

Literature Review: The Relationship between knowledge of Sexually Transmitted Disease (STIs) with The Willingness and Practice of Human Papillomavirus (HPV) Vaccination in Generation Z

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Abstract

Sexually transmitted infections (STIs) remain a major global public health problem, particularly among adolescents and young adults. Human papillomavirus (HPV) is one of the most common STIs and is strongly associated with cervical cancer, which continues to impose a significant disease burden, especially in developing countries. Generation Z, defined as individuals born between 1997 and 2012, represents the age group with the highest incidence of STIs, yet HPV vaccination coverage in this population remains low. This literature review aims to examine the relationship between knowledge of sexually transmitted infections and both the willingness and practice of HPV vaccination among Generation Z. This study employed a literature review design using a cross-sectional analytical framework. Scientific articles published between 2016 and 2026 were identified through Google Scholar and Scopus databases using keywords related to HPV, sexually transmitted infections, knowledge, vaccination intention, and vaccination practice. From 20 identified articles, 8 studies met the inclusion criteria and were critically analyzed. The findings indicate that higher levels of knowledge regarding STIs, HPV infection, cervical cancer, and HPV vaccination are generally associated with stronger intentions to receive HPV vaccination among adolescents and university students. However, this increased intention does not consistently lead into actual vaccination practices. Several studies reported no significant association between knowledge and HPV vaccine uptake. Barriers to vaccination practice include parental decision-making, perceived risk, vaccine cost, limited access, and concerns regarding vaccine safety. In conclusion, knowledge plays an important role in shaping HPV vaccination intention but is insufficient on its own to ensure vaccination practice among Generation Z. Comprehensive strategies involving parental engagement, cost reduction, and targeted health education are essential to improve HPV vaccination coverage and reduce the burden of HPV-related diseases.

Keywords: Human Papillomavirus (HPV); Generation Z, Knowledge; Vaccination Willingness; Vaccination Practice

1. Introduction

Sexually Transmitted Infections (STIs) are one of the most widespread public health challenges globally. According to the 2016 National Guidelines for the Management of STIs, STIs can be transmitted thru various forms of sexual contact, including vaginal, anal, and oral. Nevertheless, transmission can also occur from mother to baby in the womb or during childbirth through contaminated blood or tissue. Additionally, STIs can also be transmitted thru medical instruments. Sometimes, infected patients are unaware that they have been infected because the symptoms often do not appear or are similar to other diseases (1).

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The World Health Organization (WHO) states that there are over one million new cases of STIs worldwide every day (2). That figure illustrates how widespread and rapid the spread of this disease is within the global population. The World Health Organization (WHO) also notes that more than 30 types of microorganisms can be transmitted to patients, including bacteria, viruses, fungi, and parasites (3). Some common types of STIs include chlamydia, gonorrhea, syphilis, trichomoniasis, genital herpes, HIV/AIDS, and HPV (2). According to WHO (2), the causes of STIs include bacteria (gonorrhea caused by *Neisseria gonorrhoeae*, chlamydia caused by *Chlamydia trachomatis*, and syphilis caused by *Treponema pallidum*), fungi (candidiasis caused by *Candida albicans*), viruses (HIV/AIDS and cervical cancer caused by Human Papillomavirus), and parasites (trichomoniasis caused by *Trichomonas vaginalis*). The age group with the highest number of STI cases is 16-24 years old (4).

Human papillomavirus (HPV) is one of the most commonly found STIs in various regions of the world. This virus is primarily transmitted thru sexual contact and often shows no symptoms in its early stages. HPV consists of over 100 types, with approximately 40 of them capable of infecting the genital area. Types 16 and 18 are the two most commonly found in high-risk infection cases (5). Data from the Global Cancer Observatory in 2022 show that Asia has 8,4% or 397,082 cases of cervical cancer, and 8,8% or 199.795 deaths (6). In Asia, cervical cancer is ranked third after lung cancer and breast cancer. In Indonesia, cervical cancer is the second most common cancer among women. The number of cases reported is 16,8% or 36.964, while deaths from cervical cancer reach 18,1% or 20.708 (6).

