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Students' Knowledge Regarding the Dynamics of HPV at Secular and Christian Colleges

Joann Timberlake, BS; Sarah Mayer, BS; Stephanie Callister, BS; Sheri Cook, BS; Kim Hamilton, BS; Noha Daher, DrPH; Kenrick C. Bourne, DrPH, PA-C

Purpose: No studies have been identified that analyze the association between religious affiliation and college students' awareness of human papillomavirus (HPV) and its possible consequences. The purpose of this study was to investigate the relationship between knowledge of HPV and the type of college (Christian or secular) a student attends. **Methods:** The study sample included 195 college students, 18 years of age or older, attending either La Sierra University, Loma Linda University, San Bernardino Valley College, or University of La Verne. The survey assessed six areas of knowledge of HPV including general knowledge, natural history and symptoms, risk and transmission, sequelae and consequences, the role of Pap smears and viral detection, and treatment of HPV. The survey consisted of 31 questions with response categories based on a five-point Likert scale. **Results:** Forty percent of the students were Seventh-day Adventist, 23% were non-denominational Christians, and 17% were Catholics. Only 29% of the respondents indicated they knew how HPV is transmitted and only 23% of the students were familiar with the risk factors of contracting HPV. The majority of college students are poorly educated about the risk factors and routes of transmission of HPV. Forty-five percent of students surveyed were not aware that HPV can be transmitted through sexual contact. Students attending Christian colleges had more knowledge regarding HPV than students at secular colleges ($p=.02$). **Conclusion:** Results of this study indicated a significant lack of knowledge among college students regarding the risks of transmission of HPV, the relationship between Pap smears and cervical cancer, and the consequences of HPV.

INTRODUCTION

Human papillomavirus (HPV) is transmitted through sexual activity and has been linked etiologically to cervical cancer. It has been demonstrated that virtually all women with cervical dysplasia

have been infected with the specific types of HPV known to be carcinogenic.¹

Nonpenetrative sexual contact has been associated with an increased risk of HPV infection because the virus may reside on all genital areas and is spread by skin-to-skin contact.^{2,3} Precoital behaviors such as oral sex, mutual masturbation, and outercourse (genital contact without penetration) may fall under the scope of abstinence in some adolescents' definitions, and yet can lead to HPV infection.⁴ An increasing number of teenagers are participating in these activities with the assumption that they are safer than vaginal-penile sexual intercourse, and do not change their status as virgins.⁵ HPV is unlike other sexually transmitted infections because of its distinctive

combination of characteristics: it is not curable with medication, may lead to cancer, and cannot be prevented absolutely with a condom. Despite the virus mode of transmission, few researchers acknowledge the risk of acquiring genital warts and cervical cancer even with the use of coital barriers.⁴

A successful sexually transmitted disease (STD) education program directed toward adolescents and college-age students must address these unique aspects of human papillomavirus.⁶

Studies by Ramirez et al⁷ and Yacobi et al⁸ indicate a lack of knowledge concerning the transmission and consequences of HPV among college and university students. This cohort is considered a high-risk group because of sexual promiscuity and experimentation.^{7,8}

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Students at Christian colleges are not less likely to engage in sexual activity than students at secular schools, and, therefore, are just as vulnerable to infections, such as HPV. A 1989 Gallup poll among American college students on sex and religion confirmed that the majority of single evangelical students, (on both secular and Christian college campuses) have been promiscuous.⁹

A search of the literature did not identify any studies that analyze the association between religious affiliation and college students' awareness of HPV and its possible consequences. Because religion greatly affects sexual attitudes and beliefs, it stands to reason that knowledge about a specific sexually transmitted infection, such as HPV, may vary among cohorts of different faiths. We assessed students' knowledge of the transmission and consequences of HPV at both Christian and secular colleges to determine if significant differences existed between these groups. The objectives of this study were 1) determine whether or not attendance at a Christian or secular college has an impact on students' understanding of the dynamics of HPV; 2) investigate the association between knowledge of HPV and gender, religious affiliation, major of study, and age; and 3) identify the modes of learning regarding transmission, risks, and consequences of HPV.

LITERATURE REVIEW

Human papillomavirus (HPV) infection is one of the most prevalent sexually transmitted diseases in the United States.¹⁰ HPV is known to be a significant risk factor for cervical dysplasia, leading to cervical cancer and penile cancer.

More than 100 distinct types of HPV have been identified, and approximately one-third of these

can be spread through sexual contact, leading to infections of the oral and anogenital mucosa.¹⁰ The population at greatest risk for acquiring HPV is the population least likely to have much knowledge about it.⁹ Women, ages 18-24 years, are most susceptible to HPV, with prevalence rates estimated at 10%-46%.¹¹ Females often first learn about an HPV infection after an abnormal Pap smear. The general educational challenge is to develop ways of communicating accurate information about HPV and its associated risks to all women for prevention and management of HPV.¹²

Ramirez et al,⁷ in a study of female college students' knowledge of HPV, indicates that 28% of them had never heard of HPV. Vail-Smith and White¹³ found that 87% of female university students enrolled in a public health course had never heard of HPV. While both groups of researchers investigated students' general knowledge of HPV, neither study attempted to quantify the students' understanding of the association between the virus and cervical cancer.

