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Human Papillomavirus (HPV) Infection and Vaccine Knowledge and Attitudes among University Students

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By

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This thesis has been examined and approved by the following members of the student's committee.

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HUMAN PAPILLOMAVIRUS (HPV) INFECTION AND VACCINE KNOWLEDGE AND ATTITUDES AMONG UNIVERSITY STUDENTS

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIRMENTS
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ABSTRACT

HPV is the "most common sexually transmitted infection," with approximately four out of five sexually active individuals getting infected at some point in their lives (Planned Parenthood, n.d.b, para.1). Cancers of the throat, mouth, cervix, anus, penis, and vagina have all been linked to HPV infections. In addition to being tested for HPV, the utilization of barrier methods and reduction of risky sexual risk behaviors, are the best ways to prevent and treat sexually transmitted infections. This study contributes to existing literature on university students' knowledge and attitudes about HPV infections and the vaccination. This study was conducted using descriptive, cross-sectional research design. The population for this study included current university students at a large, Midwestern university. A convenience sampling technique was used to obtain students for the study. Instrumentation includes a demographics section, knowledge section in which participants were asked 21 true or false questions, and an attitudes section which consisted of thirteen five-point Likert-scale items. The data collected on completed instruments were entered into *Statistical Package for Social Sciences* (SPSS), version 25 for data management and analysis (IBM, 2017).

The results indicated that most participants have received at least one dose of the HPV vaccine, but few reported completing the vaccine series. Females demonstrated higher HPV infection and vaccine knowledge when compared to males. There was no significant difference between knowledge of HPV infection and vaccine when compared to year in school and major. Attitude score was moderate among participants. There needs to be continuous education among adolescents and parents on HPV infections, and the importance of the HPV vaccine, to decrease HPV infections and the associated consequences.

Chapter 1: Introduction

Introduction

Vaccines provide protection for individuals against deadly diseases. These immunizations are from disease-causing microorganisms, which are typically killed or weakened to stimulate the immune system into producing antibodies for a variety of deadly diseases (Centers for Disease Control and Prevention [CDC], 2012*)*. By introducing the body to these microorganisms, the body can react more efficiently to the different invading microorganisms when an individual is exposed to the disease-causing pathogens in the future (CDC, 2012*)*. An increase in vaccination rates decreases the spread of infectious disease; therefore increasing the protection of those with weakened immune systems and those who are unable to get vaccinated (Boyd, 2016).

The human papillomavirus (HPV) is "the most common sexually transmitted infection (STI)" in the United States (Planned Parenthood, n.d.b, para.1). HPV infections are most commonly spread through vaginal or anal sexual contact, or through skin-to-skin contact (Mayo Clinic, 2019). Sexually active individuals who have multiple partners, weakened immune systems, or damaged skin, are more suspectable to HPV (Mayo Clinic, 2019). Cancers of the throat, mouth, cervix, anus, penis, and vagina are linked to HPV infections (Mayo Clinic, 2019). Symptoms of an HPV infection may develop years after sexual contact with an infected individual, which makes it difficult to determine the onset of infection (CDC, 2019a). Although HPV is the most common STI, vaccinations have been developed and effectively used to prevent HPV infections and HPV related cancers.

Gardasil, Gardasil9, and Cervarix are three different types of HPV vaccines that are highly effective in protecting men and women against HPV infections (National Institute of Health, National Cancer Institute, 2018). Although Cervarix and Gardasil are not used in the United States, they are both used in other countries (National Institute of Health, National Cancer Institute, 2018). The recommended doses of the HPV vaccine are determined by the age in which the first dose is administered (Cancer Council Victoria, n.d.b). Those who receive the first dose of the Gardasil 9 vaccine at 14 years or younger will need two doses of the vaccine. Those who receive the first dose at 15 years and older will need three doses of the vaccine. Younger recipients' immune systems respond more efficiently to the vaccine requiring only two doses for those whose first dose is administered under the age of 15 (Cancer Council Victoria, n.d.b).

Statement of the Problem

Many of those who are eligible for the HPV vaccine have not been immunized. According to the American Sexual Health Association (ASHA), HPV is the most common STI, with approximately four out of five sexually active individuals getting infected at some point in their lives (n.d.). HPV can be transmitted from one partner, remain dormant, and then be unknowingly transmitted to another partner (ASHA, n.d.). The consequences of HPV can include the existence of warts on the hands, feet, or genitals; as well as penile, cervical, vaginal, anal, and oropharyngeal cancers. Most individuals do not know that they are infected (ASHA, n.d.). Those who are eligible for the HPV vaccination can decrease the transmission, and HPV-related cancers, by obtaining the vaccination and routine screenings (ASHA, n.d.).

Testing for HPV can cost $30 or more (Holland, 2019). In addition to the HPV testing costs, individuals will have clinic visit costs, and if they decide on a Pap test additional charges will be included (Holland, 2019). The cost associated for treatment ranges from $15,000 for cervical cancer to $33,000 for oral cancer (Righolt, Pabla, & Mahmud, 2018). According to Planned Parenthood, the HPV vaccine costs approximately $250 per dose, so $500-750 dollars total (n.d.a). However, most health insurance companies cover the costs associated with receiving this vaccine, and programs have also been established to help those that do not have health coverage (Planned Parenthood, n.d.a). Individuals could save thousands of dollars in medical bills from HPV infections and related cancer treatments by receiving the vaccine (Parenthood, n.d.a; Righolt et al., 2018).

Between 2009-2017, an average of about 12.5 million vaccines were distributed to providers each year (CDC, 2015a). Although HPV vaccinations are increasing, many adolescents have not received the complete series (CDC, 2018b). According to the CDC, in 2017, approximately 66 percent of adolescents ages 14-17 years received the first dose in the vaccination series, whereas, less than half of adolescents have received all the recommended doses to complete the series (CDC, 2018b). This means that 51 percent of individuals who have received a dose of the HPV series have not received the remaining doses (CDC, 2018b). Males and females who are not immunized against HPV are at a higher risk for contracting an HPV infection.

There are many misconceptions that decrease vaccination rates. Misconceptions regarding vaccines that may increase individuals' and their parents' decisions to forgo

vaccination include lack of knowledge, religious beliefs, concerns about the safety and efficacy of vaccines, or belief that vaccine-preventable diseases are not serious (World Health Organization [WHO], 2013). Another factor is that parents think that by getting their children vaccinated for HPV they will be encouraging sexual activity or they believe that their child is not sexually active, meaning that they do not believe their child needs to be vaccinated for HPV (John Hopkins Medicine, 2018). However, the full spectrum of influences on vaccine uptake and reasons for vaccine hesitancy are unknown among university students. The evaluation of knowledge and attitudes among university students will provide insight into what influences vaccine uptake among adolescents.

Significance of the Problem

Each year there are 14 million new cases of HPV infections, with 79 million people currently infected (American Sexual Health Association, n.d.). "HPV is thought to be responsible for more than 90% of anal and cervical cancers, about 70% of vaginal and vulvar cancers, 60% of penile cancers, and 60% to 70% of oropharyngeal cancer" (CDC, 2018a, para. 2). There are over 11,000 cases of cervical cancer diagnosed each year, with 4,000 deaths in the United States (CDC, 2018a). The number of deaths related to cancer can be decreased with consistent use of both vaccines and highly effective screening tests. The HPV vaccine can prevent over 90% of HPV related cancers (CDC, 2019d). Forgoing vaccination can increase the spread of infection and lead to cancer. Determining how demographics affect an individual's knowledge and attitudes toward the HPV vaccination can help educators determine what needs to be addressed in health education

courses, public health, and health promotion efforts in order to increase knowledge and vaccination rates.

If individuals lack awareness of HPV, their risk increases because they do not know how to prevent it, and may not access screening procedures, which may lead to cancer. Individuals' attitudes and knowledge are predictors of their behavior (McLeod, 2018). Therefore, this study is needed to identify students' perceived risk and perceived severity toward HPV and the vaccine because different people have different perceptions of risk and severity.

