Journal of Pediatric Nursing (2016) **31**, e155–e166

Human Papillomavirus Infection and Vaccination

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Received 25 April 2015; revised 7 October 2015; accepted 9 October 2015

Key words:
Human papillomavirus;
HPV;
Infection;
Vaccine;
Immunization;
Adolescents;
Young adults;
Parent attitudes;
Vaccination barriers;
Safety;
Efficacy;
Vaccine delivery

Background: Human papillomavirus (HPV) is an infection that can be sexually transmitted and result in health consequences including genital warts and cancers. Two vaccines, Gardasil® [Human Papillomavirus Quadrivalent (Types 6, 11, 16, and 18) Vaccine, Recombinant] and Cervarix™ [Human Papillomavirus Bivalent (Types 16 and 18) Vaccine], have been approved for the prevention of HPV and HPV-related diseases.
Objectives: To explore facilitators and barriers associated with HPV vaccine utilization and compliance regarding vaccine series completion in school-aged, adolescent, and young adult females in the United States; to discuss HPV infection and highlight the safety and efficacy of the HPV vaccine; and to illustrate delivery strategies that can improve immunization rates and review implications for healthcare providers.
Methods: A literature review was performed using health-related online databases (CINAHL, MEDLINE, PubMED, Web of Science, EBSCOHost and Google Scholar) and archival searching to identify current vaccination rates and factors associated with vaccine uptake.
Results: Despite the availability of vaccines that prevent cancer, acceptance and utilization rates of both HPV vaccines are less than recommended by the Advisory Committee for Immunization Practices (ACIP). Some of the barriers to HPV vaccination include lack of provider recommendation, negative parent or patient attitudes and beliefs, cost, and missed clinical opportunities. The primary facilitator to HPV vaccination is a strong provider recommendation.
Conclusions: Healthcare providers can enhance HPV vaccine utilization by taking an active role with patients. Strategies include education and advocacy for receiving the vaccine, maximizing access to the HPV vaccine, and implementing new strategies for vaccine-delivery.

INFECTIOUS DISEASES REMAIN a major cause of illness, disability, and death in the United States with an estimated 30,000 adults and a growing number of children dying each year from vaccine-preventable diseases (Hurley et al., 2014; Yorita Christensen et al., 2009). Likewise, sexually transmitted infections are a significant public health concern with nearly 20 million new infections occurring each year costing approximately $15.6 billion in direct medical expenses (Centers for Disease Control and Prevention [CDC], 2013c). Sexually transmitted infections have a profound impact on sexual and reproductive health, yet they are highly preventable through a variety of interventions (CDC, 2013c; Owusu-Edusei et al., 2013).

Vaccines are available to prevent two sexually transmitted infections: hepatitis B virus and human papillomavirus. Although hepatitis B virus infection is not solely sexually transmitted, the vaccine to protect against it was developed more than 30 years ago and has since been widely adopted into infant immunization schedules. The vaccine to protect against infection from human papillomavirus (HPV) became available more recently in 2006, but due to a variety of factors that impact HPV vaccine acceptability and vaccine utilization, HPV vaccination has not been universally accepted by healthcare providers, parents, or the public

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http://dx.doi.org/10.1016/j.pedn.2015.10.005
0882-5963/

(Gottlieb et al., 2014). This literature review explores human papillomavirus infection and the factors that are associated with HPV vaccine uptake, which can be defined as the coverage level or acceptance of a vaccine in a population (The College of Physicians of Philadelphia, 2015), as well as the reasons for non-vaccination among school-aged, adolescent, and young adult females in the United States.

Methods

Using the keywords human papillomavirus, HPV, infection, vaccine, immunization, adolescents, young adults, parent attitudes, vaccination barriers, safety, efficacy, and vaccine delivery, sources from both nursing and medicine disciplines were examined for the review of literature on human papillomavirus infection and vaccination. In addition to archival searching, several online databases were searched, including CINAHL®, MEDLINE®, PubMed Central®, Web of Science, and EBSCOhost®.