Baer et al¹⁴ found that 96.2% of first-year college males and 95.4% of females were aware of genital warts, however, only 4.2% of males and 11.2% of females knew that HPV caused genital warts. The primary method of education about sexually transmitted diseases was in health education classes.

STD education should be restructured to include HPV knowledge, risks, transmittance, and association with cervical cancer. Gerhardt et al,⁶ in a study of females ages 15-23 years, evaluated knowledge of HPV transmittance and risks. They report that 42% of these females falsely believed that HPV infection was always symptomatic, and 22% of them did not realize that

condoms could decrease the transmittance of HPV. The results of another study on HPV awareness indicates that of all sexually transmitted infections, students at a public university knew the least about HPV.⁸

Educational programs focused on well known STDs (like human immunodeficiency virus (HIV)) have resulted in statistically significant positive effects on short-term safe-sex behaviors.¹¹ The type of HIV education programs used for primary prevention in the general public could certainly be effective with HPV-focused education.¹¹ Lambert,¹¹ using a questionnaire about knowledge of HPV and other sexually transmitted diseases among first-year physician assistant and psychology students, found that significantly more non-HPV questions were answered correctly than HPV-related questions. Three months after an educational intervention focused specifically on HPV, both groups of students showed a significant improvement in answering HPV-related questions, while there was no improvement in answering non-HPV questions. In the same study, there were no significant scoring differences between males and females. HPV interventions may be significantly effective, since the virus affects a large proportion of the general public, many of whom have had a personal experience with HPV. In 2000, Lambert¹¹ helped to emphasize that brief, focused, educational interventions are effective in improving students' knowledge of HPV.

Fifty-nine percent of students surveyed by Yacobi et al⁸ did not know how HPV was transmitted. Methods of HPV transmission that respondents thought were possible included kissing, anal sex, oral sex, vaginal sex, and casual contact. Fifty-nine percent of the students also indicated that they would not be more concerned about spreading HPV if the infection were a cause

of cancer.⁸ In the same study, the students were uncertain if they would even tell their sexual partner if they were diagnosed with HPV. In order to develop a thorough HPV education plan in colleges, it is imperative that we understand what students at both secular and Christian colleges know about the transmission and consequences of HPV.

METHODS

Subjects

The study sample included 195 college students, 18 years of age and older, attending La Sierra University, Loma Linda University, San Bernardino Valley College, and University of La Verne.

Instrument

The instrument used in the HPV study was a survey (see Appendix). The validity of the survey was established prior to distribution to college students. Three research experts reviewed a draft of the survey for design, clarity of questions, and length of the survey.

The survey assessed six areas of knowledge of HPV including general knowledge, natural history and symptoms, risk and transmission, sequelae and consequences, the role of Pap smears in HPV, and treatment of HPV. The survey consisted of 31 questions with response categories based on a five-point Likert scale (1=strongly disagree, 5=strongly agree). Students were instructed during the survey process to circle '3' (neutral) if they had no knowledge about the statement.

An additional question on the survey asked students to identify modes of learning about HPV including forms of media, friends and family, and institutions, such as the public school. Students also answered five demographic questions pertaining to age, gender, area of academic study, religion, and college attended.

Procedures

We distributed the surveys in the common areas of each institution. All students were given full disclosure of the study purpose, and students verbally consented to participate.

To encourage participation in the study, we ensured the participants that the survey was anonymous. Investigators also distributed bottles of water and soda to students participating in the study. In addition, students received an information handout regarding basic knowledge of HPV¹⁵ following completion of the survey.

Data Analysis

Data was analyzed using the Statistical Package for the Social Sciences (SPSS) for Windows version 12.0.¹⁶ We used frequencies and relative frequencies to summarize the data. We used the Mann-Whitney U test to determine if students' knowledge of HPV differed by type of college attended (Christian versus secular), as well as by gender. We used the Kruskal-Wallis test to determine whether the knowledge of HPV differed by area of study, age, or religious affiliation.

RESULTS

Demographics

The demographic characteristics of the sample are displayed in Table 1. The sample (n=195) was comprised of college students, ages 18 and older, who attended the following educational institutions: Loma Linda University (31.8%, n=62), La Sierra University (25.1%, n=49), La Verne University (27.2%, n=53), and San Bernardino Valley College (15.9%, n=31).