Purpose

The purpose of this study was to assess the knowledge and attitudes of current university students regarding HPV infections, the HPV vaccination, and determine if knowledge and attitudes differ based on the student's gender and field of study.

Research Questions

1. To what extent do university student's knowledge towards HPV infections statistically differ by demographics?
2. To what extent do university student's knowledge towards the HPV vaccine statistically differ by demographics?
3. To what extent do university student's attitudes towards the HPV vaccine statistically differ by demographics?
4. To what extent have university students received the HPV vaccines?
5. To what extent do university students perceive themselves to be at risk for HPV infections?

Limitations

Study participants were limited to students at a midwestern university; thus, the findings cannot be generalized to other groups of college students. The study was based on self-reported information. The information gathered may be inaccurate as participants may have been unable to recall the information accurately (potential for recall bias). The available time to administer the survey to university students is limited as surveys were administered during a specific class and time. Students who were not present in class were excluded from the study. The convenience sampling method that was used may have overrepresented students in a given major, limiting the representation of all majors offered on campus. Data collection was completed in more general health-related courses. Although there was the opportunity to survey students from all majors it is likely that there were more participants in health-related majors. In addition, the knowledge and attitudes related to other HPV-associated cancers (i.e. penile or anal) was not assessed.

Delimitations

This study was delimited to university students of different ages, race, and ethnicity at a large Midwestern university. For students to participate they must have been enrolled as either a part-time or full-time student attending large undergraduate classes during the Spring 2020 semester. The survey was only available for participants during one of their lecture periods.

Assumptions

It is assumed that participants clearly understood survey questions and answered honestly and to the best of their ability. It is also assumed that participants correctly identified their demographics.

Definitions:

1. **Barrier Methods**: Used during sexual intercourse to prevent contraception and sexually transmitted infections. (Stoppler, 2016). Barrier methods include internal and external condoms, cervical cap, spermicide, and the diaphragm (The American College of Obstetricians and Gynecologists [ACOG], n.d). Spermicide, cervical cap, diaphragm, and the today sponge, are used to prevent conception. External condoms and internal condoms can be used to prevent STI transmission (Stoppler, 2016).
2. **Cervarix**: HPV vaccine that is not used in the United States, which protects against HPV strains 16 and 18 **(**National Institute of Health, National Cancer Institute, 2018)
3. **Contraceptive:** Device used to prevent pregnancy, such as birth control pills and condoms, which are also used to protect against STIs (Collins English Dictionary, 2019).
4. **Gardasil**: HPV vaccine that is not used in the United States, which provides protection against HPV strains 16, 18, 11, and 6 (National Institute of Health, National Cancer Institute, 2018).

5. **Gardasil 9**: "Vaccine that helps protect against certain cancers and diseases caused by 9 types of human papillomavirus (HPV) (Types 6, 11, 16, 18, 31, 33, 45, 52 and 58)" (Merck Sharp & Dohome Corp, n.d., para. 1). The Gardasil 9 vaccine is used in the United States.
6. **HPV**: HPV stands for human papillomavirus. It is a virus and is the "most common STI" (Planned Parenthood, n.d.b, para 1).
7. **Pap Smear (Pap test)**: used to collect cells from the cervix to test for cancer and can be combined with an HPV test (Mayo Clinic, 2019).
8. **Sexually Transmitted Infection (STI)**: Infections that spread from person to person during unprotected sexual contact, including vaginal, anal, and oral sex (WHO, 2019). STIs can also be spread through blood and blood products. Examples of STIs are chlamydia, HPV, herpes, and more (WHO, 2019).
9. **Vaccine:** a product that is made up of disease-causing microorganisms which are typically killed or weakened to stimulate the immune system to produce immunity to specific diseases (CDC, 2012*)*.
10. **Vaccination:** the act of administering a vaccine into the body (CDC, 2018c).

Chapter 2: Literature Review

Introduction

The purpose of this study was to assess the knowledge and beliefs of current university students regarding HPV infections, the HPV vaccination, and determine if knowledge and attitudes differ based on the student's gender and field of study. This chapter will examine research on HPV infections, HPV vaccines, cancers associated with HPV infections, sexual activity among college students, barriers to vaccine uptake, knowledge and awareness, differences in knowledge among demographic variables, and attitudes towards HPV and the vaccine.

Human Papillomavirus (HPV)

HPV is the "most common sexually transmitted infection" and is most commonly diagnosed among sexually active individuals, especially those 15-25-year-old (Medeiros & Ramada, 2010; Planned Parenthood, n.d.b, para.1). Individuals who are sexually active are at risk for HPV (CDC, 2019a). It is most commonly spread through vaginal and anal sexual activity, but can also spread during oral sex (CDC, 2019f). The act of wearing condoms does not eliminate the risk of HPV in sexually active individuals because it can be spread by skin-to-skin contact (ASHA, n.d.). There are 79 million Americans who are currently infected with HPV (CDC, 2019a). In addition, 14 million new cases of HPV infections occur each year (American Sexual Health Association, n.d.). There are over 100 different types of HPV, and some types of HPV can lead to adverse health outcomes (CDC, 2019f). However, the majority of HPV cases go undetected due to the lack of symptoms (CDC, 2019a). Ways to prevent HPV include practicing safer sex, receiving

the HPV vaccine, getting regular Pap/HPV tests, and using proper barrier methods, such as condoms and dental dams (Mayo Clinic, 2017).

Health Consequences Associated with HPV

HPV can be harmless, but the consequences of this virus vary from no health problems to genital warts and even cancers if screenings are not done regularly (U.S. Food and Drug Administration, n.d.) (ASHA, n.d.). Regular screenings should be completed regardless of current sexual activity status because cancer may take years to develop (ASHA, n.d.). HPV infections may lead to cancer when the virus stays in the body for years (CDC, 2018a). Every year, HPV is associated with 44,000 new cases of cancer, with approximately 34,800 cases found to be caused by this virus (CDC, 2019b). The HPV vaccination can prevent 81% of newly diagnosed HPV-associated cancer cases each year (GW Cancer Center, 2017). HPV-associated cancers include cervical, vaginal, vulvar, penile, anal, and oropharyngeal. Cancers associated with this virus have specific cellular types which helps with diagnosis (CDC, 2019b). Cervical cancer is the most common cancer associated with HPV. “HPV is thought to be responsible for more than 90% of anal and cervical cancers, about 70% of vaginal and vulvar cancers, 60% of penile cancers, and 60% to 70% of oropharyngeal cancer” (CDC, 2018a, para. 2). Cervical cancer can be eliminated through primary HPV vaccinations and secondary prevention approaches, such as screening and treatment of precancerous lesions, and thus the deaths associated with cervical cancer can be avoided and lives can be saved (WHO, n.d.). By avoiding contributing factors associated with risky behaviors, HPV and more serious consequences can be prevented.

Factors Contributing to HPV Infection

There are many factors that increase an individual's chance of contracting HPV, such as lack of testing, lack of knowledge on transmission and prevention techniques, and participating in risky sexual behaviors. Risky sexual behaviors include partaking in unprotected sexual activity, drinking, using drugs, lack of testing, and having multiple sexual partners (Bogle, 2008; McAnulty, 2012).

STI testing. According to the American Cancer Society, a Pap test, also called Pap smear, is a screening procedure that tests for abnormal (cancer) cells in the cervix (2020). Changes in cervical cells can be caused by the HPV virus. The HPV test is used to look for the HPV virus in cervical cells. An HPV test can be completed at the same time as a Pap smear, also known as co-testing (American Cancer Society, 2020). For many people with HPV there are no symptoms. Men are typically asymptomatic carriers of HPV (Medeiros & Ramada, 2010). The asymptomatic nature of HPV can hide the fact that HPV is present contributing to the spreading of the virus (CDC, 2019f). Just because symptoms are not present does not mean that an STI is not present. If the test is positive for HPV, individuals will know to take preventive measures during sexual activity. University students who engage in unprotected sexual activity put themselves at a greater risk for contracting an STI such as HPV (Mair, Ponicki, & Gruenewald, 2016). These actions can increase individuals' and their sexual partners' risk of HPV.

