Name of Student

Name of Professor

Name of Class

Day Month Year

 **Human Papillomavirus Infection (HPV)**

**Introduction**

Human Papillomavirus infection (HPV) is a viral infection that causes warts, skin or growth of mucous membrane. There exist more than a hundred varieties of HPV. Some of them can cause warts while some cast detrimental consequences as cancer. Primarily, specific kind of genital HPV manifests cancer of the lower parts of the uterus which connects to the cervix (vagina). The other prominent kinds of cancer are cancers of penis, anus, back of throat, vulva and vagina. The fundamental element fueling the spread of the infection is sexual transmission or after skin to skin contact. It is worthy to highlight the infection has symptoms, definite causes, treatment plan, vaccines and risk factors. The HPV strains can be categorized as per their threat of causing cervical cancer into the high risk (HPV-16 and -8) and low-risk (HPV-6 and -11) types. Essentially, all the instances of external genital warts are manifested by the HPV infection where approximately 90% of instances are associated with HPV types 11 and 6. As per studies conducted in the United States of America (USA), nearly 1% of the sexually active community is affected and has visible genital warts and more than 155 of the population has a subclinical infection. In the women aged above 25, the highest rates of HPV infection were reported. Everyone person in the two is at the risk of adopting genital HPV infection in their lifetime and by the age of 80 years, the percentage exceeds 80 among women.

1. **Symptoms and Signs**

More than 170 kinds of HPV have been recognized and they are designated by various numbers. In several cases, the immune system of body defeats the HPV infection before it causes warts. Once warts appear, they vary as per the kind of HPV. Flat, plantar, genital and common warts are commonly found.

The infection in the skin in the genital area is, irrefutably, the most pervasive sexually transmitted infection (STI) across the world. They can also be easily identified and are generally associated with anal or genital warts. The strains of such infection which can cause genital warts are primarily different from those on the other parts of the body as feet, hands or thighs. A wide range of HPV can manifest in genital warts but type 11 and 6 collectively account for approximately 915 of all the instances. The majority of genital HPV infections are cleared by the immune system in months and they never cause any significant overt symptoms. Several people establish the infection at some stage of their lives while the percentage of the women affected in the contemporary era is 10%(Steven and Duarte-Franco). With the potential engagement in the sexual activity, a prominent acceleration in the establishment of genital HPV infection is observed.

The other symptom as common warts are essentially found on feet and hands but can also occur on knees or elbows in some of the cases. Common warts have a critical surface similar to cauliflower and are raised above the affected skin. Cutaneous HPV kinds are not affiliated with the development of cancer but can cause genital warts. The third symptom, plantar warts, occur on the inside of the soles of the feet and cause pain when the person walks. In flat warts, symptoms are commonly found on the face, arms or forehead. Similar to common warts, flat warts can occur in teens and children frequently. People with normal immune function are not at the risk of developing cancer.

In addition, infections of type 11 and 6 can cause a rare condition called recurrent laryngeal papillomatosis wherein warts are established on the larynx. These can occur frequently and they can interfere with breathing and in extreme cases, can manifest to detrimental consequences as cancer.

**Cancer**

More than a dozen types of HPV are termed high-risk types as the persistent infection caused by them is found to be related with cancers as vulva, penis, cervix, anus and oropharynx. The individuals affected with HIV and HPV are largely prone to developing anal or cervical cancer. As per an estimate, 561,200 cases across the world were reported in 2002 which consequently made HPV one of the common infectious elements contributing toward cancer. Throughout the world, cancers associated with HPV account for 5% of diagnosed cancer. In the United States of America (USA), approximately 30,700 cases of cancer occur each year because of HPV. HPV is believed to cause a person to get affected by cancer by integrating DNA and non-integrated episomes. A wide range of researchers has demonstrated a potential link between squamous cell carcinoma and HPV types. In these cases, in vitro experiments conclude that the virus may inhibit apoptosis perpetuated by ultraviolet light.