Human Papilloma Virus (HPV) is the main cause of cervical cancer. Literature states that HPV is a significant contributor to the etiology of cervical cancer, even reported as the primary cause in 99.7% of cases (7). The process from HPV infection to the development of cervical cancer also does not happen quickly, thus providing ample opportunity for primary prevention and early detection if intervention is implemented before sexual activity (8). In men, HPV infection also carries a risk of causing cancer in the penis and anal region, although its prevalence is lower than in women (9).

The high number of cervical cancer cases is not merely a clinical issue, but a public health issue that requires strong, targeted, and sustainable primary prevention. With this logic of prevention, HPV vaccination becomes a long-term health investment. However, the HPV vaccination program promoted by the government did not achieve the expected results in 2023. This program is included in the School Children's Immunization Month (BIAS) and targets children in grades 5 and 6 of elementary school, or ages 11 and 12. According to a report from the Ministry of Health of the Republic of Indonesia (10), the national HPV vaccination coverage is only 9%. This figure is still far from the national target of 90%.

According to the 2016 National Guidelines for the Management of STIs (11), vaccination can be given to women and men aged 9 to 26 years. The HPV vaccine is administered in 3 doses. The second dose can be given 2 months after the first dose is injected. The third dose is then given 6 months after the first dose. The HPV vaccination program is carried out in accordance with the Regulation of the Minister of Health of the Republic of Indonesia Number 12 of 2017 concerning the Implementation of Immunization in Article 7 and the Decree of the Minister of Health of the Republic of Indonesia Number: HK.01.07/MENKES/6779/2021 concerning the Human Papillomavirus (HPV) Vaccine Immunization Introduction Program for the Years 2022 - 2024, as well as the Decree of the Director General of Disease Prevention and Control Number: HK.02.02/C/3427/2022 concerning Technical Guidelines for the Implementation of the Human Papillomavirus (HPV) Vaccine Immunization Introduction Program during the School Children's Immunization Month (BIAS) for the Years 2022- 2024.

The vaccines currently available focus on the HPV L1 protein as their target antigen. The L1 protein is the main capsid protein in HPV. It functions to form the outer structure of the virus, initiate infection by binding to host cells, and is the basis of the HPV vaccine because of its ability to become virus-like or a viral-like particle (VLP). Additionally, there is more L1 protein than L2. According to Gultom (12), the selection of L1 VLP vaccine for cervical cancer prevention is based on ease of production and the generation of genotype-restricted in vitro neutralizing antibody titers similar to L1/L2 VLP. Additionally, L1 VLP is expected to bind to both heparan sulfate proteoglycan (HSPG) and secondary receptors, whereas L1/L2 VLP will only bind to HSPG because the secondary receptor binding site is blocked by the L2 N-terminal. It can be concluded that the VLP L1 vaccine is considered more effective in preventing infection.

Based on previous research in Gultom (12), it is stated that the protection mechanism produced by the VLP vaccine is the formation of neutralizing antibodies induced by the vaccine itself. Currently, there are two prophylactic vaccines available on the market: Cervarix for bivalent VLP HPV 16/18 L1 and Gardasil for quadrivalent HPV 6/11/16/18. Both VLP vaccines use the L1 capsid structural protein. Cervarix is administered at 20/20 mg per dose using AS04, which contains 500 mg of aluminum hydroxide and 50 µg of 3-O-deacylated monophosphoryl lipid A derived from detoxified polysaccharides with *Salmonella enterica*. The subspecies of *Salmonella enterica* used is the enteric serovar Minnesota as an adjuvant. AS04 is used to enhance humoral and cellular immune responses and extend the duration of protection.

Meanwhile, Gardasil is administered in doses of 20/40/40/20 mg per type of HPV 6/11/16/18. Gardasil uses 225 mg of aluminum phosphate as an adjuvant and is administered intramuscularly (12).