More than half of the adolescents in the United States engage in sexual intercourse before the age of 18 (CDC, 2019e). Pap smear testing begins at 21 years old (Choosing Wisely, 2016). According to the American Cancer Society, women 21-29

years old should have a Pap test every 3 years, and if the results are abnormal, an HPV test should be completed (2020). Women 30 through 65 should have an HPV test completed with their Pap test every 5 years. HPV tests have only been approved to test a woman's cervix. Although HPV occurs in other parts of the body there are no proven tests to manage positive results. The only efficient way to test for HPV is through Pap smear tests on women (American Cancer Society, 2020). In addition to being tested, using barrier methods and reducing other sexual risk behaviors are the best ways to prevent and treat sexually transmitted infections (Felson, 2018).

Sexual risk behaviors. Sexual risk taking can have serious health consequences (McAnulty, 2012). According to McAnulty, sexual risk is defined as engaging in unprotected sexual activity (i.e., vaginal, oral, anal), having multiple sexual partners, and having sex with an individual that one does not know well (McAnulty, 2012). Unprotected sex includes sexual activity without the use of barrier methods or other pregnancy contraceptives making an individual more likely to become pregnant and/or get a sexually transmitted infection (STI) (Felson, 2018). Barrier methods help protect not only the individual but also their sexual partners from STI's. However, HPV is commonly carried on skin that is not necessarily covered by traditional barrier methods, such as condoms, and prevention of transmission is not guaranteed with use (Wallace, n.d.). The skin-to-skin transmission of HPV differentiates it from many other STI's that are spread primarily through the exchange of bodily fluid.

Various factors influence college students' behavioral choices. They include social pressures to consume alcohol or use drugs before or during sex, engage in

unplanned and impulsive sexual activity, and the inability to discuss risky sexual encounters prior to engaging in those sexual activities (Bogle, 2008; McAnulty, 2012). They all contribute to risky sexual behaviors. The prevalence of alcohol use among college students is associated with the likelihood of non-committal sexual activity (Dvorak et al., 2016). Non-committal sexual activity, sometimes termed as hooking up, has become the norm on college campuses (Bogle, 2008). According to Dvorak et al. (2016), non-committal sexual encounters with strangers is common among university students. In a study by Sutton and Simons (2014), 66% of men and 50% of women have reported having non-committal sexual activity at least once, while 18.2% of men and 10.5% of women reported having non-committal sex 10 or more times. “Hookups are sexual encounters between partners without the expectation of romantic commitment” (Dvorak et al., 2016, para. 2).

The age in which sexual activity begins differs based on each individual (Guttmacher Institute, 2019). The number of adolescents that have had sexual intercourse increases as they age (Guttmacher Institute, 2019). Most students are sexually active by the time they start college, however research on the prevalence of sexual activity during college is limited. According to Finer and Philbin, 30% of teens ages 15-16 have had sex (2013). Over half of the adolescents in the United States have had sexual intercourse before the age of 18 (CDC, 2019e). In 2013, the Guttmacher Institute found that approximately 20% of adolescents at age 15 reported sexual activity, compared to approximately 67% of 18-year-olds (2019). Common reasons for abstaining from sexual activity, among teens who reported no sexual activity at the age of 18, included religion,

moral beliefs, and not finding the right person (Planned Parenthood, 2017). Children 12 and younger who have engaged in sexual activity typically did not consent (Finer, & Philbin, 2013). Young adults between the ages of 15 and 25 have the highest rates of HPV infections, and half of the newly diagnosed sexually transmitted diseases are reported among them (CDC, 2019f; Dempsey, 2008). More than half of males and females are sexually active before they are 18 years old, however HPV is not normally tested for before the age of 21. There is a gap between the initiation of sexual activity and HPV testing which could lead to an increase in transmission.

Multiple factors influence sexual risk-taking including alcohol, peers, family, and religion. Alcohol influences social behaviors, such as increasing aggression, risky sexual activity, and others (Steele & Southwick, 1985). Alcohol impairs an individual's ability to foresee negative consequences associated with actions (Steele & Southwick, 1985). Frequency and strength of drinks are connected to an increased number of sex partners and the increased frequency of unplanned sex (Mair, Ponicki, & Gruenewald, 2016). Off-campus events associated with heavy alcohol consumption, including bars, apartments, and parties, are all associated with unprotected sexual activity (Mair et al., 2016). An increase in unprotected sex is seen among sorority and fraternity members, males, and non-white students compared to those not in these demographics (Mair et. al, 2016). Individuals who are in a relationship are more likely to have fewer partners, but more frequent unprotected sex (Mair et. al, 2016).

Alcohol use is linked to noncommittal sexual activity and a variety of sexual risk outcomes (Dvorak et al., 2016). Another study found that "males reported more one-night

stands, partners in the last year, and intentional sex without emotional involvement" (Townsend, & Wasserman, 2011, para 23). Females tend to be more selective in choosing partners, whereas males are less selective and are more willing to engage in non-committal sexual intercourse (Townsend, & Wasserman, 2011). Based on these known risk behaviors, it is essential that we address preventive efforts prior to the initiation of the behaviors. The best way to prevent these risk factors would be by receiving the vaccine. HPV vaccines are available and can decrease, and even prevent, the associated health consequences from occurring (CDC, 2019a).

HPV Vaccines

Vaccinations available to protect against HPV include Gardasil, Gardasil 9 and Cervarix (NIH, 2019). Each of these vaccines prevent infection for HPV types 16 and 18. HPV types 16 and 18 are known to cause cancer (National Institute of Health, National Cancer Institute, 2018). A series of vaccinations are required for full protection against HPV. The HPV vaccination series is recommended for adolescents at age 11 or 12 (CDC, 2019c).

Cervarix is only available to women and protects against HPV types 16 and 18 (Boskey, 2020). The Cervarix vaccine is no longer used in the United States, but it is used in Europe and China. This is the only HPV vaccine that is used in China (Boskey, 2020). The Food and Drug Administration (FDA) approved Gardasil for use in 2006 (Richards, 2016). The Gardasil vaccine was originally only approved for girls ages 11 to 12, however, in 2009 the Gardasil vaccine was made available to males (Richards, 2016). In addition to types 16 and 18, Gardasil also prevents HPV types 6 and 11 (NIH, 2019).

Quadrivalent vaccine is another name commonly used for Gardasil since it protects against four different HPV types (Boskey, 2020). Since Gardasil-9 protects against more HPV strains, the Gardasil vaccine is no longer used (Boskey, 2020).

The Gardasil 9 vaccine was approved for use in 2014, which protects against the same four HPV strains as the Gardasil vaccine, as well as five additional HPV types (FDA, 2018). The Gardasil 9 vaccine protects against HPV types 6, 11, 16, 18, 31, 33, 45, 52 and 58 (Merck Sharp & Dohome Corp, n.d.). The Gardasil 9 vaccination was originally recommended for people ages 9 through 26, although it has since been approved to include those 27 through 45 years of age (FDA, 2018). HPV vaccination uptake is related to an individual's knowledge on the vaccine. Individuals who have less information and knowledge about the HPV vaccination are less likely to receive the vaccine (Donadiki et al., 2014). Those who have misconceptions about the vaccination are also less likely to be get vaccinated (Donadiki et al., 2014).

HPV vaccine schedule. A 2-dose schedule is recommended for adolescents who receive their first dose before turning 15 years old (CDC, 2019c). If an individual is administered the first dose before turning 15, the second dose should not be given within the first 5 months after receiving the first (CDC, 2019c). A 3-dose schedule is recommended for adolescents who received their first dose after turning 15 years old and those with immunocompromising conditions (CDC, 2019c). "In a 3-dose series, the second dose should be given 1-2 months after the first dose, and the third dose should be given at least 6 months after the first dose" (CDC, 2019c, para. 7). When an additional

dose is given before the recommended time, another dose will need to be administered, however, there is no maximum time limit between doses (CDC, 2019c).