The largest age group was 23 years of age or older (34.4%, n=67); 28.7% of students (n=56) were 19-20 years of age and 23.6% (n = 46) of the students were 21-22 years old. The majority (55.4%, n =

108) of the sample was female. These students reported a wide variety of religious affiliations. The majority of the participants were Seventh-day Adventist (37.4%, n=73). Almost one-fourth (23.1%, n=45) of the students were non-denominational Christians. Catholic students represented 16.9% (n=33) of the sample. Participants were also analyzed according to their area of study. The majority of the participants reported their academic major as "Other sciences" (33.3%, n=65). Business and economics (17.4%, n=34), and humanities (14.4%, n=28), were the second and third most common majors.

General Knowledge of HPV

The survey asked the students about their knowledge of HPV and past educational exposure. The frequency distribution regarding the general knowledge of HPV is displayed in Table 2. Only 29.3% of the students indicated they knew how HPV is transmitted. Less than one-fourth of the students surveyed (23.1%) were familiar with the risk factors of contracting HPV. Students were much more confident about their knowledge of genital warts, with 54.4% of them indicating they knew how warts were contracted. Only a small minority of students (14.3%) had learned about HPV while in high school. A slightly higher percentage of students were educated about the virus during their years in college (21.5%).

Knowledge of Natural History and Symptoms of HPV

Students had limited knowledge regarding symptoms of HPV, with 72.9% answering incorrectly or neutrally (Table 3). Students demonstrated more knowledge about the timing of symptoms with approximately one-third (30.2%) of the students answering correctly. On the other hand, 47.2% of the students knew that a person

Table 1. Frequency Distribution of Participants by Age, Gender, Religion Subgroups and Major

Variable	Frequency (%)
Age (years)*	
18	22 (11.3)
19-20	56 (28.7)
21-22	46 (23.6)
23 and older	67 (34.4)
Gender*	
Female	108 (55.4)
Male	73 (37.4)
Religion Subgroups*	
Catholic	33 (16.9)
Seventh-day Adventist	73 (37.4)
Non-denominational Christian	45 (23.1)
No religion	7 (3.6)
Non-Christian	8 (4.1)
Other Christian	14 (7.2)
Major*	
Humanities	28 (14.4)
Biological sciences	25 (12.8)
Other sciences	65 (33.3)
Mathematics	2 (1.0)
Business/Economics	34 (17.4)
Religious studies	2 (1.0)
Psych/Criminology	14 (7.2)
Communications/Media	7 (3.6)
Undecided	12 (6.2)

*Percentages do not add to 100% due to missing data

Table 2. Frequency Distribution of Correct and Incorrect Responses to Statements Concerning General HPV* Knowledge

Statement	Frequency (%)
Learned about HPV in high school*	
Yes	28 (14.3)
No	128 (65.6)
Unsure	38 (19.5)
Learned about HPV in college*	
Yes	42 (21.5)
No	123 (63.0)
Unsure	29 (14.9)
Knew how genital warts are contracted*	
Yes	106 (54.4)
No	27 (13.9)
Unsure	60 (30.8)
Familiar with risk factors of contracting HPV	
Yes	45 (23.1)
No	72 (36.9)
Unsure	78 (40)
Knew how HPV is transmitted*	
Yes	27 (29.3)
No	89 (45.7)
Unsure	46 (23.6)

* Percentages do not add to 100% due to missing data

◆HPV=Human Papillomavirus

infected with HPV may not be aware of the infection. Only 9.8% of the students knew that the female immune system will naturally eradicate the majority of HPV infections.

Knowledge of Risk and Transmission of HPV

The college students' knowledge about the risks and transmission of HPV is displayed in Table 4. The majority of college students are poorly educated about the risk

factors and routes of transmission of HPV.

Over half (54.4.7%) of the students surveyed were not aware that HPV can be transmitted through sexual contact. Students also were uneducated about the possibility of contracting the virus via oral sex (52.4%). Students have been poorly educated regarding how to protect themselves from HPV. When asked if oral contraceptive pills (OCPs) protect against HPV, only 55.9% knew that OCPs are not protective

against HPV. When questioned about the effectiveness of condoms in preventing transmission of HPV, 42.6% of students were aware that a condom does not fully protect them.

Only 34.3% of the students were aware that HPV can be transmitted from a person who does not appear to have any signs or symptoms of infection. Almost 46% of the students surveyed had no knowledge regarding this topic, and the remainder of them felt they were not at risk for contracting the

Table 3. Frequency Distribution of Correct and Incorrect Responses to Statements Concerning the Natural History and Symptoms of HPV* (n=195)

Statement	Frequency (%)
Symptoms of HPV are fever, fatigue, rash*	
Correct	52 (26.7)
Incorrect	41 (21.1)
No Knowledge	101 (51.8)
Symptoms of HPV appear within days*	
Correct	59 (30.2)
Incorrect	31 (15.9)
No Knowledge	103 (52.8)
Person infected with HPV may not know*	
Correct	92 (47.2)
Incorrect	27 (13.9)
No Knowledge	72 (36.9)
Immune system will eradicate most HPV infections*	
Correct	19 (9.8)
Incorrect	75 (38.4)
No Knowledge	99 (50.8)

* Percentages do not add to 100% due to missing data

◆HPV=Human Papillomavirus

disease if their partner had no active symptoms.