**Lung Cancer**

Evidence links HPV to malignant tumors of the respiratory tract. The International Agency for Research on Cancer stipulated people affected with lungs cancer were at an increased risk of having various kinds of HPV antibodies in comparison to the normal people. Furthermore, the average frequencies HPV in lungs cancers were 15 % in America and 17% in Europe(Koutsky et al.). The number exceeded 35% in the Asian region amid significant heterogeneity between certain regions and states. Researchers have concluded that patients of lungs cancer have profound tendencies to have excessive types of HPV in comparison to non-cancer patients.

**Cervical Cancer**

Approximately all the instances of cervical cancer are linked with two types of HPV infection as HPV16 and HPV 18. HPV type 16 is found to be the root element in causing penile cancers, vulva and anal cancers and it is present in 41 to 54% of the cervical cancers. Approximately 260,000 deaths and 528,000 new cases were manifested by cervical cancer across the world. It is essential to highlight that 85% of the instances involving cervical cancer took place in the developing states.

1. **Pathology**

Essentially, the sexually transmitted HPV is classified into two categories as high risk and low risk. The low-risk HPV causes warts around the genitals. Both Type 6 and 11 have the potential to be the primary root of treating genital warts and recurrent papillomatosis. Besides, these high-risk HPVs contribute towards 5% of the instances of cancer occurring across the world. In the United States of America (USA), high-risk HPV cause 2% of all cases in men and 3% of all cases in women.

**Transmission**

The risk factors for the genital HPV infections comprise first sexual intercourse at an early age, smoking, multiple partners and immunosuppression. The genital HPV is spread after potential and direct skin to skin contact where anal and vaginal sex is the most prominent methods of transmission from oral sex. Though all the kinds of HIV can be transmitted to a child from a mother during birth, the occurrence in a newly born baby is rare. Perinatal transmission of HPV 6 and 11 can result in the establishment of the juvenile onset recurrent respiratory papillomatosis (JORRP). It is a very rare condition which has rates of 3 cases in 100,000 children in the United States of America (USA). If a woman has genital warts at the time of giving birth, the threat of JORP will still be under 1%.

Furthermore, female genital and cervical cancer have remained the most common focal point of several researchers. Since both of these cancers are associated with cervical cancer, researchers have expressed interest in examining these infections. Empirical studies have illustrated comprehensive views on the matter. For instance, when a woman changes her partner each year consecutively for four years, she is at an increased risk of leaving the college with HPV infection and the ratio is even greater than 85%. It is critical to highlight that condoms cannot protect the virus as the area surrounding the genitals and the inner thighs are exposed. Thus, these areas remain exposed to the skin of the infected person. Studies have explicated women who were HPV positive in the cervix or vagina, 88% of them were positive in the vulvovaginal area and 46% were in the cervix.

**Common Substances**

 Various studies have reflected HPV transmission is transmitted after sharing contaminated objects like razors. However, the other routes than sexual transmission are not common in female genital HPV infection. The genital contact of fingers is a plausible manner of transmitting the infection but an uncommon one. One of the most contentious aspects is the spread of infection through the blood. In the past, researchers nullified the postulations that it can be transmitted via blood but the contemporary studies have raised critical questions. In 2005, researchers reported the frozen blood samples of sexually naïve pediatric patients having transfusion-acquired HIV infection were tested positive for HPV-16. It is an explicit illustration of the postulate that it can be transmitted through blood transfusion. Nevertheless, since the non-sexual transmission is rare, it cannot be thoroughly proved. Blood samples of 180 healthy male donors for HPV of Australian Red Cross were tested and consequently found strains of the virus in 15 samples. However, it has not yet been identified whether or not HPV is transmitted through blood. As blood donations in the contemporary age are not screened for HPV and there exist institutions as the American Red Cross and other communities that cannot prohibit the HPV positive individuals to donate blood.

**Significance in Cancer**

The E6/E7 proteins activate proteins which suppress proteins, p53 and Rb. All the HPV can produce transient production but only a few strains as 16 and 18 can immortalize the cells in vitro. It has been proved both of them cannot immortalize the fundamental rat cells as the activation of the ras oncogene is imperative. When the genome gets encapsidated, capsid appears to witness a redox-dependent maturation event. A study in 2010 has concluded that E6 and E7 are an integral part of activating Wnt signaling and beta-catenin accumulation in cancers caused by HPV.