The efficacy of the quadrivalent vaccine in preventing CIN 2/3 caused by HPV types 6/11/16/18 in women who have never been infected with HPV approaches 100%. This efficacy also applies to preventing vulvar lesions and genital warts. However, this efficacy is reduced in women who have already been exposed to HPV. Meanwhile, the bivalent vaccine was found to be seropositive against HPV 16/18 in 99.5% of cases. Additionally, the efficacy against CIN 2+ lesions for HPV 16/18 was 90.4%, against CIN caused by HPV 16 was 93.3%, and against CIN lesions caused by HPV 18 was 83.3%. (12). According to the Indonesian Pediatric Association (8), the HPV vaccine is more effective when given to women who are not yet sexually active, specifically before adolescence, because the efficacy of the HPV vaccine decreases when given to sexually active adolescents who are already infected with HPV. Based on research, administering 2 doses of the HPV vaccine at ages 10-13 compared to 3 doses at ages 16-18 was proven to produce antibody levels that were no lower than administering 3 doses at ages 16-18.

The final decision to accept this vaccine is still heavily influenced by family perceptions and the availability of accurate information. This triggered an evaluation of the low HPV vaccination rates, particularly among Generation Z, who currently live in a digital environment but still face classic challenges such as negative stigma toward people with STIs and minimal family involvement. According to the generation classification based on the 2020 Indonesian population census, Generation Z is born between 1997 and 2012. Generation Z is the largest age group, accounting for 27.94%, followed by Generation Y/millennials at 25.87%, and Generation X at 21.88% (Central Bureau of Statistics, 2020). Cases of Sexually Transmitted Infections (STIs) are most prevalent among the 16-24 age group (4), making this data place Generation Z in the age group with the highest number of STI cases compared to other generations today (14).

Cases of STIs are still generally high in Indonesia, as are cases of cervical cancer in women. The journey from infection to cancer takes years, making HPV vaccination an effective preventive solution. However, HPV vaccination rates in Indonesia are still very low despite the high incidence of STIs, particularly cervical cancer. Thus, the relationship between knowledge of Sexually Transmitted Infections (STIs) and the willingness and practice of HPV vaccination in Generation Z will be explored.

2. Materials and methods

The study design for this research is a literature review that examines the relationship between knowledge of Sexually Transmitted Infections (STIs) and the willingness and practice of Human Papillomavirus (HPV) vaccination among Generation Z. However, research specifically addressing this topic in Generation Z is still limited. This study uses a cross-sectional method with the independent variable being knowledge of STIs and the dependent variable being the willingness and practice of HPV vaccination. The target population is Generation Z, and the sample is Generation Z aged 16-24.

The previous studies used in this research are article publications published between 2016 and 2026, or within the last 10 years. The study sources were obtained through the Google Scholar and Scopus databases. The keywords used to search for the study topic are Human Papilloma Virus (HPV), Generation Z, Knowledge, Vaccination Willingness, and Vaccination Practices. In this literature review, the author summarizes and critically and deeply analyzes the previously read studies. After searching using keywords, a total of 20 study sources were found. The studies were reviewed and evaluated by the authors, resulting in the selection of 8 studies deemed most relevant and appropriate to the research topic. The research findings will be briefly summarized in a table and discussed in their entirety in the discussion section.

3. Result

Table 1 The Relationship Between Knowledge and Vaccination Willingness

No	Author, Title, Journal	Method	Result
1	Pramana, I. G. K., Pramitaresthri, I G. A., Sanjiwani, I. A., & Astuti, I. W. (2025). The relationship between the level of knowledge about cervical cancer and the motivation for HPV vaccination among nursing students.	Cross Sectional	There is a strong positive relationship between the level of knowledge about cervical cancer and the motivation for HPV vaccination among Udayana Nursing students aged 20-22 years (0.654). The better the level of knowledge