Almost 50% of the students had no knowledge that HPV can be transmitted through both sexual intercourse and foreplay. The majority of the students (64.6%) had no knowledge or answered incorrectly regarding whether or not a virgin is able to contract HPV. Most students (86.6%) did not know of the possibility of contracting HPV from a public restroom. Almost 44% of the students demonstrated knowledge concerning the risks of contracting HPV from an asymptomatic partner. When asked if warts on the body could lead to genital warts, only 48.7% of the students answered correctly.

Knowledge of Sequelae and Consequences of HPV

HPV is the causative agent of both genital warts and cervical cancer. Results displayed in Table 5 show

that a high proportion of students had no knowledge of the sequelae and consequences of HPV. The majority of respondents (61%) were unaware or incorrect in response to the statement that HPV leads to cervical cancer.

Only 9.2% of the students were aware that a female who has not had HPV is not likely to get cervical cancer. More than half of the students (67.2%) did not know that a male with HPV is at higher risk for genital warts. Although HPV is not a cause of infertility, only 12.3% of the students responded correctly to this statement. More than half of students surveyed (60.5%) were unsure if HPV could lead to AIDS.

Knowledge Concerning the Role of Pap (Papanicolaou) Smears and HPV

Students' knowledge of the relationship between Pap smears, HPV, and cervical cancer, is shown

in Table 6. Almost half (49.2%) of the students surveyed had no knowledge of whether a Pap smear is used to identify women with HPV infections. Only one-third (32.8%) of the students agreed with the statement demonstrating the lack of knowledge of this purpose of Pap smears. Students' awareness of the use of Pap smears to screen for cervical cancer was significantly greater than their knowledge pertaining to Pap smears and HPV. Almost 45% knew that Pap smears screened for cervical cancer, while only 52% were unsure or incorrect. Only 38% of the students knew that HPV leads to cervical cancer.

Knowledge of Treatment of HPV

Students demonstrated more knowledge regarding curing HPV than general treatment of HPV. Forty-one percent of the students responded correctly to the statements regarding the current

Table 4. Frequency Distribution of Correct and Incorrect Responses to Statement Concerning Student's Knowledge About the Risks and Transmissions of HPV (n=195)

Statements	Frequency (%)	Statements	Frequency (%)
<u>HPV is not transmitted through sexual contact*</u>		<u>Having a new sexual partner increases my risk of contracting HPV*</u>	
Correct	89 (45.7)	Correct	92 (47.2)
Incorrect	29 (14.9)	Incorrect	21 (10.7)
No Knowledge	77 (39.5)	No Knowledge	81 (41.5)
<u>A person cannot contract HPV by engaging in oral sex with an infected individual*</u>		<u>If I have a wart on my body, I am at risk for getting genital warts*</u>	
Correct	92 (47.2)	Correct	95 (48.7)
Incorrect	19 (9.8)	Incorrect	19 (9.7)
No Knowledge	83 (42.6)	No Knowledge	62 (31.8)
<u>Birth control pills protect against becoming infected with HPV*</u>		<u>HPV is transmitted through the exchange of bodily fluids like semen and blood*</u>	
Correct	109 (55.9)	Correct	75 (38.5)
Incorrect	11 (5.7)	Incorrect	33 (16.9)
No Knowledge	74 (37.9)	No Knowledge	77 (39.5)
<u>Proper use of a condom fully protects me from HPV infection*</u>		<u>There is no risk in contracting HPV during foreplay if intercourse does not occur*</u>	
Correct	83 (42.6)	Correct	78 (40.0)
Incorrect	32 (16.4)	Incorrect	23 (11.8)
No Knowledge	79 (40.5)	No Knowledge	92 (47.2)
<u>An individual can get HPV from a public restroom*</u>		<u>A virgin cannot have an HPV infection*</u>	
Correct	26 (13.4)	Correct	65 (33.4)
Incorrect	72 (36.9)	Incorrect	31 (15.9)
No Knowledge	97 (49.7)	No Knowledge	95 (48.7)
<u>I can only get HPV by having sex with someone who has symptoms*</u>		<u>If a potential partner does not show signs or symptoms of a sexually transmitted disease I would be less concerned about contracting HPV*</u>	
Correct	67 (34.3)	Correct	85 (43.6)
Incorrect	38 (19.4)	Incorrect	25 (12.8)
No Knowledge	89 (45.6)	No Knowledge	81 (41.5)

* Percentages may not add to 100% due to unreported data
 6HPV = Human Papillomavirus