1. **Pathophysiology**

 Besides anogenital warts, the infection can be affiliated with extra and anogenital cancer, cervical cancer and recurrent respiratory papillomatosis. In the establishment of cervical cancer, HPV infection plays a dominant role in addition to other elements. Approximately more than 70% of such similar HPV-16 and -18 and other kinds of HPV have been determined above 99.5%.The virions of HPV comprise an 8-kb circular genome which is embedded in a closed shell constituting minor and major proteins. This genome not only accounts for the late structural genes but also for many early genes which further ensure replication, interaction and viral transcription associated with the host genome. In a wide range of individuals, HPV infections are asymptomatic and transient and 68% of new infections get resolved within a year and approximately 90% are resolved within two years. As per a study conducted on the female college students in the United States of America (USA), the average duration of newly established infection was 8 months. An increased threat of the infection was linked with African, American and Hispanic ethnicities and younger age, enhanced frequency of sexual interaction, increased amount of partners and vigorous consumption of alcohol. In most of the cases, the infections resolve spontaneously but there exist some cases where it persists and ultimately cervical cancer is established. However, it is not clearly understood that the infections resolve in some individuals but cause severe lesions in others. When the infection is manifested by the high-risk HPV type, the infection persists consolidating maximum genomic instability and causing neoplastic equilibrium of epithelium.

Throughout the world, cervical cancer is the second most prominent cancer established by women in the developing states. In the developed states, cervical cancer results in 1.7% of cancers while in developing state it accounts for 7%. It is essential to highlight the causes of pervasive instances of cancer in developing states. The lack of availability of resources and screening programs in addition to the high-risk traits as high parity and poor nutrition contribute to the spread of cancer. The mortality and prevalence rates vary in the United States as per ethnicity. In the United States of America (USA), it is the most common sexually transmitted disease and an estimate refers to more than 6.2 million new infections each year in the individuals ranging from 14 to 44 years. In the general population, the prevalence of the infection in women ranges from 2% to 4%. The U.S. National Health and Nutrition Examination Survey (NHANES) identified the general prevalence of HPV infection in samples of women. The results concluded that the infection accelerated in prevalence each year ranging from the ages of 14 to 24 years and then decreased by the age of 59 years.

1. **Diagnosis**

The healthy framework indicates HPV testing in a patient with specific aspects as several abnormal Pap test results. The ongoing results in the distinguishing proof of atomic pathways associated with cervical cancer give supportive data about novel bio-or oncogenic markers that permit checking these fundamental sub-atomic occasions in cytological smears, histological, or cytological examples. These bio-or onco-markers are probably going to improve the identification of lesions with a high danger of movement in both essential screening and triage settings. E6 and E7 mRNA recognition PreTect HPV-Proofer or p16 cell-cycle protein levels are instances of these new atomic markers. As per empirical studies, these markers, which are exceptionally touchy and explicit, permit to recognize cells experiencing threatening transformation.

**Testing Men**

Clinicians regularly rely upon the immunization among youngsters and to make a generally safe of ailment and mortality and treat the tumors when they show up. Others trust that decreasing HPV infection in more people is critical to anticipate a larger number of malignant growths as opposed to simply treating them. When tests are utilized, negative test outcomes illustrate safety from the transmission and positive test outcomes display, condoms and gloves, were expected to predict transmission until the infection clears.

Various studies have aimed at finding HPV in men, including high-risk types on fingers, urine, mouth, anus, saliva, urethra, semen, scrotum, blood and penis. The Qiagen pack was utilized effectively to test the scrotum, anus and penis of men in long term associations with ladies who were carrying high-chance of being affected with HPV. 60% of them were found to convey the infection, essentially on the penis. Different examinations utilized cytobrushes and custom investigation. In a research study, specialists inspected subjects' penis, scrotum and urethra. Moreover, tests taken from the urethra added under 1% to the HPV rate. Results like this drove Giuliano to suggest testing the glans, wrinkles and shaft between them besides the scrotum as examining the anus or urethra added struggled to substantiate the diagnosis.