HPV vaccine uptake. According to the American College Health Association – National College Health Assessment II (ACHA-NCHA II), 60.2% of college students from a midwestern university reported receiving the HPV vaccine (2019). This study did not state whether the 60.2% referred to one dose or the completion of the series (ACHA-NCHA II, 2019). A study determining HPV knowledge, attitude, and vaccination among Chinese college students in the United States found that the majority of participants had never received the HPV vaccine (Tung et al., 2019). In a large study (n = 449), 57.7% of participants had never received the vaccination, 18.4% were unsure if they had, and only 38.3% of participants had received one to three doses (Tung et al., 2019). The study found that out of the 38.3%, only 22% of participants had completed the three doses. According to Tung and colleagues, "older individuals were less likely to receive the HPV vaccine (29.7%) compared to younger participants (43.7%)" (p. 3202). Other differences found in HPV vaccine uptake included gender, knowledge, and attitude (Tung et al., 2019). There are barriers associated with vaccine uptake that influences an individual's decision to receive the HPV vaccine.

Barriers to HPV Vaccine Uptake

Potential barriers for healthcare providers offering the HPV vaccine to patients include parents' attitudes and concerns regarding HPV vaccination, financial concerns, knowledge gaps, insurance coverage, personal preference for age for vaccinating, and personal preference for vaccinating girl's vs boys (Holman, et al., 2014).

Key barriers for parents include not receiving a health care professional's recommendation for the HPV vaccine, belief that one's child is not of age to get vaccinated for HPV, concerns on the side effects and safety of the vaccination, the cost of the HPV vaccine, lack of knowledge, vaccine effect on sexual behavior, and the travel distance to receive the vaccination (Holman et al., 2014). Additional barriers for underserved and disadvantaged populations include distrust of the healthcare system, lack of health insurance, cultural factors, and immigration status (Holman et al., 2014). Studies have found that most parents are aware of the HPV vaccine but need more information on the vaccine before committing to vaccinating their children (Holman et al., 2014). By giving parents more information on the HPV vaccine, this could decrease the barrier of concern about the side effects and safety. Parents are also worried that by receiving this vaccine it will have an effect on their child's sexual behavior. Parents of adolescents are concerned that by receiving the vaccination they are condoning sexual activity among their teenagers (Holman et al., 2014). However, a study done by Liddon, Leichliter, and Markowitz found that the HPV vaccination was not associated with sexual activity among adolescent women (2012). The study also found that those who received the HPV vaccine were more likely to wear condoms during sexual activity (Liddon, Leichliter, and Markowitz, 2012). Overall, it has been found that those who have received the vaccine have not been found to be more sexually active than those who have not (Liddon et al., 2012).

Barriers associated with adolescents receiving the HPV vaccine include low perceived benefit, lack of perceived risk of HPV infections, and lack of awareness that

they can receive the vaccine (Holman et al., 2014). The National Immunization Survey (NIS)-Teen data indicates that the HPV vaccine uptake is much lower among male adolescents compared to females (CDC, 2015b). Other HPV vaccine barriers include social repercussions associated with getting the vaccine and follow-up care/appointments. Depending on the age of receiving the first dose, adolescents may need two to three vaccine doses. Parents and adolescents must be aware of the doses needed to be effective. Families may also get too busy to return for the other doses (Holman et al., 2014).

A study by Hirth, Batuuka, Gross, & Berenson (2018) found common misconceptions among college students include lack of vaccine awareness, cost concerns, convince, fear of needles and side effects, lack of effectiveness, and negative social influences, attitudes, and opinions. Social influences include decisions made by parents, health provider input, partner input, family and friend recommendation, and social media (Hirth, Batuuka, Gross, & Berenson, 2018). Negative opinions can come from family, friends, social media, and grassroot efforts to discourage HPV vaccinations. Students noted that not only the cost, but also the cost of transportation, a lack of transportation, time constraint, and having to attended appointments to receive the vaccination as barriers (Hirth et al., 2018).

Attitudes towards HPV and the vaccination. Researchers Tung and colleagues surveyed university students and found that older participants, and participants without a consistent health care provider, more frequently reported negative attitudes towards HPV and the vaccination when compared to younger participants and those with a consistent health care provider (Tung et al., 2019). The beliefs about HPV were not found to differ

based on the sexual experience of the participants (Hsu, Cheng, Hsu, Fetzer, & Chou, 2011). An individual's attitudes toward HPV infections and the associated risks are linked to seeking information from a doctor and other sources (Baldwin et al., (2013). Individuals with prior knowledge and awareness of the HPV vaccination had more positive attitudes about it, compared to those without prior knowledge (Dany, Chidiac, & Nassar, 2015). Economic status has also been shown to play a role in attitudes toward the HPV vaccine. One study found that people with low socioeconomic status exhibited more negative attitudes regarding the HPV infection and vaccine (Dany et al., 2015). The individuals' knowledge, along with their economic status and access to a primary care provider, all factor into individuals' overall attitudes toward the HPV infection and vaccination. Correct or incorrect knowledge affects attitudes making determination of level of knowledge important, so that health educators can focus on commonly misunderstood content.

Health Belief Model (HBM)

The Health Belief Model (HBM) is a health behavior change model used to predict health-related behaviors. According to the HBM, heath-related action depends upon three constructs: 1) The existence of sufficient motivation 2) The belief that an individual is susceptible to a serious health problem/illness 3) The belief that following a health recommendation would decrease the perceived threat to contracting a health-related problem/illness (Sharma & Atri, 2010, p. 85). This model's framework is used to explain and influence an individual's health behaviors. It is used to encourage people to make positive actions to avoid the consequences from a negative health behavior. The

HBM focuses on the individual's perceptions (Donadiki, Jiménez-García, Hernández-Barrera, Sourtzi, Carrasco-Garrido, López de Andrés, Velonakis, 2014). The HBM is useful in determining university students' perceived susceptibility, severity, barriers and benefits regarding HPV infections and the vaccination. The use of the HBM may help determine whether or not university students perceive themselves to be at risk of contracting HPV and whether or not college students intend to receive the Gardasil 9 vaccination.

Previous research has applied the HBM to examine beliefs, behaviors, and perception of risks associated with vaccinations and vaccine uptake in order to identify patients' perceptions of diseases and vaccinations (Donadiki, et al., 2014). A study done by Donadiki and colleagues used the constructs of perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cue to action, and self-efficacy to examine the reasons why female university students refuse the HPV vaccination. Students that ranked perceived barriers, and no general benefits, with a high score were more likely to refuse the vaccination. Whereas, those who ranked perceived general and vaccination barriers low were more likely to receive the vaccination (Donadiki et al., 2014). By using the HBM, researchers are able to predict students who are more likely to be vaccinated compared to those who are not. They are also able to predict why students are not vaccinated. This study stated that using the HBM to determine an individual's perceived benefits, barriers, susceptibility, and severity of receiving the HPV vaccine may be key in the development of educational materials (Donadiki et al., 2014).

Knowledge and awareness related to HPV and HPV vaccines. Knowledge and awareness of HPV infections and HPV vaccine relates to an individuals' perceived susceptibility and perceived severity. In one study by Baldwin and colleagues (2013), mothers with higher perceived susceptibility toward HPV were more likely to discuss the HPV vaccine with a physician. In a large study assessing physicians' quality of HPV vaccine recommendations, their strength of endorsement, timeliness, consistency, and urgency, researchers found that a majority of physicians recommended the HPV vaccination irregularly, with a lack of urgency, and behind schedule (Gilkey, Malo, Shah, Hall, & Brewer, 2015). Only half of the physicians reported recommending same-day vaccinations and 27% reported not strongly endorsing the HPV vaccination (Gilkey et al., 2015).

Differences in knowledge among demographic variables. Several studies have shown that females have greater knowledge about HPV when compared to males. In a study done by Tung, Lu, Qiu, and Ervin (2019), males exhibited lower HPV knowledge when compared to females, 36.6% vs 49.4%. Medeiros and Ramada (2010) also found a relationship between knowledge and gender. They surveyed 1706 university students in Portugal regarding knowledge about cervical cancer and HPV, the relationship between HPV and cervical cancer, and attitudes towards HPV vaccination and sexual education. They found that 40.2% of males and 64.1% of females had heard of HPV (Medeiros & Ramada, 2010). A lack of knowledge and education among males may lead to low vaccination rates (Mccutcheon & Schaar, 2017). Males lack of knowledge in regard to

HPV and the vaccine may be attributed to the fact that the vaccine was originally approved for girls ages 11 to 12 years old.