Table 5. Frequency Distribution of Correct and Incorrect Responses Concerning Sequelae and Consequences of HPV* (n= 195)

Statement	Frequency (%)	Statement	Frequency (%)
<u>HPV leads to cervical cancer*</u>		<u>A male with genital warts is at higher risk for developing penile cancer</u>	
Correct	75 (38.4)	Correct	52 (26.7)
Incorrect	25 (12.8)	Incorrect	33 (17.4)
No Knowledge	94 (48.2)	No Knowledge	109 (55.9)
<u>A female who has not had HPV is not likely to get cervical cancer</u>		<u>HPV can lead to AIDS*</u>	
Correct	18 (9.2)	Correct	72 (37.0)
Incorrect	69 (35.4)	Incorrect	22 (11.3)
No Knowledge	108 (55.4)	No Knowledge	96 (49.2)
<u>HPV can lead to genital warts*</u>		<u>HPV can lead to infertility*</u>	
Correct	63 (32.3)	Correct	24 (12.3)
Incorrect	28 (14.4)	Incorrect	71 (37.0)
No Knowledge	103 (52.8)	No Knowledge	98 (50.3)

* Percentages may not add to 100% due to unreported data

♦ HPV=Human Papillomavirus

Table 6. Frequency Distribution of Correct and Incorrect Responses Concerning Sequelae and Consequences of HPV* (n= 195)

Statement	Frequency (%)	Statement	Frequency (%)
<u>6HPV leads to cervical cancer*</u>		<u>HPV is curable with medication*</u>	
Correct	75 (38.4)	Correct	79 (40.6)
Incorrect	25 (12.8)	Incorrect	18 (9.2)
No Knowledge	94 (48.2)	No Knowledge	98 (50.3)
<u>Pap smears identify past HPV infections*</u>		<u>Current treatment is available for HPV*</u>	
Correct	64 (32.8)	Correct	39 (20.0)
Incorrect	34 (27.4)	Incorrect	62 (31.8)
No Knowledge	96 (49.2)	No Knowledge	93 (47.7)
<u>Pap smears screen for cervical cancer*</u>			
Correct	87 (44.6)		
Incorrect	27 (13.9)		
No Knowledge	74 (37.9)		

* Percentages may not add to 100% due to unreported data

♦ HPV=Human Papillomavirus

lack of cure for HPV. 20% of the students knew that current treatment is not available for HPV. These results are shown in Table 6.

Student Preferences for Learning about HPV

We asked the students to identify which educational methods they would prefer to learn more about HPV. The majority of the students

reported that they would be most comfortable learning about HPV from school, pamphlets and magazines, or health care providers.

Differences in Knowledge by Type of College (Christian vs. Secular)

Students attending Christian colleges had a significantly greater level of knowledge regarding the dynamics of HPV than students at secular colleges. More students at Christian colleges understood that the risks of contracting HPV increase with promiscuity and multiple sexual partners ($z=-2.28$, $p=.02$).

Students at Christian colleges more frequently identified the consequences of HPV infection; they knew that HPV leads to cervical cancer ($z = -1.98$, $p = .048$), and not to AIDS ($z = -2.86$, $p=.004$). Furthermore, students at Christian colleges were aware of how to protect themselves against HPV; they more often correctly responded that neither birth control pills nor proper use of a condom fully protected against infection ($z = -2.36$, $p=.02$ and $z = -2.29$, $p=.02$, respectively).

When compared to students at secular colleges, a greater proportion of students at Christian schools reported having learned about HPV in college ($z= -3.09$, $p=.002$). There was no difference, however, between the two groups regarding lack of HPV education during high school. Students at Christian colleges correctly identified symptoms of HPV more frequently than the secular college students ($z = -2.21$, $p = .03$). They also knew that symptoms do not usually appear a few days after infection ($z = -2.41$, $p = .02$). Students at Christian colleges were more aware that HPV may go unrecognized by the infected individual ($z = -2.20$, $p = .03$).

Differences in Knowledge by Gender

Female respondents were more knowledgeable about the mode of transmission of genital warts ($z = -1.96$, $p = .05$) and transmission of HPV through sexual contact ($z = -2.65$, $p = .008$). Male students

showed significantly less understanding about the role of Pap smear screenings for cervical cancer ($z = -2.66$, $p = .008$).

Difference in Knowledge by Area of Academic Study

Students with science majors had the greatest knowledge regarding HPV transmission ($\chi^2 = 9.6$, $p = .02$). Business majors were most consistent in acknowledging that symptoms of fever, fatigue, and a blistering rash were not associated with HPV ($\chi^2 = 10.3$, $p = .02$). Students who reported their area of study to be non-science, non-business, or non-humanities were listed under "other". These students demonstrated the greatest knowledge that having a new sexual partner increases the risk of contracting HPV ($\chi^2 = 8.9$, $p = .03$), and that HPV does not result in infertility ($\chi^2 = 9.6$, $p = .02$).

