.5-42)	0.652	3568.5
Do girls/women need to be screened for HIV before getting vaccinated?	Wrong answer Correct answer Don't know	33 (38.8) 26 (30.6) 26 (30.6)	2 (26-29.5)	Wrong answer Correct answer Don't know	31 (35.6) 10 (11.5) 46 (52.9)	3 (20.5-38.5)	0.054	3111.5
Can it be given in a woman already having HPV infection?	Wrong answer Correct answer Don't know	32 (37.6) 16 (18.8) 37 (43.5)	2 (24-34.5)	Wrong answer Correct answer Don't know	18 (20.7) 21 (24.1) 48 (55.2)	3 (19.5-34.5)	0.427	3459.0
Do girls/women who have already been vaccinated, require cervical cancer screening?	Wrong answer Correct answer Don't know	7 (8.2) 61 (71.8) 17 (20)	1 (12-39)	Wrong answer Correct answer Don't know	5 (5.7) 45 (51.7) 37 (42.5)	1 (21 - 41)	0.003	2869.5
Is it safe for people have sexual relations without condoms after HPV vaccine?	Wrong answer Correct answer Don't know	41 (48.2) 10 (11.8) 34 (40)	2 (22-37.5)	Wrong answer Correct answer Don't know	27 (31) 18 (20.7) 42 (48.3)	2 (22.5-34.5)	0.811	3625.5
Protection provided by HPV vaccine is approximately…	Wrong answer Correct answer Don't know	59 (69.4) 26 (30.6) 0 (0.0)	2 (13-42.5)	Wrong answer Correct answer Don't know	58 (66.6) 29 (33.3) 0 (0.0)	2 (14.5-43.5)	0.726	3588.5

Table III. Opinion about HPV vaccination: medical *vs.* non-medical students.

Items	Medical n=86			Non-medical n=86			*p*-value	Mann-Whitney U
	Answer	Frequency (%)	Median (Q1-Q3)	Answer	Frequency (%)	Median (Q1-Q3)		
Would you like to receive HPV vaccination	Yes No Don't know	52 (60.5) 22 (25.6) 12 (14)	1 (17-37)	Yes No Don't know	23 (26.7) 15 (17.4) 48 (55.8)	3 (19-35.5)	<0.001	2013.000
Would you like yourself to be educated by experts	Yes No	20 (23.3) 66 (76.7)	2 (31.5-54.5)	Yes No	32 (37.2) 54 (62.8%)	2 (37.5-48.5)	0.047*	3182.000
Has anyone sought your opinion regarding HPV vaccination	Yes No	18 (20.9) 68 (79.1)	2 (30.5-55.5)	Yes No	15 (17.4) 71 (82.6)	2 (29-57)	0.562	3569.000

The overall willingness to receive the HPV vaccine was higher among medical students than among non-medical students. Therefore, we can conclude that medical students' educational backgrounds may have aided in having a more positive attitude toward the vaccine. To support this, a study conducted in China in 2014 revealed that 60% of the medical students surveyed were willing to be vaccinated against HPV[26]. In addition, another study reported that a greater knowledge of HPV among students was associated with a higher likelihood of being willing to receive the vaccine[27]. Moreover, a study conducted in India showed a positive correlation between knowledge levels and willingness to undergo cervical cancer screening[28]. This emphasizes the need to raise awareness of cervical cancer, HPV, HPV vaccines, and cervical cancer screening. This can be accomplished by implementing educational programs in schools and through platforms such as social media, television programs, and local campaigns.

As predicted, college education was the main source of knowledge about HPV vaccines among medical students. By contrast, non-medical students gained information mostly from the media. A study from South Carolina also found that 50% and 29% of university students received information about HPV vaccination from the internet and television, respectively[29]. Two other studies from Italy and Gabon indicated that the media was the main source of knowledge of the HPV vaccine among the general public[30,31].

In this study, the availability of the HPV vaccine in the country was the major obstacle preventing medical students from being vaccinated. This matches the findings of Yörük et al[24], although they only examined female university students. By contrast, inadequate information about the HPV vaccine was reported as the main challenge among non-medical students. Interestingly, Oz et al[32] demonstrated that insufficient information was the main reason university students rejected the vaccine. Multiple studies have reported various challenges that prevent students from being vaccinated.

Table IV. Opinion about HPV vaccination: Female *vs.* Male students.

Items	Female n=85			Male n=87			*p*-value	Mann-Whitney U
	Answer	Frequency (%)	Median (Q1-Q3)	Answer	Frequency (%)	Median (Q1-Q3)		
Would you like to receive HPV vaccination	Yes No Don't Know	53 (62.4) 5 (5.9) 27 (31.8)	1 (16-40)	Yes No Don't know	22 (25.3) 32 (36.8) 33 (37.9)	2 (27-32.5)	0.001*	2676.500
Would you like yourself to be educated by experts	Yes No	32 (37.6) 53 (62.4)	2 (37.25-47.75)	Yes No	20 (23) 67 (77)	2 (31.75-55.25)	0.037*	3155.500
Has anyone sought your opinion regarding HPV vaccination	Yes No	17 (20) 68 (80)	2 (29.75-55.25)	Yes No	16 (18.4) 71 (81.6)	2 (29.75-55.25)	0.789	3638.000