	Community of Publishing in Nursing (COPING), 13(3).		possessed, the stronger the motivation to get the HPV vaccine. The majority of respondents with good knowledge and strong motivation were 25 people (55.6%), while the majority with poor knowledge had low motivation, total 4 people (8.9%).
2	Halim, C.L., Kartarino, D., & Fadillah, Q. (2025). Knowledge and Attitudes of High School Students at Sutomo 2 Medan Regarding HPV Vaccination. Syntax Literate: Indonesian Scientific Journal, 10(10).	Cross Sectional	There is a relationship between knowledge related to cervical cancer, HPV, and the HPV vaccine and the students' intention to get vaccinated. The majority of female students at Sutomo 2 High School in Medan have knowledge that falls into the moderate (51.7%), high (31.7%), and low (16.5%) categories. Regarding the vaccination status of the female students, 90% were not yet vaccinated, 57.4% stated they were willing to be vaccinated, while 42% were not. Most have a positive attitude toward HPV vaccine acceptance, although some remain neutral because they haven't yet understood the role of vaccine information factors and its cost.
3	Simanjuntak, R. A. P. S., Sugiharto, S. (2023). Knowledge of cervical cancer and attitudes toward human papillomavirus vaccination. REPOTIF: Journal of Public Health, 7(1).	Cross Sectional	There is a relationship between the level of knowledge about cervical cancer and the acceptance of HPV vaccination among female students at SMAN 3 Tangerang Regency. A total of 70% of respondents were 16 years old, followed by 27% who were 17 years old and 3% who were 15 years old. This research was conducted by providing education and administering pre-tests and post-tests, among other things. There was an increase in interest and willingness to receive vaccination, accompanied by an increase in knowledge. The percentage interested in vaccination increased from 22% to 44% after the educational session. Meanwhile, there was also an increase of 8% if funded by the government, from 84% before to 92%.
4	Liang, J., Yang, Y., & Li, X. (2025). Awareness and determinants of HPV vaccination intentions among female university students in Guangzhou, China: a cross-sectional study. Journal of Global Health Economics and Policy, volume 5.	Cross Sectional	There is a relationship between female university student knowledge and vaccine acceptance in Guangzhou, China. Out of 1435 respondents, 70.9% were first-year students and 15.4% were second-year students. They have good knowledge regarding cervical cancer (88.4%), HPV (85.6%), and the HPV vaccine (93.3%). Although 79.0% acknowledge the effectiveness of the HPV vaccine in preventing cervical cancer, only 42.7% understand the optimal timing for vaccination (before starting sexual activity). A total of 1250 respondents (87.1%) stated they were willing to receive the HPV vaccine. Meanwhile, students from urban areas showed a greater willingness to be vaccinated.
5	Sari, A. D., Lutfi, N., Syadida, H., Dirani, Cholifah, N., Asriningrum, T. P., Yekti, P. K., Binati, Cahyasari, I. A., Hidayatullah, N. S., Mulya, L. A.,	Cross Sectional	According to the Health Belief Model (HBM), 70.8% of female students aged 18-26 at Airlangga University in Surabaya have high

	Firman, A. T., Nugraheni, G. (2019). Knowledge and Belief Profile of HPV Vaccination as a Cervical Cancer Prevention Effort among Female Students at Universitas Airlangga, Surabaya. <i>Journal of Community Pharmacy</i> , 6(1),14-22.		knowledge, but this does not significantly influence their intention to get the HPV vaccine. Meanwhile, family support shows a significant relationship with getting the HPV vaccine. UNAIR students from health faculties have higher knowledge about cervical cancer and HPV (75.4%) compared to non-health faculties (68%).
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Table 2 The Relationship Between Knowledge and Vaccination Practice