Students with a business major demonstrated the greatest understanding that HPV leads to cervical cancer ($\chi^2 = 18.8$, $p < .001$). They were also more aware that HPV leads to genital warts ($\chi^2 = 11.3$, $p = .01$), and that a person can unknowingly be infected with HPV ($\chi^2 = 20.8$, $p < .001$). Business students were also most knowledgeable that a Pap smear screens for cervical cancer ($\chi^2 = 13.8$, $p = .003$).

Difference in Knowledge by Age

Students 23 years of age and older were most knowledgeable regarding transmission and risk factors of HPV ($\chi^2 = 12.8$, $p = .005$). Students 21-22 years of age often correctly determined that a person can unknowingly be infected with HPV ($\chi^2 = 16.2$, $p = .001$). This group was also most educated about Pap smears ($\chi^2 = 17.6$, $p = .001$). Students 19-20 years of age were more knowledgeable about symptoms and sequelae of HPV ($\chi^2 = 11.2$, $p = .01$); they knew that HPV leads to

cervical cancer ($\chi^2 = 22.8$, $p < .001$), and does not cause infertility ($\chi^2 = 25.4$, $p < .001$). Eighteen year old students were more aware that a Pap smear identifies HPV infections in women ($\chi^2 = 17.6$, $p = .001$), and that the virus leads to genital warts ($\chi^2 = 10.9$, $p = .11$). This age group was also most educated about treatment options available for HPV ($\chi^2 = 14.8$, $p = .002$) and correctly responded that a new sexual partner increases the risks of contracting HPV ($\chi^2 = 17.4$, $p = .001$).

Difference in Knowledge by Religion

We were not able to ascertain a difference in knowledge regarding HPV between students of the different religions. When grouped by Christian versus non-Christian denominations, however, the data revealed some differences in HPV knowledge. Students of Christian denominations at both secular and Christian colleges better understood that HPV is not curable with medication ($z = -2.01$, $p = .04$).

Students of Christian denominations also showed a significant amount of knowledge regarding the inability of oral contraceptives to protect against HPV ($z = -2.36$, $p = .02$). Students of non-Christian denominations demonstrated significantly less knowledge regarding the timing of the symptoms of HPV, when compared to Christian students ($z = -2.41$, $p = .02$).

DISCUSSION

Our results are consistent with previous studies indicating a significant lack of knowledge among college students regarding HPV.^{3,6,8,9,12,14} Although HPV is the most prevalent STD in the US, the majority of students reported that they did not learn about the virus in either high school or college. Our study highlights a discrepancy

between the students' perceived understanding of HPV and genital wart transmission. Students may think they know how genital warts are transmitted or simply be more familiar with the term "genital warts" than with the abbreviation "HPV". Our findings support Baer et al,¹⁴ who indicate that students report being aware of genital warts without understanding the etiology. The connection between HPV and genital warts should be emphasized when creating STD education curriculum focused at college students.

Our results about students' limited knowledge of risks and transmission of HPV are also consistent with Yacobi et al.⁸ Students' responses indicate that their perceived knowledge of HPV is greater than their actual understanding of the virus.

Our study showed that students do not understand how to protect themselves from HPV. Students had the misconception that condoms fully protect against HPV. Our findings are consistent with previous research that found that "the majority of women believed that condoms are protective against HPV."² Perhaps recent efforts to promote "safe sex" through barrier methods and the "overemphasis of birth control" have led to this belief.¹¹ Because HPV is transmitted via skin-to-skin contact, condoms may not protect against infection and "the efficacy of condoms to protect against HPV is... the matter of scientific debate."¹² Students are not aware of this, and future education programs should focus on clarifying how HPV is transmitted.

Students' uncertainty about whether birth control pills protect against HPV reflects their lack of understanding of the sexual mode of transmission. Our research found that there was no difference between males' and females' knowledge of the pill's inability to prevent HPV. This is consistent

with Waller et al,² who reported women's limited awareness that the pill is not protective.

Students' belief that asymptomatic sexual partners cannot transmit HPV demonstrates a misconception that the absence of physical signs means less sexual risk. Students also did not understand that oral sex carries a risk of HPV transmission. This is a concern considering the results from a recent study that indicated the increased practice of oral sex among adolescents.⁵

Previous researchers found a limited understanding of the relationship between Pap smears, HPV, and cervical cancer.^{2,14} Pitts and Clark¹² found that women knew about the role of annual Pap smears in cervical cancer detection, but were unaware of the effects of HPV. Waller et al² also indicates a lack of awareness of the connection between HPV and cervical cancer. Similarly, our results show a discrepancy, in that more students knew that a Pap smear screens for cervical cancer, but they did not understand the link between HPV and cervical dysplasia. This was illustrated clearly by the distribution of responses to the statement, "HPV can lead to cervical cancer."