Epidemiology of HPV Infections

According to data collected by the Centers for Disease Control and Prevention (2013c), there are more than 14 million new human papillomavirus infections annually in the United States. It is the most prevalent sexually transmitted infection in the United States with more than 79 million existing cases and accounts for the majority of newly acquired sexually transmitted infections (CDC, 2013c).

HPV is transmitted through direct skin-to-skin contact with an HPV infected individual. Transmission is correlated with sexual intercourse, both vaginal and anal. In addition, transmission can also occur following non-penetrative sexual activity such as oral–genital sex (CDC, 2012). Less commonly, HPV can occur through vertical transmission from mother to infant during the intrapartum period (Markowitz et al., 2014).

Risk factors for the development of HPV infection include multiple sex partners, lack of condom use, age at first sexual intercourse, non-monogamous sexual relationships, and history of prior infection (Chelimo, Wouldes, Cameron, & Elwood, 2013). Among sexually active individuals, the lifetime risk of having an HPV infection is approximately 75%. HPV risk and prevalence varies by age and gender. Sexually active adolescent and young adult females are at a higher risk and affected at a disproportionate rate compared to women greater than 25 years of age and men. This is most likely due to a combination of behavioral, biological, and cultural influences (Dunne et al., 2007; Matkins, 2013). The peak period for acquiring HPV infection is shortly after becoming sexually active but can occur at any time during the reproductive years. Greater than 50% of college women test positive for HPV within 3 to 4 years after the initiation of sexual activity. By 50 years of age, more than 80% of women have been exposed to the virus (Chesson, Dunne, Hariri, & Markowitz, 2014).

Pathogenesis of HPV Infection

Human papillomaviruses are small, non-enveloped, double-stranded DNA viruses that infect the mucosal or cutaneous epithelium. HPV infection and replication occurs at the basal layer of the epithelium. The virus may persist in the basal layer in latent form or may continue to replicate as the basal layers differentiate and rise through the epithelium at which point histological and cytological changes may occur (Fernandes, de Araújo, & de Medeiros Fernandes, 2013). Despite the high prevalence of HPV infection, many cases resolve spontaneously due to a gradual development of an immune response against HPV DNA. Some HPV infections can be subclinical and consequently the person is asymptomatic. Yet, it is possible for the virus to remain in a non-detectable, dormant state and then reactivate years later. A small percentage of individuals exposed to persistent or repetitive infections will acquire warts, dysplastic cervical abnormalities, and potentially cancer (Juckett & Hartman-Adams, 2010).

Types of HPV

Over 100 different types of HPV have been identified. The HPV types are classified as low-risk or high-risk based on their potential for causing cancer.

Low-Risk, Non-Oncogenic Types of HPV

HPV types 6 and 11 have very low oncogenic potential and are rarely associated with cancer. These types of HPV infection can cause benign or low-grade cervical cell abnormalities, genital warts, and laryngeal papillomas. HPV types 6 and 11 cause almost 100% of anogenital warts (CDC, 2012). About one in 100 sexually active individuals have genital warts related to HPV (CDC, 2014a). The most visible type of wart is condyloma acuminatum, which is a raised, polypoid mass with an irregular fingerlike surface and fissures. These warts are highly infectious and can cause pain, bleeding, genital or urethral obstruction, and complications during pregnancy (Huether & McCance, 2012). Genital warts have a physical and psychosocial impact on a woman's health. Women might feel ashamed and embarrassed leading to lower self-esteem (Jeynes, Chung, & Challenor, 2009).

High-Risk, Oncogenic Types of HPV

Persistent infections with high-risk, oncogenic HPV subtypes have been widely implicated in the development of cervical cancer due to resulting high-grade cervical cell abnormalities. HPV subtypes 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 68, 69, 73, and 82 are considered high risk. These subtypes are also responsible for many vulvar, vaginal, penile, anal, and oropharyngeal cancers (CDC, 2012; Markowitz et al., 2014).

Worldwide, HPV-16 accounts for 50% of cervical cancer cases. Together, HPV-16 and HPV-18 account for about 70% of squamous cell carcinomas and adenocarcinomas of the