No	Author, Title, Journal	Method	Result
1	Halim, C.L., Kartarino, D., & Fadillah, Q. (2025). Knowledge and Attitudes of High School Students at Sutomo 2 Medan Regarding HPV Vaccination. <i>Syntax Literate: Indonesian Scientific Journal</i> , 10(10).	Cross Sectional	The majority of female students at Sutomo 2 High School in Medan have a moderate (51.7%), high (31.7%), and low (16.5%) level of knowledge regarding cervical cancer, HPV, and HPV vaccination. However, only 10% have received the vaccine, while 90% have not. This shows that knowledge alone is not enough to encourage vaccination. Therefore, there is no relationship between knowledge and HPV vaccination practice.
2	Ladomenou, F., Gorla, E., Matalliotakis, M., Serbis, A., Christaki, E., Tsabouri, S., Makis, A., & Siomou, E. (2026). Determinants of human papillomavirus (HPV) vaccine uptake and health literacy regarding HPV infection and vaccine among undergraduate university students in Greece. <i>Vaccine</i> , volume 70, https://doi.org/10.1016/j.vaccine.2025.128042	Cross Sectional	Out of a total of 1418 students in Greece (81.4% female, 18.6% male), 66% had already received the HPV vaccine, although 86.6% knew about HPV. The majority of students were vaccinated against HPV at the age of 11-15 years (52.3%), followed by 16-18 years (30.7%). The majority of students who did not get vaccinated were hindered by parental decisions (46.7%), with the rest due to information about the vaccine itself. Therefore, there is no relationship between knowledge and HPV vaccination practice.
3	Yap, J., Satria, F. B., Alona, I., Siregar, I. M., Chen, S., Yung, C. F., Davis, C., Lubis, I. N. D., & Tang, S. (2025). Challenges in Expanding Access to the HPV Vaccine Among Schooling Girls: A Mixed-Methods Study from Indonesia. <i>Vaccines</i> , 9(13), https://doi.org/10.3390/vaccines13090948	Quantitative (BIAS Program 2023) and Qualitative (FGD)	In this study, it was found that HPV vaccine coverage was lower in Medan (27.20%) compared to Deli Serdang (62.09%) (agriculture & industry). In fact, Medan is an urban

			district with a more advanced economic profile. This is inconsistent with other studies that state that urban or more developed areas typically have good access to, knowledge of, and acceptance of vaccines. This could be because vaccination practices are not significantly related to knowledge about cervical cancer. However, these practices are related to parental decisions.
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4. Discussion

Human Papillomavirus (HPV) is one of the Sexually Transmitted Infections (STIs) that are common in society. STIs can be prevented with good knowledge. According to research by Pramana et al. (15), Halim et al. (16), Simanjuntak et al. (17), and Liang et al. (18), the level of knowledge among high school adolescents and university students is positively correlated with their willingness to be vaccinated. High knowledge about Sexually Transmitted Infections (STIs), Human Papillomavirus (HPV), cervical cancer, and the HPV vaccine influences a high interest in getting the HPV vaccine. If knowledge among Generation Z aged 16-24 is low, motivation to get vaccinated is also low. However, in the study by Sari et al. (19), high knowledge did not significantly influence the intention to get vaccinated. Meanwhile, family support showed a more significant relationship to vaccination activities.

Knowledge is not directly related to vaccination practice. In Halim et al. (16), although the majority of high school students had sufficient knowledge about cervical cancer, HPV, and the HPV vaccine, the actual vaccination rate was only 10%. The remaining 90% had not yet received the HPV vaccine. This indicates that knowledge alone is not sufficient to initiate vaccination. This is also supported by Ladomenou et al. (20), although 86.6% are aware of HPV, only 66% have been vaccinated against it. The majority received the vaccine between the ages of 11 and 15, and those who have not been vaccinated were hindered by parental decisions. Yap et al. (21) also mentioned that vaccination practices are related to parents' final decisions about their children. This concept is relevant because adolescent vaccination often requires parental consent and support, including informational, emotional, and financial support. The study by Saragih et al., conducted on parents of adolescent girls at SMP X Jakarta, clearly shows that decisions regarding HPV vaccination are closely tied to family psychosocial factors. Out of 185 respondents, 60.5% had good knowledge, and 76.2% had a positive attitude toward HPV vaccination (7). The Kendall Tau test showed a significant relationship between knowledge and attitudes with a p-value of 0.000, as well as a strong positive correlation (0.645), which means that the better the parents' knowledge, the more positive their attitude toward HPV vaccination (7). This finding confirms that knowledge is not merely passive information. Knowledge can be a driving force in shaping attitudes, which then influence decisions and actions.