Studies have also found an association between level of knowledge about HPV infections and the vaccine, and students who are studying health science. Medeiros & Ramada (2010), found an association between students in a health-related major and awareness of HPV. According to Tung et al. (2019), health science students have significantly more knowledge on HPV and the vaccine when compared to non-health science majors. This study found that 61.4% of health-related majors understood HPV compared to the 42.2% of non-health-related majors (Tung et al., 2019).

The main source of HPV information varies based on gender and major (Medeiros & Ramada, 2010). A relationship was discovered between being a health science student and choosing school/teaching as the main source of information on HPV (Medeiros & Ramada, 2010). The study also found that male, non-health students selected media as their main source of information on HPV, whereas female, non-health students reported that their primary source of HPV information came from health professionals, and their secondary source of information came from the media (Medeiros & Ramada, 2010). Their study found a significant association between male health science students, female students, whether they were health-science or non-health science, and HPV awareness (Medeiros & Ramada, 2010).

Summary

This chapter examined the factors that influence the behavior choices of college students; cancers associated with HPV; the sexual activity of college students; HPV

vaccines; the barriers associated with HPV vaccine uptake; and current research on college students' knowledge and attitudes toward HPV, the HPV vaccination, and health science and non-health studies. There is limited research that examines the knowledge and attitude differences between gender and major. Previous research studies indicated that there are many misconceptions associated with the HPV vaccine. Studies have also shown that knowledge plays a significant role in attitudes toward the HPV vaccine. It is important to understand students' knowledge about HPV and the vaccine for health education and public health programing.

Chapter 3: Research Methodology

Introduction

The purpose of this study was to assess college students' knowledge and attitudes towards HPV infections, the HPV vaccination, and determine if knowledge and attitudes differ based on the student's gender and field of study. This chapter presents a description of the research design, the sample to be used, sampling technique, research instruments, data collection procedures, and data processing and analysis.

Research Design

A descriptive, cross-sectional research design was used to collect quantitative data from students at a large, Midwestern university. A descriptive research design has the advantage of explaining what the data shows and is used to simplify large amounts of data (SRM, 2006). "Descriptive research designs help provide answers to the questions of who, what, when, where, and how associated with a particular research problem" (University of Southern California [USC] Libraries, 2019, para. 24). Additionally, descriptive research provides information on current status of particular occurrences (USC Libraries, 2019). Using a descriptive research deign will describe the behaviors and attitudes related to HPV infections and the vaccination.

Cross-sectional studies provide a snapshot of a group of people at a given time (Cherry, 2019). Since the data collection for this research was from a sample of university students at a given time, a cross-sectional design was most appropriate. The focus of this study was on the current status of knowledge and attitudes towards HPV

infections and the HPV vaccination among university students. There was no intervention completed to see if their knowledge and attitudes change in the future.

Subject Selection

The sample consisted of students that were enrolled at a large, Midwestern university. Participants were selected from large enrollment courses including undergraduate students enrolled as part time or full time, 18 years of age, of any sex or gender, and all ethnic backgrounds. A convenience sampling technique was used to obtain students for the study. Salkind (2012) defines convenience sampling as a "a group of participants from whom a sample will be drawn is easily accessible and easy to select" (p. 74). The advantages of convenience sampling include inexpensive and participants are readily available. Disadvantages include biased results and inability to generalize the results (Statistics How To, 2015). However, hidden biases can be reduced by ensuring university students of any ethnicity and age participate in the study by using participants in different large enrollment courses. The researcher ensured eligibility by announcing to students present in the lectures that participants must be 18 years of age and older. The researcher also announced that anyone under the age of 18 should not fill the survey out and must turn it in blank.

Participants in this study were not compensated for their participation, and no incentives were used to encourage participation. The total enrollment at the university was estimated to be about 15,000. Based on the number of students at the university, and the Krejcie and Morgan (1970) model, the estimated number of participants needed for

the study was 380 to reflect the university population. Too small of a sample size increases the likelihood of a type two error (Deziel, 2019).

Upon IRB approval, the instructors of the large enrollment courses were contacted in person and by email to obtain permission to distribute the survey to their class. To obtain volunteer participants, a supervised distribution method was used in order to achieve an optimal response rate. Surveys were distributed during the course's scheduled class time along with a consent form. To obtain informed consent, the researcher went into large enrollment courses and introduced the study. The researcher read the informed consent aloud, made sure that every student received a copy, and left the room while the surveys were completed.

Instrumentation

The students in the large enrollment courses were asked to complete a paper-based survey. The survey consisted of three sections including (1) demographics, (2) knowledge about HPV and the vaccine, and (3) attitudes towards HPV and its vaccination.

The demographics section was developed by the researcher and was designed to collect information on year in school, sex, part or full-time student, major of study, and HPV vaccine uptake. For major of study, participants could select health-related, education, arts, business, chemistry/engineering/biology, undeclared, or other. Majors that classify as other include law enforcement, psychology, sociology, and social science.

The survey questions on knowledge regarding HPV and the vaccine were developed by Dany et al. (2015), along with additional questions created by the researcher. This survey was selected after an extensive review of existing literature. Dany et al. (2015) did not assess the validity or reliability of the instrument, however, this instrument was also used by researchers Tung et al. (2019) who established content validity of the instrument (Tung et al., 2019). Participants completed 21 true-false items to evaluate their HPV infection and vaccine knowledge. These questions assessed participants knowledge on the signs and symptoms of HPV, ways of transmission, those affected, age in which the vaccination is optimal, and what the vaccine protects against.

The survey questions on attitudes towards HPV infections and the vaccination were developed by Dany et al. (2015) and Donadiki et al. (2014). The survey items that assessed attitudes towards HPV and the vaccination consisted of thirteen five-point Likert-scale items which asked participants about their perceived susceptibility, perceived severity, beliefs on vaccine capability, and benefits and barriers toward the vaccine. Participants were able to choose: 1-Strongly agree, 2-Agree, 3-Neutral, 4-Disagree, or 5-Strongly disagree (Tung et al., 2019). Summated scales determine attitudes and behaviors. Content validity of the instrument was established, but other psychometric properties of the instrument have not been recognized.

Data Collection

Surveys were distributed via paper copy to university students upon approval from the university Institutional Review Board (IRB). Using the eservices website, various general education courses, primarily large enrollment lectures, were selected

from multiple university departments. Participants were required to be a minimum of 18 years, and enrolled in classes at a large Midwestern university, in order to participate in this research. Students were asked to voluntarily participate by filling out the survey after the informed consent document was read aloud. Participants were informed about the purpose of the study, that all their responses would remain confidential, and that all information would be used strictly for research purposes only.

Data Processing and Analysis

The data was cleaned to remove incomplete surveys, and surveys that did not meet inclusion criteria. The data collected on completed instruments was entered into *Statistical Package for Social Sciences* (SPSS), version 25 for data management and analysis (IBM, 2017). Knowledge on HPV infections and the HPV vaccination was measured through descriptive statistics, independent T-tests, and ANOVA.