In addition, a research experiment directed the subjects not to wash their private parts for 12 hours before inspecting, including the urethra just as the scrotum and the penis. Different considerations lack the substance to highlight a detailed analysis of the implications of washing hands. Another study utilized wet cytobrushes as opposed to wet the skin. It found a higher extent of men to be HPV-positive when the skin was rubbed with a six hundred grit emery paper before being washed with the brush, instead of washing without preparation(Meln et al.). The conclusion was vague whether the emery paper gathered the virions or essentially released them for the swab to collect. Studies have accomplished self-accumulation as successful as collection acquired by a clinician since patients were more likely than a clinician to rub vivaciously. Women exhibit similar accomplishments in self-examining utilizing tampons, lavage, cytobrushes and swabs. A wide range of studies utilized cytobrushes to test fingertips and under fingernails, without making the brush wet.

**Supplementary Testing Implications**

In spite of the fact that it is conceivable to test for HPV DNA in different types of infections, there are no FDA-affirmed tests for general screening in the United States of America or tests endorsed by the Canadian government. The inconclusive nature and medical complexity have created the impediment to performing credible screening. Genital warts are the crucial unmistakable indication of safe genital HPV and can be related to a visual check. These evident developments, are the ramifications of non-carcinogenic HPV kinds. Five percent of vinegar is utilized to distinguish the two warts and squamous intraepithelial neoplasia (SIL) sores with restricted success by making unusual tissue seem white. However, most specialists have discovered this procedure productive in only moist zones similar to the female genital tract. In the contemporary age, HPV tests for guys are utilized in research only. The methodology is searching for a resistant reaction in the blood which would contain antibodies for HPV if the patient is HPV an FDA endorsed item as of August 2018. Thus, testing by blood would be a less obtrusive examination for screening commitments.

1. **Prevention**

Unlike other relevant explicitly transmitted infections, HPV expects skin-to-skin contact. It is essential to underpin it neither requires sex nor the trading of organic liquid. Since there are no medications accessible to treat an HPV disease, counteractive action is the most ideal approach to secure safety and wellbeing. This clearly includes more secure approach, however, it could likewise include getting the Gardasil, Gardasil 9, or Cervarix immunization. As HPV is the most widely recognized STI on the planet today, in excess of 70 percent of the populace is influenced by no less than one strain of the infection, counteractive action methodologies ought to be the foremost priority for any individual who is explicitly active in sex. In the current age, there exists only one approach to maintain a strategic distance from HPV which is abstinence. However, the credibility of the approach is different as per the perceptions and beliefs of individuals.

Consequently, certain non-penetrative and safe exercises like shared masturbation and frottage (dry humping) can spread virus similarly as adequately as intercourse. In addition, in light of the fact that the danger of HPV accelerates with the number of individuals a person engages in sexual relations with over a lifetime, guardians and teachers ought to urge teenagers to postpone sex for whatever length of time that conceivable and help them comprehend the particular dangers that HPV presents.

**Condoms**

Condoms are integral to reducing the peril of HPV. It is imperative to see, in any case, that they do not ensure conceivably defenseless areas of tissue. For instance, tissues around and in the vulva, vagina, scrotum or anus. This proved to some extent by a four-research study experimented by the Centers for Disease Control and Prevention (CDC). It concluded that the predictable utilization of condoms was related to a 50 percent decrease in HPV chance among non-monogamous men with different sex accomplices. Steady and right utilization of condoms is fundamental besides while doing oral sex. Furthermore, a decrease in the number of sex partners ought to be considered. Several types of research have exhibited an immediate connection between HPV infection and the records of sex partners an individual has over a lifetime. Primarily, a report published in 2013 in Germany inferred that the primary dangers factors for HPV-related cervical complexities were the number of sex partners and beginning sex at an early age. Another critical aspect is that an early age suspect increased the number of sex partners with the passage of time.