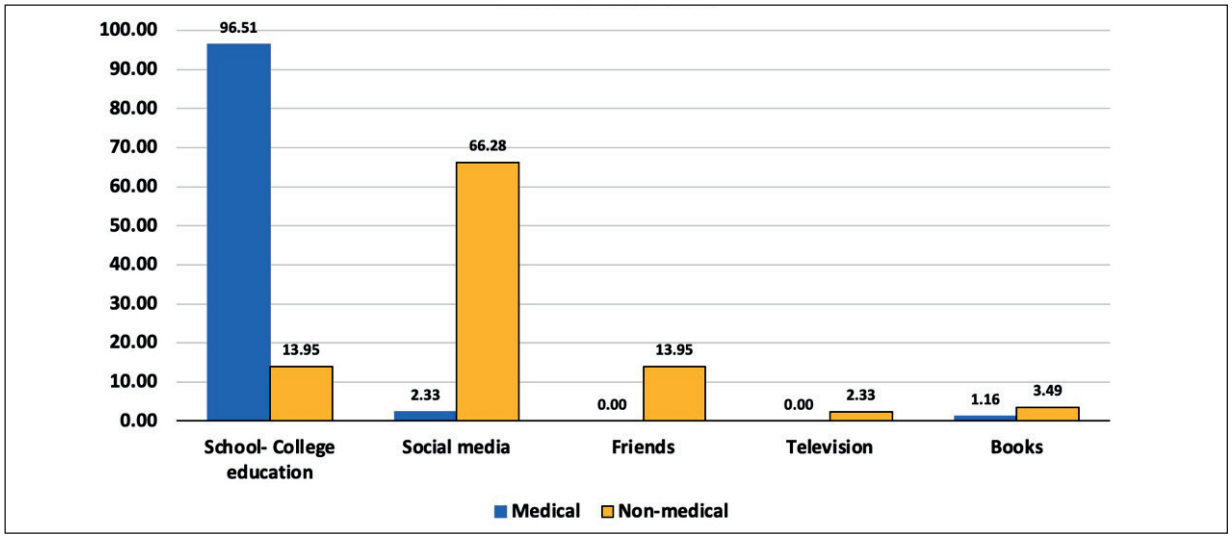

Figure 1. Sources of knowledge about HPV vaccination: medical students vs. non-medical students.

For instance, Al-Shaikh et al[17] and Saqer et al[18] both reported that the side effects of receiving the HPV vaccine were a concern among students. Additionally, a review of the literature mentioned the cost of the vaccine as a major obstacle for taking the vaccine[33]. Finally, in the study by Zimet et al[34], the most common reason for not taking the vaccine was being married or being in a monogamous relationship.

The results of this study highlight the knowledge gap between medical and non-medical students, regardless of gender. Although not examined in this study, such a knowledge gap is expected to be larger in the general population, particularly in areas away from the capital city.

This study has some limitations. First, this study represents the views of students at one institute and does not reflect the views of students from multiple universities in the Kingdom. Second, socioeconomic status and religious beliefs vary in different places in the Kingdom, which may affect the responder's opinion toward the vaccine. Therefore, these results may not be generalizable to other areas. Finally, although we used a validated questionnaire from the literature and carefully incorporated the input from the pilot survey before applying the questionnaire to the study, questionnaires have their own limitations, which may be reflected in the results of this study[35].

Conclusions

This study showed that medical students had more knowledge about cervical cancer and HPV vaccination than arts and business students. Accordingly, we speculate that the mainstream public (with no university or formal education) may have an even lower level of knowledge about cervical cancer and HPV vaccination, particularly in

Table V. Challenge to receiving vaccination: Medical *vs.* Non-medical students.

Challenge stopping you from receiving the vaccination	Medical n=86		Non-medical n=86		*p*-value	Mann-Whitney U
	Frequency (%)	Median (Q1-Q3)	Frequency (%)	Median (Q1-Q3)		
Availability	41 (47.7)	2 (3-34)	10 (11.6)	2 (6-10)	< 0.001	2394.000
Inadequate information	34 (39.5)		58 (67.4)			
Parents	3 (3.5)		2 (2.3)			
Worry about efficacy of vaccine	1 (1.2)		10 (11.6)			
High cost	7 (8.1)		6 (7)			

rural areas. This should be investigated in future studies. Since the HPV vaccine is newly implemented in the National Immunization Schedule by the Ministry of Health and because of the high mortality rate of cervical cancer in Saudi Arabia, we strongly believe in the need for a national program for early detection and screening of cervical cancer. Therefore, it is essential to include such basic educational programs in the community.

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Author Contributions

Methodology, S.A.A., A.A. (AlFahdah AlSaleem), N.A., R.K., A.A. (Alanoud Alessa), A.A. (Alhanouf Aljaloud), and S.A.; formal analysis, A.A. (AlFahdah AlSaleem); investigation, S.A.A.; resources, S.A.A., R.K., and A.A. (Alanoud Alessa); data curation, S.A.A., A.A. (AlFahdah AlSaleem), N.A., R.K., A.A. (Alanoud Alessa), A.A. (Alhanouf Aljaloud), and S.A.; writing—original draft preparation, S.A.A., N.A., A.A. (Alanoud Alessa), A.A. (Alhanouf Aljaloud), and S.A.; writing—review and editing, S.A.A.; project administration, A.A. (AlFahdah AlSaleem). All the authors have read and agreed to the published version of the manuscript.

Conflict of Interest

The authors declare that they have no conflict of interest.

Data Availability Statement

The data supporting the conclusions of this article will be made available by the authors without undue reservation.

Ethics Statement

The study was conducted in accordance with the guidelines of the Declaration of Helsinki and approved by the Institutional Review Board (Ethics Committee) of King Saud University (protocol code number E-19-4439 and date of approval: February 2020).

Informed Consent Statement

Informed consent was obtained from all participants involved in the study.

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