Table 1

Table of Specification

Research Questions (RQ)	**Survey Items to be used to assess RQ**	**Level of Data (Nominal, Ordinal, Interval/Ratio)**	**Analysis needed to assess RQ**
To what extent do university student's knowledge towards HPV infections statistically differ by demographics?	- Individual items on the knowledge about HPV survey. - Total summated scores of knowledge scale.	- Nominal - Interval/ratio	- Descriptive Statistics - T-test for independent samples
To what extent do university student's knowledge towards the HPV vaccine statistically differ by demographics?	- Individual items on the knowledge about HPV survey. - Total summated scores of survey.	- Nominal - Interval/ratio	- Descriptive Statistics including frequencies, percentages, and measures of central tendency - T-test for independent samples
To what extent do university student's attitudes towards the HPV vaccine statistically differ by demographics?	- Individual items on the attitude about HPV survey. - Total summated scores of survey.	- Ordinal - Interval/ratio	- Descriptive Statistics including frequencies, percentages, and measures of central tendency - T-test for independent samples
To what extent do university students perceive themselves to be at risk for HPV infections?	- Based on my lifestyle, I believe I am susceptive to HPV infection.	- Ordinal	- Descriptive Statistics including frequencies, percentages, and measures of central tendency
To what extent have university students received the HPV vaccines?	- Have you received any of the recommended HPV vaccines?	- Nominal	- T-test for independent samples

Summary

This chapter examined the research design, subject selection, instrumentation, and how data was collected, processed, and analyzed. In this study, a descriptive, cross-sectional research design was used to collect quantitative data from students at a large, Midwestern university. A convenience sampling technique was used to obtain students from large enrollment courses at a given time. It was a self-report study in which participants read the questions and answered survey questions to the best of their ability.

Chapter 4: Results

The purpose of this study was to assess the knowledge and attitudes of current university students regarding HPV infections, the HPV vaccination, and determine whether knowledge and attitudes vary based on the student's gender and field of study. The data collected was analyzed using *Statistical Package for Social Sciences (SPSS*), version 25. The study addressed the following research questions.

1. To what extent do university student's knowledge towards HPV infections statistically differ by demographics?
2. To what extent do university student's knowledge towards the HPV vaccine statistically differ by demographics?
3. To what extent do university student's attitudes towards the HPV vaccine statistically differ by demographics?
4. To what extent have university students received the HPV vaccines?
5. To what extent do university students perceive themselves to be at risk for HPV infections?

Participants

The sample size was a convenience sample of 422 participants. The majority of the participants were females (n = 277, 65.64%) as opposed to males (n = 145, 34.36%). When asked about their highest education level, most participants reported being in their first year of college. Participants were also asked their major in school and whether they were part-time or full-time students. Most participants reported being enrolled as full-

time students (n = 409, 96.90%) as compared with part-time students (n = 12, 2.80%) (See Table 2).

Table 2

Demographic Information (N = 422)

Variable	n (%)
Gender	
Male	145 (34.36)
Female	277 (65.64)
Academic Year	
1st	271 (64.20)
2nd	94 (22.30)
3rd	35 (8.3)
4th	20 (4.70)
5th +	2 (0.5)
Academic Status	
Part Time	12 (2.80)
Full Time	409 (96.90)

Variable	n (%)
Major	
Health Related	163 (38.60)
Education	75 (17.80)
Arts	14 (3.30)
Business	42 (10.0)
Chemistry/Engineering/Biology	23 (5.50)
Undeclared	20 (4.70)
Other	77 (18.20)
Participants who have received at least one of the HPV vaccines	
Yes	205 (48.6)
No	102 (24.20)
Unsure	114 (27.0)

Note: * Totals not adding up to 422 indicate missing data

Knowledge of HPV Infections

The mean score for the knowledge section was 7.52 (SD = 1.33). It should be noted that a majority of participant thought that the human papillomavirus causes herpes (n= 271, 64.22%), and approximately half of participants did not know that despite a normal Pap test result, a woman could still have an HPV infection (n= 195, 46.21%). Only 3.32% (n= 14) of participants were unaware that HPV can be transmitted through vaginal, anal, and oral sex as well as genital to genital contact. On the other hand, the

majority of participants were aware that HPV infections are highly associated with cervical cancer (n= 375, 88.86%). Most participants also knew that HPV infections are not caused by the same type of virus (n=335, 79.38%) (See Table 3).

Knowledge of HPV Vaccine

The mean score for the HPV vaccine knowledge section was 7.49 (SD = 1.52). Most of the participants believe there is a time limit in which additional vaccine doses must be given (n=316, 74.88%), and only half knew that the HPV vaccine is recommended for both boys and girls ages 11 and 12 (n=230, 54.50%). Most participants knew the HPV types that the Gardasil 9 vaccine protects against (n=367, 86.97%). About one-third of participants believed that receiving the HPV vaccine encourages people to engage in sexual behavior (n=126, 29.86%). Even though most participants were aware that HPV infections are highly associated with cervical cancer (88.86%), approximately half did not know that the HPV vaccine protects against cervical cancer (n=190, 45.02%) (See Table 3).

Table 3

Participants knowledge regarding the human papilloma virus and the vaccination (n = 422).

Knowledge statement	Correct n (%)	Incorrect n (%)
"HPV can be transmitted through vaginal, anal, and oral sex as well as genital to genital contact."	408 (96.68 %)	14 (3.32%)
"Only females can be infected with HPV and show symptoms."	392 (92.89%)	30 (7.11%)
"The type of cancer highly associated with the HPV infection is cervical cancer."	375 (88.86%)	47 (11.14%)
"HPV vaccine is best taken before someone ever participates in sexual activities."	369 (87.44%)	53 (12.56%)
The Gardasil 9 vaccine protects against HPV types 6, 11, 16, 18, 31,33,45, 52 and 58.	367 (86.97%)	55 (13.03%)
"Women who receive HPV vaccine still have to get Pap smear."	363 (86.02%)	59 (13.98%)
"Human Papilloma virus can lead to genital warts (growths on the genitals)."	336 (79.62%)	86 (20.38%)
"All HPV infections are caused by the same type of virus."	335 (79.38%)	87 (20.62%)
"HPV can be transmitted from a carrier to his/her partner only if the carrier shows symptoms."	333 (78.91%)	89 (21.09%)
"HPV vaccines do not protect against all HPV infections that cause cancer."	326 (77.25%)	96 (22.75%)
"HPV vaccines have the same effect whether the female takes it before or after being infected with HPV."	325 (77.01%)	97 (22.99%)
"HPV vaccine can only be taken after age of 18 years."	322 (76.30%)	100 (23.70%)
"In most cases, HPV infected persons do not show symptoms."	310 (73.46%)	112 (26.54%)
"There is no current cure for the HPV infection."	306 (72.51%)	116 (27.49%)

Knowledge statement	Correct n (%)	Incorrect n (%)
People who receive the HPV vaccine are more likely to engage in sexual behavior.	296 (70.14%)	126 (29.86%)
"HPV vaccine protects against cervical cancer."	232 (54.98%)	190 (45.02%)
The HPV vaccine is recommended for males and females ages 11 and 12.	230 (54.50%)	192 (45.50%)
"A normal Pap smear implies that the women is free of HPV."	227 (53.79%)	195 (46.21%)
There are three types of HPV vaccines, but only one is used in the United States.	226 (53.55%)	196 (46.45%)
"Human Papilloma virus can cause herpes."	151 (35.78)	271 (64.22)
There is no maximum time limit between the HPV vaccine doses.	106 (25.12%)	316 (74.88%)
Note: Question items derived from source (Dany et al., 2015)		

Attitudes Toward HPV Vaccine

The mean score for this attitude section was 46.57 (SD = 6.23). Approximately 15% of participants agreed that they are susceptible to getting an HPV infection and only half agreed that it is essential to receive the HPV vaccine. The majority of participant responses demonstrated a positive attitude toward the price of the vaccine (n=381, 90.40%). Most participants agreed that they would recommend the vaccine to their friends (n=291, 69%) and that all gynecologists and health care providers should recommend the vaccine to their patients (n=328, 77.7%). However, only 11.4% of participants believed that they had enough information on the HPV vaccine. A majority of participants believed that they are not susceptive to an HPV infection (n=272, 64.5%). Only 51 participants (12.10%) believe that they are susceptive to HPV infection (See Table 4).