The lack of understanding of HPV causes concern because of its severe consequences. Cervical cancer is one of the few malignancies caused by a sexually transmitted virus, and our study demonstrated that students are unaware of this connection. According to current guidelines of the American College of Obstetricians and Gynecologists, annual Pap smears (cervical cytology screening) should begin approximately three years after initiation of sexual intercourse, but no later than age 21 years.¹⁷ Many of the female students we surveyed are in this group, and yet still showed limited understanding of the purpose of these tests.

Educational efforts directed toward this age group of females should be a priority, especially considering college students' susceptibility to HPV infection.¹¹

Our results also indicated that students at Christian colleges knew more than students at secular colleges regarding HPV transmission, risks, and consequences. This may be explained by the fact that both participating Christian colleges (Loma Linda University and La Sierra University) emphasize health professional education. These students' higher level of knowledge may be due to an interest in science and medicine, education related to health, and not simply their attendance at a Christian school. In addition, one of the two secular schools that participated in our study is a community college (San Bernardino Valley College), where many students are pursuing vocational degrees. This may account for the decreased awareness among students surveyed at secular institutions.

Our study revealed a greater level of knowledge among students of Christian denominations when compared to students of non-Christian religions. This difference is perhaps explained by the frequent emphasis of abstinence in Christian homes and institutions. Often, abstinence-based sex education programs include information about the routes of transmission, consequences, and prevention of STDs. Christian students more often responded correctly to statements regarding these issues than their non-Christian counterparts.

There was little difference in the lack of awareness of HPV when comparing responses from males and females. Understandably, females were more knowledgeable about the role of Pap smears in screening for cervical cancer, yet were not more aware than males of the role of HPV in cervical cancer.

This seems to indicate that health care professionals are not educating women about HPV during their physical exams.

While Waller et al² indicates that younger women had a lower awareness of HPV, our results indicate that the lack of knowledge was consistent across all age groups. There was no significant difference between students based on age. All groups demonstrated poor knowledge concerning risks, transmission, and consequences of HPV.

This is the first study to evaluate HPV knowledge among students at Christian and secular colleges. Our large sample size (195 students) added to the strength of our study, as did the diverse nature of the sample with regards to academic major and religion. A total of 14 different religions and 9 different majors were represented. Because the Christian schools surveyed were both Seventh-day Adventist, we may have had some sample bias. Had other Christian colleges agreed to participate in the study, we may have found different results.

We were asked by numerous students at each campus we visited if HPV was erroneously used in place of HIV. These students were directed to the words "human papillomavirus" written in the introduction of each survey. This common misunderstanding seems to indicate the overall unfamiliarity with HPV. Due to their lack of familiarity with HPV, students frequently circled "3" (neutral response) to all statements. This may explain the overall high percentage of neutral responses to many questions.

The survey was targeted in its design to college-age students, using language we deemed appropriate considering the age and the educational background of the students. The questionnaire's ability to accurately assess knowledge, however, required an understanding

of basic terminology such as Pap smear, infertility, foreplay, and sexually transmitted disease. Therefore, we cannot eliminate the possibility that students' responses were the result of misunderstanding of terms rather than a lack of knowledge of HPV. The length of the survey (31 statements) may also have deterred students from accurately completing all items. During our data analysis, we found that the design of the survey had a significant flaw. Statement 23 (Appendix) was written 1.5 cm from the top of the second page of the survey. It was obscured by a part of the clipboard used while distributing the surveys and almost 10% of the students omitted this question.

Upon finishing our survey and reading the HPV information sheet we distributed, numerous students asked questions about specific items on the survey and showed concern or anxiety about HPV. There was a high level of curiosity among the students to learn more about the virus and many seemed distressed that they knew so little about a very common STD.

According to Pitts and Clark,¹² because "the major sources of knowledge are medical and health professionals", HPV awareness should be included in patient education plans. Waller et al² found that women most often cited the media or their general practitioner as sources of knowledge regarding HPV. Our results indicated that, of the possible methods of education, college students prefer learning about HPV from their health care providers. While the students in our survey also reported that they would feel comfortable learning about HPV from magazines or pamphlets, past researchers make a point that "topics of cervical cancer and HPV...have yet to permeate...magazines and newspapers or television programmes."⁴ Thus, the burden of HPV education seems to

rest on the shoulders of doctors, nurse practitioners, and physician assistants. The sensitive issue of HPV and cervical cancer can be addressed during a woman's annual exam. It is our opinion that prior to the Pap smear, the practitioner should explain that the procedure screens for cervical cancer and that HPV is the causative agent of cervical cancer.

CONCLUSION

Our findings of limited HPV awareness among college students are consistent with past studies and reinforce previous researchers' recommendations to develop comprehensive educational programs regarding HPV. In light of our study, it is imperative that efforts be made to increase college students' knowledge of risk, transmission, and consequences of HPV.