If parents are hesitant, teenagers are also less likely to take action. If teenagers don't feel at risk, they are also likely to delay. If the cost is considered too high, vaccination practices do not occur even if the intention is there. Generation Z, as a group of adolescents and young adults, faces situations that require more precise prevention strategies. On one hand, they are at a phase of increased HPV exposure risk as sexual activity begins. On the other hand, they are also at a phase where health decisions are influenced by social networks, family, and access to information. Parental education also influences the ability to receive health information. Wantini and Indrayani emphasize that the educational background of parents influences their ability to accept new information related to HPV vaccination and their ability to provide informational support to their children (22). In the study by Saragih et al., the majority of parents had secondary education (51.9%) (7). This condition provides an opportunity for realistic educational intervention because the secondary education group can generally still improve their health literacy thru community and school-based approaches. Based on the description, it is evident that cervical cancer and HPV are significant and preventable issues, but primary prevention thru vaccination is still not optimal.

The problem is that the current generation of adolescents, including Generation Z as a vulnerable age group (4), faces a different social environment compared to previous generations. They are in a developmental phase characterized by

identity exploration, including social and sexual relationships. At this stage, risky sexual behaviors can emerge, increasing the likelihood of exposure to sexually transmitted infections, including HPV. Research by Ungsianik and Yulianti found a relationship between parental upbringing and risky sexual behavior in adolescents, with a p-value of < 0.05 (23). This finding is important because it shows that risk does not exist in isolation for adolescent individuals. Risk is also linked to family support structures, communication, and social control at home. In HPV disease, this becomes relevant because HPV can be transmitted thru sexual contact with infected individuals, and is also related to reproductive organ hygiene practices (7). This means that risky behavior and low prevention can reinforce each other, especially in adolescent and young adult groups. Beside family factors, economic aspects also play a significant role.

The high cost of HPV vaccination is often a barrier. It is stated that the cost of the bivalent HPV vaccine ranges from Rp 600,000 to Rp 800,000, while the quadrivalent vaccine costs around Rp 1,100,000 to Rp 1,300,000 (24). In the study by Saragih et al., the majority of respondents had an income less than or equal to the minimum wage (68.6%) (7). This economic condition can affect families' willingness and ability to get vaccinated. The findings of Wantini and Indrayani support this. They reported that many parents with incomes below the minimum wage found it difficult to afford vaccination costs even with only two children, and 70.1% of parents would consider vaccination if it were free or government-funded (22). Another study on private high school girls also showed that 41.6% of respondents did not get the HPV vaccine because the vaccine was expensive and there was no support from their parents (25). These cost barriers and family support are inseparable from the variables of knowledge and risk perception, as families will assess whether the benefits of the vaccine outweigh the costs, whether the side effects are acceptable, and whether the vaccine is truly necessary.

Saragih et al. also found that for some question items, respondents tended to answer negatively regarding the aspects of side effects, cost, and the decision to vaccinate their children (7). This shows that the generally positive attitude can remain fragile on certain most sensitive issues, namely security and cost. These two issues are also very closely related to decision-making behavior within families. In HPV disease, individuals tend to consider their susceptibility to infection, the severity of the consequences, the benefits of the vaccine, and perceived barriers such as cost, access, and concerns about side effects. If Generation Z has low knowledge about HPV and cervical cancer, they may assess their vulnerability as low and then delay vaccination. If they engage in risky sexual behavior, objective vulnerability increases, but without adequate knowledge, this increased risk is not always followed by preventive behavior. This condition can create a gap between the actual risk and the protective measures taken.

5. Conclusion

In this literature review, it can be concluded that there is a relationship between knowledge and the willingness to be vaccinated. However, that willingness is not always happen in the form of vaccination practices. The obstacles to HPV vaccination are low knowledge of STIs, cervical cancer, and HPV itself, including the HPV vaccine. Meanwhile, there is no significant relationship between knowledge and HPV vaccination practices. Vaccine acceptance is low despite the high burden of cervical cancer and the availability of the vaccine in healthcare services. This is a result of a combination of factors including knowledge, attitudes, risk perception, and cost barriers. Additionally, it is also most influenced by the parents' final decision regarding vaccine acceptance.

Compliance with ethical standards

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Disclosure of conflict of interest

There is no conflict of interest to be disclosed.

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