Table 4

Participants attitudes toward HPV infections and the vaccination (n = 422)

Attitude Assessing Statement	**Strongly Agree n (%)**	**Agree n (%)**	**Neutral n (%)**	**Disagree n (%)**	**Strongly Disagree n (%)**
"Based on my lifestyle, I believe I am susceptive to HPV infection."	10 (2.4%)	41 (9.7%)	98 (23.2%)	135 (32.0%)	137 (32.5%)
"Receiving the HPV vaccine is essential for me."	85 (20.10%)	129 (30.60%)	144 (34.10%)	47 (11.1%)	17 (4.0%)
"I believe that contracting HPV is serious and life threatening."	138 (32.7%)	199 (47.2%)	68 (16.10%)	13 (3.10%)	2 (0.5%)
"I believe that the current HPV vaccine is capable of preventing the occurrence of cervical cancer."	57 (13.50%)	168 (39.80%)	149 (35.30%)	43 (10.20%)	4 (0.90%)
"I believe that the price of the vaccine is affordable."	42 (10.0%)	126 (29.90%)	213 (50.50%)	35 (8.30%)	5 (1.20%)
"I believe that the side effects of the vaccine are reasonable and will not deter me from taking the vaccine."	88 (20.9%)	172 (40.8%)	146 (34.6%)	10 (2.40%)	6 (1.40%)
"I would recommend the HPV vaccine for my friends."	111 (26.3%)	180 (42.7%)	109 (25.8%)	16 (3.80%)	4 (0.90%)

Attitude Assessing Statement	Strongly Agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly Disagree n (%)
"I believe that all gynecologists and primary care providers should recommend the vaccine to their patients."	130 (30.80%)	198 (46.90%)	84 (19.90%)	9 (2.10%)	1 (0.2%)
"It is preferable to get HPV and to be protected naturally than to vaccinate."	20 (4.70%)	47 (11.10%)	85 (20.10%)	123 (29.10%)	147 (34.80%)
"I believe that if I receive the HPV vaccine, I will not be protected against HPV."	3 (0.7%)	28 (6.60%)	93 (22.0%)	230 (54.5%)	67 (15.90%)
"I do not have enough information about the HPV vaccine."	121 (28.70%)	137 (32.50%)	113 (26.8%)	38 (9.0%)	10 (2.40%)
"Cost would influence my choice to receive the HPV vaccine."	24 (5.70%)	126 (29.90%)	113 (26.80%)	127 (30.10%)	32 (7.60%)
"I do not believe that HPV is exceptionally harmful."	12 (2.80%)	61 (14.50%)	100 (23.70%)	172 (40.80%)	77 (18.20%)
Note: * Totals not adding up to 100% indicate missing data Question items derived from sources (Dany et al., 2015 & Donadiki et al., 2014).					

Vaccine Uptake

The majority of participants reported that they have received at least one dose of the HPV vaccine (n = 205, 48.60%) or were uncertain of their HPV vaccine status (n = 114, 27.0%). A total of 24.20% (n = 102) of participants reported that they have never received the HPV vaccine. Of the 205 participants that reported receiving at least one dose of the HPV vaccine, 147 (71.71%) reported that they completed the total

recommended doses, 20 (9.76%) reported not completing the recommended doses, and 38 (18.54%) participants were unsure.

Factors Associated with HPV Knowledge and Attitudes and the Vaccine

Females demonstrated higher HPV infection knowledge (M = 7.66, SD = 1.27) when compared to males (M = 7.25, SD = 1.41) (t(420) = -3.053, p<.05). There was no significant difference in HPV infection knowledge based on year in school (f(4,417) = 2.390, p>.05). In addition, there was no significant difference in participants' HPV infection knowledge when compared to major in school (f(6,407) = .300, p >.05). Females also demonstrated higher HPV vaccine knowledge (mean = 7.66, SD = 1.48) when compared to males (mean = 7.17, SD = 1.54) (t(420) = -3.176, p<.05). There was no significant difference between HPV vaccine knowledge and participants year in school (f(4,417) = 1.652 , p>.05) or their major (f(6,407) = 1.446, p >.05).

The total attitude mean of all participants was 46.57 out of 65 (SD=6.23). As for attitudes towards HPV and the vaccine, male participants (mean =44.43; SD = 47.69) scored lower compared to female participants (mean = 47.69; SD = 6.33) (t(323.830) = -5.448, p<.05). No significant differences were found between attitudes towards HPV and the vaccine based on participants' year in school (f(4,406) = 1.127 , p>.05). A one-way ANOVA showed that there was a significant difference between the attitudes of participants and their major in school (f(6,396) = 3.305, p <.05). The results of the Tukey post-hoc analysis revealed statistically higher attitudes among those in "Health Related Majors" (M=48.24, SD=6.16) and those that indicated "Other Majors" (M=45.36, SD=6.11) (p<.05).

Summary

The purpose of the study was to assess the knowledge and attitudes of current university students regarding HPV infections, the HPV vaccination, and determine if knowledge and attitudes differ based on the student's gender and field of study. The researcher assessed the knowledge level of participants regarding HPV infections and vaccines. Additionally, the researcher examined the attitudes regarding HPV vaccines of participants. The researcher also examined the relationship between knowledge and attitude scores with gender, year in school, and major to determine whether there was a difference in knowledge and attitudes. Females demonstrated more HPV infection and vaccine knowledge when compared to males. There was no significant difference in HPV infection and vaccine knowledge based on year in school or the participants' majors. Based on participants' answers, they reported a moderate attitude score regarding HPV and the vaccine.

Chapter 5: Discussion, Conclusion and Recommendations

Young adults have the highest rates of HPV infections; and half of the newly diagnosed STI's are reported in those between 15 and 25 years of age (CDC, 2019f; Dempsey, 2008). It is important to research the attitudes and knowledge of those with the highest risk of HPV infections to determine what may affect their decisions in receiving, or not receiving, the HPV vaccine. This chapter will discuss a summary of the study, discussion and conclusion, recommendations for future health education, and recommendations for future studies.

Summary

This study consisted primarily of female university students. The majority of participants were first year students in health-related majors. Surveyed participants were asked about their knowledge on HPV infections and the vaccination, attitudes, and vaccine uptake. The data for this study was collected through a 42-item survey. The survey was distributed via paper copy to university students. A total of 422 university students participated in the study.

Participants completed 21 true-false items to evaluate their knowledge on HPV and the vaccine. The research found that females demonstrated more HPV infection and vaccine knowledge when compared to males. There was no significant difference found between HPV infection and vaccine knowledge based on year in school or the participants' majors. The study also found that participants' scores showed an overall moderate attitude towards the HPV vaccination.

Discussion and Conclusion

There have been several studies conducted to assess HPV knowledge and attitudes, and vaccination rates. Most studies focus exclusively on either females or males, or one ethnicity (Donadiki, 2014; Tung et al., 2019; Hsu, 2011; & Wong et al., 2009). Few studies include comparisons between males and females and look at how demographic characteristics influence knowledge and attitudes (Medeiros et al., 2010; Tung et al., 2019). Considering the differences in knowledge and attitudes, based on demographics, will help educators determine what needs to be addressed in health education courses, public health, and health promotion efforts. Most of the existing literature focuses exclusively on knowledge and attitudes based on gender or ethnicity. By looking at both males and females, this research addresses the difference in knowledge and attitudes among genders.

Participants in this study had a mean HPV infection knowledge score of 7.52 out of 10. More than half of the participants believed that HPV causes herpes. This is an area in which knowledge needs to be improved, and addressed, in future education. These results concur with a previous study, which also reported that the majority of participants were unsure or thought that HPV caused herpes (Tung et al., 2019). Participants had a mean HPV vaccine knowledge score of 7.49 out of 10. About half of the respondents were unsure of the recommended age for receiving the vaccine, that only one of the three types of vaccine are used in the U.S., and that there is no maximum time interval between doses. These results were consistent with a previous study, which also rereported low

knowledge regarding the recommended age in which adolescents should receive the vaccine (Tung et al., 2019).