ACKNOWLEDGEMENTS

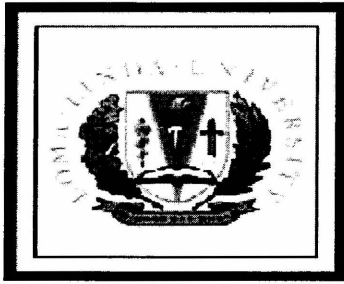
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Appendix



Date ____/____/____

Students' Knowledge Regarding the Dynamics of Human Papilloma Virus at Private, Secular and Christian Universities

This survey is conducted to assess students' knowledge regarding the dynamics of human papillomavirus (HPV). Information from this survey will be used to conduct research through Loma Linda University Physician Assistant Masters Program. The data that you provide will be kept confidential. Please check the appropriate response.

Name of University/College:

- Loma Linda University
- La Sierra University
- University of La Verne
- San Bernardino Valley College

Academic Major:

- Humanities
- Biological Sciences
- Other Sciences
- Mathematics
- Business/Economics
- Religious Studies
- Other _____

Religion:

- Catholic
- Hindu
- Jewish
- Methodist
- Mormon
- Muslim
- Non- denominational Christian
- Protestant
- Other _____

Age

- 18 years old
- 19- 20 years old
- 21- 22 years old
- 23 and older

Gender

- Female
- Male

Please respond by circling the best answer corresponding to each of the statements below.
 1- strongly disagree 2- disagree 3- neutral 4- agree 5- strongly agree

- | | | | | | |
|---|---|---|---|---|---|
| 1. I know how HPV is transmitted | 1 | 2 | 3 | 4 | 5 |
| 2. I learned about HPV in college | 1 | 2 | 3 | 4 | 5 |
| 3. I learned about HPV in high school | 1 | 2 | 3 | 4 | 5 |
| 4. Symptoms of HPV include fever, fatigue, and blistering rash | 1 | 2 | 3 | 4 | 5 |
| 5. HPV is curable with medication | 1 | 2 | 3 | 4 | 5 |
| 6. HPV is not transmitted through sexual contact | 1 | 2 | 3 | 4 | 5 |
| 7. I am familiar with the risk factors of contracting HPV | 1 | 2 | 3 | 4 | 5 |
| 8. A person cannot contract HPV by engaging in oral sex with an infected individual | 1 | 2 | 3 | 4 | 5 |
| 9. Birth control pills protect against becoming infected with HPV | 1 | 2 | 3 | 4 | 5 |
| 10. Proper use of a condom fully protects me from HPV infection | 1 | 2 | 3 | 4 | 5 |
| 11. An individual can get HPV from a public restroom | 1 | 2 | 3 | 4 | 5 |
| 12. I can only get HPV by having sex with someone who has symptoms | 1 | 2 | 3 | 4 | 5 |
| 13. I know how genital warts are contracted | 1 | 2 | 3 | 4 | 5 |
| 14. When an individual becomes infected with HPV, symptoms usually appear within a few days | 1 | 2 | 3 | 4 | 5 |
| 15. A PAP smear helps to identify past HPV infections in women | 1 | 2 | 3 | 4 | 5 |
| 16. There is currently treatment available for HPV | 1 | 2 | 3 | 4 | 5 |
| 17. Having a new sexual partner increases my risk of contracting HPV | 1 | 2 | 3 | 4 | 5 |
| 18. HPV can lead to cervical cancer | 1 | 2 | 3 | 4 | 5 |
| 19. A female who has not had HPV is not likely to get cervical cancer | 1 | 2 | 3 | 4 | 5 |

20. HPV can lead to genital warts	1	2	3	4	5
21. HPV can lead to infertility	1	2	3	4	5
22. A male with genital warts is at higher risk for developing penile cancer	1	2	3	4	5
23. If I have a wart on my body, I am at risk for getting genital warts	1	2	3	4	5
24. HPV is transmitted through the exchange of bodily fluids like semen and blood	1	2	3	4	5
25. HPV can lead to AIDS	1	2	3	4	5
26. A person can be infected with HPV and not know	1	2	3	4	5
27. There is no risk in contracting HPV during foreplay if intercourse does not occur	1	2	3	4	5
28. A virgin cannot have an HPV infection	1	2	3	4	5
29. If a potential partner does not show signs or symptoms of a sexually transmitted disease I would be less concerned about contracting HPV	1	2	3	4	5
30. A PAP smear screens for cervical cancer	1	2	3	4	5
31. Most women's immune systems will successfully eradicate an HPV infection	1	2	3	4	5

If you do not feel that you have been adequately educated about HPV, how it is transmitted, and how to prevent it, please indicate below how you might like to receive this type of information. Please check all that apply.

- Family
- Friends
- Health care provider
- Internet
- Pamphlets/ magazines
- School
- Television/ Video
- Other _____