**Vaccines**

Three vaccines are accessible to prevent the infection by HPV types as Gardasil 9, Gardasil and Cervarix. Each of the three protects against the disease with HPV types 16 and 18 that cause the majority of the HPV-related cancer cases. Gardasil likewise combats HPV types 6 and 11 which cause 90% of genital moles. Gardasil is a recombinant quadrivalent antibody while Cervarix is bivalent prepared from an infection like particles of the L1 capsid protein. Gardasil 9 can possibly anticipate about 90% of anal, cervical, vulvar, cancers, and vaginal. It can protect for HPV types 11, 6, 16, 18, 31, 33, 45, 52, and 58. The last five cause up to 20% of cervical cancers which were not lately covered. The vaccines give little advantage to women infected with HPV types and 16. Therefore, the vaccine is primarily recommended for women who have not yet been prone to HPV while doing sex. A critical appraisal of the matter reveals that The World Health Organization (WHO) efficiently underpins the cost-effective and appropriate techniques for utilizing the vaccine in public sector programs. It is highly likely HPV vaccines combat the precancerous cervical lesions among young women, especially women vaccinated ranging from 15 to 26. A widespread belief has been established after empirical researches that the HPV vaccines never enhance the threat of detrimental events. These studies conclude the vaccine is efficient in younger girls in comparison to old teenagers. Switzerland, the United States of America (USA), Mexico, Switzerland, Quebec and the Netherlands initiated scheduling for girls in 2014 who were below 15 years. Women and men both are the carriers of HPV. The Gardasil vaccine is a potential source for safeguarding against warts, anal cancer and genital warts.

1. **Treatment**

In the contemporary age, there exists a potential scarcity of potential means of treating HPV infection. The viral infection, in some cases, resolves to an undetectable extent by itself. As per the Centers for Disease Control and Prevention, the immune system of the body filters the HPV inherently within 2 years in 90% cases. Specialists, however, have not fully agreed on whether or not the virus is absolutely reduced or eliminated to the undetectable extent and is challenging to identify in the phase where it is contagious. The prominent and the best solution is taking preventive measures as discussed above.

The follow-up care plan is essentially adopted and practiced by several health care providers. It is at times not successful because of the portion of the treated persons rarely return for assessment and record. Besides normal means of mail and phone calls, text messaging and email can enhance the number of people returning for care.

**Conclusion**

The HPV infection is the most common sexually transmitted disease and empirical evidence reflects it is specifically prevalent in the women ranging from 20 to 24. It has essentially been associated with the establishment of both genital warts and cervical cancer. HIV type 11 and 6 are linked with more than 90% of instances of genital warts and HPV infection with the high-risk type is considered the root cause of cervical cancer. Though the vast majority of infections appear transient and resolve in 2 years, cervical cancer develops approximately after 12-15 years once the initial infection has been diagnosed. Vaccines and preventive measures as condoms and safe sex practice are crucial to combat the menace and be protected from HPV infection. Common warts have a critical surface similar to cauliflower and are raised above the affected skin. The sexually transmitted HPV is classified into two categories as high risk and low risk. The low-risk HPV causes warts around the genitals. The risk factors for the genital HPV infections comprise first sexual intercourse at an early age, smoking, multiple partners and immunosuppression. There are no FDA-affirmed tests for general screening in the United States of America or tests endorsed by the Canadian government. Moreover, another critical aspect highlights the prominent difference in the ratio of cervical cancer in developed and developing state where the scarcity of resources is the potential cause fueling the prevalence of the infection.

 Works Cited

Koutsky, Laura A., et al. “EPIDEMIOLOGY OF GENITAL HUMAN PAPILLOMAVIRUS INFECTION.” *Epidemiologic Reviews*, vol. 10, no. 1, 1988, pp. 122–63. *DOI.org (Crossref)*, doi:10.1093/oxfordjournals.epirev.a036020.

Meln, Santiago, et al. “Molecular Diagnosis of Human Papillomavirus Infections.” *Human Papillomavirus and Related Diseases From Bench to Bedside A Diagnostic and Preventive Perspective*, edited by Davy Vanden Broeck, InTech, 2013. *DOI.org (Crossref)*, doi:10.5772/55706.

Steben, Marc, and Eliane Duarte-Franco. “Human Papillomavirus Infection: Epidemiology and Pathophysiology.” *Gynecologic Oncology*, vol. 107, no. 2 Suppl 1, Nov. 2007, pp. S2-5. *PubMed*, doi:10.1016/j.ygyno.2007.07.067.