Mean knowledge score regarding HPV infection and vaccines, revealed that female university students have more knowledge compared to male university students. The results concurred with previous research (Medeiros et al., 2010; Tung et al., 2019). Females have higher HPV infection and vaccine knowledge, when compared to males. This is most likely due to females learning accurate information from their physicians when reaching the age of sexual activity and pap smears (Medeiros et al., 2010). Targeted education may also influence levels of knowledge of those at greatest risk. The results of the study showed no significant differences in participants' knowledge of HPV infections and the vaccine when compared to major. These results differ from previous studies which found that health science students have higher knowledge than non-health science students (Medeiros et al., 2010; Tung et al., 2019). It is anticipated that health science students would have a higher knowledge score because they take more health-related courses, and most health classes have a unit on sexually transmitted infections. The reason this study may not have shown what other studies have found is that this study compared specific majors instead of comparing non-health science with health science majors. This difference could be due to the fact that this variable examined each major individually.

The total mean attitude score of all participants was 46.57 out of 65 for this study. When assessing attitudes based on major, this study revealed statistically significant differences in attitudes between those in health-related majors (M=48.24, SD=6.16), and

those who indicated other majors (M=45.36, SD=6.11). The majors included in the other category may require more health education and health promotion to improve attitudes regarding HPV and the vaccine.

In this study, 48.60% reported that they have received at least one dose of the HPV vaccine. Those who reported receiving at least one dose of the vaccine were higher in this study than the rate of 38.6% that was reported among 449 Chinese undergraduate university students (Tung et al., 2019). Another study also found that 71.7% of participants were unvaccinated (Medeiros et al., 2010). In this study, a total of 51.20% of participants reported being unsure about their vaccination uptake or that they have not receive the HPV vaccine.

Recommendations for Health Education

Based on the findings of this study there are recommendations for future health education. Education on HPV infections and the vaccination should begin prior to high school and continue through college as statistics have shown that young adults between 15 and 25-years old have been found to have the highest rates of HPV infection. Health educators should continue to educate students on the importance of safe sex practices, the HPV vaccine, and the consequences for not receiving the HPV vaccine. Based on the participants knowledge score, health educators have been successful at educating students on HPV related information, such as the types of cancers that are highly associated with HPV infections, the HPV strains that the vaccine protects against, the symptoms of HPV, and that infected individuals may asymptomatic. It is important for students to be aware that the vaccination is effective in preventing HPV strains 6, 11, 16, 18, 31, 33, 45, 52

and 58. These areas should continue to be addressed in health curriculum. Findings from this study support the need for educational curricula on university campuses, and in high school health classes, that address HPV and the vaccination. Of greatest concern is the fact that out of 422 participants, only 147 (34.83%) participants reported completing all the recommended HPV vaccine doses.

Educational materials should be made available to adolescents and their parents. Educating students can be done using educational materials such as fact sheets, brochures, posters, social media posts, books, lectures, online resources and demonstrations. These educational methods have been used in secondary and post-secondary education courses and clinical settings, to successfully increase knowledge, attitudes and awareness (Kirby, Laris, & Rolleri, 2007). According to Kirby and Laris (2009), 17 different characteristics have been found to improve the effectiveness of educational curriculum, such as focus on health goals, focus on specific behaviors leading to health goals, use of methods that actively involve the participants; use age-appropriate activities, instructional methods, and behavioral messages. Student health services on university campuses can work to create educational information, and work to increase the HPV vaccination rates among university students. In educational settings, educators should not only address the consequences for women; they need to be gender inclusive. Providing the same information to everyone improves relevance for all. Students can learn age-appropriate information that can help keep themselves and others safe. If males are not educated on the importance of HPV, they could be asymptomatic, spread it, and be susceptible to cancers. By educating students, on safer sex practices, the rate of HPV

infections will decrease, which will lead to a decrease in HPV related cancers. One study found that written and video educational interventions are effective in educating students about HPV and increasing vaccine intentions (Krawczyk, Lau, Perez, Delisle, Amsel, & Rosberger, 2012). Identifying what influences students to partake in unprotected sex, their perceived susceptibility to STI's, and attitudes towards the HPV vaccine, are important steps in reducing HPV infections and the health-related consequences.

University-level health curricula, and educational messaging, should address the knowledge areas that were shown to be insufficient in the present study, especially focusing on HPV vaccination education for male students. While educating students, educators should emphasize the fact that HPV does not cause herpes, that normal pap smears do not mean an individual does not have HPV, and that there is no current cure for HPV. They should also stress that the vaccine is highly recommended for 11 and 12 year old children, and that only one vaccine type is used in the U.S. Emphasis on the recommended age of the vaccine is important because sexual activity among 11 and 12 year old children is rare and it is important to receive the HPV vaccine prior to being exposed to the types of HPV the vaccine targets (CDC, 2016). Educators should also highlight that receiving the vaccination does not change/encourage sexual behavior among recipients. Educators are addressing this common misconception, but with 29.86% of participants still believing that receiving the HPV vaccine, changes sexual behavior among recipients, it needs to continuously be addressed. This is a significant barrier that is associated with receiving the vaccine. This misconception needs to be addressed because parents that believe it encourages sexual activity may choose not to

have their children receive the HPV vaccine. This can then leave young adolescents unprotected from HPV infections and HPV-associated cancers. Continuing to address what students already know, and adding educational materials that they are unfamiliar with, will help students understand the importance of preventing HPV.

It is essential that adolescents be taught safe sex practices to prevent HPV infections. It is necessary for health care providers and educators to educate males on HPV and the vaccination prior to adolescence and sexual activity is necessary as statistics have shown that males have less knowledge when compared to females in this study and previous studies. In clinical settings, health care providers need to address the consequences of HPV for males.

Recommendation for Future Research Studies

This study provides a snapshot of university students' HPV infection and vaccination knowledge and attitudes, and shows the rates of vaccination uptake. HPV infections have the highest rates among young adolescents between the ages of 15 and 25. Future studies of students ages 11 through 25 should be conducted to determine their knowledge and attitudes based on age because the HPV vaccine is recommended to start at 11 years old. Based on vaccine release dates, different age groups may be not be exposed to the same information (vaccine release date: 2006 & 2014). Since the HPV vaccine is recommended for children ages 11 and 12, parents need to be educated on the HPV vaccine and the importance of receiving them, because they are the primary decision makers for their children. This may identify gaps that schools are not addressing. This study was limited to current students at a midwestern university. Studies should

continue to assess students' knowledge and attitudes regarding HPV infections and the vaccination in larger populations and other areas of the country. Future studies should also examine the sexual activity of participants as sexual behavior can lead to HPV. It is also recommended that more research look at participants use of barrier methods that prevent sexually transmitted infections. Researchers should also assess testing rates and reasons for getting tested. The reasons why participants may choose not to get vaccinated, and why they do, can also be assessed. In a future study, the knowledge and attitudes of participants could be compared to testing rates, condom use, and sexual behavior. The more understanding we gain on college students' knowledge and attitudes, the more health educators can effectively educate to improve their overall health and reduce health consequences associated with HPV infections.

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Appendices

Appendix A

Institutional Review Board Letter of Approval

MINNESOTA STATE UNIVERSITY
MANKATO

February 18, 2020

Dear Joe Visker, PhD:

Re: IRB Proposal entitled "[1567653-1] Human Papillomavirus (HPV) Infection and Vaccine Knowledge and Attitudes among Male and Female University Students with Varying Degrees"
Review Level: Level *[I]*

Your IRB Proposal has been approved as of February 18, 2020. On behalf of the Minnesota State University, Mankato IRB, we wish you success with your study. Remember that you must seek approval for any changes in your study, its design, funding source, consent process, or any part of the study that may affect participants in the study (see https://grad.mnsu.edu/irb/revision.html). Should any of the participants in your study suffer a research-related injury or other harmful outcome, you are required to report them to the Associate Vice-President of Research and Dean of Graduate Studies immediately at 507-389-1242.

When you complete your data collection or should you discontinue your study, you must submit a Closure request (see https://grad.mnsu.edu/irb/closure.html). All documents related to this research must be stored for a minimum of three years following the date on your Closure request. Please include your IRBNet ID number with any correspondence with the IRB.

Cordially,

Bonnie Berg, Ph.D.
IRB Co-Chair

Jeffrey Buchanan, Ph.D.
IRB Co-Chair

Mary Hadley, FACN, Ph.D.
IRB Director

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Minnesota State University, Mankato IRB's records.