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A STUDY ON KNOWLEDGE, ACCEPTABILITY, BARRIERS AND ECONOMIC CONSIDERATIONS OF HUMAN PAPILLOMAVIRUS AND ITS VACCINATION AMONG UNVACCINATED INDIAN ADULTS

A dissertation submitted in partial fulfilment of the requirements for the MSc in Pharmaceutical Business and Technology

Innopharma Labs Faculty of Science

Griffith College Dublin

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May 2025

CANDIDATE DECLARATION

I, Rishab Puthiya Purayil, certify that the dissertation entitled, **"A study on knowledge, acceptability, barriers and economic considerations of human papillomavirus and its vaccination among unvaccinated Indian adults"** submitted for MSc in Pharmaceutical Business and Technology is the result of my own work. It is based on my independent study and research, and I have properly referenced and acknowledged all the sources and materials used in its creation.

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LIST OF ABBREVIATIONS:

HPV	Human Papilloma virus
LR-HPVs	Low-risk Human Papilloma virus
HR HPVs	High-risk Human Papilloma virus
SCC	Squamous cell carcinomas
EV	Epidermodysplasia verruciformis
CIN	Cervical intraepithelial neoplasia
PCR	Polymerase chain reaction
IARC	International Agency for Research on Cancer
HNCs	Head and neck cancers
QALY	Quality-Adjusted Life Year
DNA	Deoxyribonucleic acid

ABSTRACT

This study evaluates the knowledge, acceptability, perceptions of barriers, and cost of HPV infection and vaccination among unvaccinated Indian adults in the context of rising health concerns related to HPV and historically low vaccine uptake. It used a quantitative cross-sectional study design, and thirty-three closed-ended questions from a structured online survey were used to collect data. Research participants were recruited between March and early May 2025 from urban, suburban, and rural settings in India and were adults, aged 18 and older. Descriptive statistics and chi-square tests $p<0.05$ were run on a final sample of 248 eligible responses to examine associations between demographics and knowledge or acceptance levels. Results revealed that 30.65% of participants were aware of how HPV is spread, 73.39% had heard of the HPV vaccine, and 6% were aware of the screening process. About 51.6% of respondents had moderate or low knowledge of prevention, compared to 48.4% who had high knowledge. The research revealed no significant statistical relationships yet female survey participants from cities with higher earnings and better education outcomes tended to know more about these vaccinations. Most common barriers faced by men against vaccination was because they encountered cost, lagging knowledge as well as insufficient healthcare guidance and targeted stigma. In addition, while 83% identified cervical cancer as a public health problem, the nonavalent vaccine generated low willingness to pay as financial limitations were a major barrier. No significant relationship was found between the level of Knowledge and the age, gender or residence of the population according to Chi-Square tests, however relationship was found between age and acceptability levels. The findings confirm that awareness around the risks associated with HPV still leaves a gap in knowledge and presents socio- cultural barriers. High acceptability rates stress the importance of better education together with healthcare provider engagement and government-supported vaccine subsidies to boost vaccination rates. In India the burden of HPV disease can be significantly reduced by incorporation of HPV vaccination into the national immunization program, laying emphasis on gender-neutral vaccination policies, and focusing on removing myths and misconceptions about the vaccine. Overall, this study provides important information to those invested in increasing adult vaccination rates in a public health approach that gives people information, access, and affordability.

Keywords: HPV, descriptive statistics, chi-square tests

CHAPTER 1: INTRODUCTION

1.1 Overview

The Human Papilloma virus (HPV) is a sexually transmitted virus that is the leading cause for cervical cancer in women and estimated incidence 134,420 cases annually with mortality of about 74,000 women every year in India (Swarnapriya, Kavitha and Reddy, 2016)

HPV considered to be the cause of almost all cervical cancer cases, they are group of more than 200 related viruses out of which nearly 40 are transmitted through anal and vaginal intercourse (Larebo *et al.*, 2022)**.** HPV infection is acquired shortly after first sexual experience with an infected partner, which is usually cleared at early age. If it persists, it can cause a variety of malignancies and benign lesions that affect the oropharyngeal tract and the ano-genital tract in both sexes (Trucchi *et al.*, 2020)**.** Over 80% of sexually active women have HPV at some time in their life and its early detection can be done efficiently with well-organized screening (Destaw, Yosef and Bogale, 2021)**.**

Now there are HPV prophylactic vaccine available that protects against most genital warts and cervical cancer. It is also known as the cervical cancer vaccine (Cheung *et al.*, 2018)**.** Strong endorsement by health care professionals and social media influencers of the HPV vaccination is still an essential tactic for a vaccination program to be implemented successfully (Shetty *et al.*, 2021)**.** However, the HPV vaccination is not popular for males in India, although it is advised for girls and women, however immunizing boys and men will be an effective strategy for preventing cervical cancer in Indian women. The current HPV vaccination protects genital warts and other HPV-related disorders in addition to six cancers: cervix, vaginal, vulva, anus, penile, and oropharyngeal (De Martel *et al.*, 2017) **.**

Poor vaccination rates in India are probably partly a result of inadequate knowledge and instruction on HPV infection, cervical cancer, and the HPV vaccine. Due to above stated reasons evaluating men's and women's awareness of HPV and their acceptance of the vaccination is crucial (Shetty *et al.*, 2021).

1.2 Purpose of the Study

This study evaluates knowledge and attitudes alongside acceptability screening and barriers related to human papillomavirus infection and vaccination for Indian adult men and women. Given that cervical cancer as well as other HPV-related conditions represent a serious health burden and so this study explores levels of awareness around HPV virus transmission routes as well as known risk factors and prevention measures such as vaccination and screening.

This study also puts light on the barriers experienced by public in receiving the vaccination, the attitude towards the vaccination and how the cost of the vaccine can put an impact on the vaccination rate in the country. The level of knowledge demonstrated by those who are aware of HPV-related diseases gives HPV professionals an idea of what aspects of awareness need strengthening, and in which areas the population is relatively informed.

This study evaluates how well the public understands HPV vaccines and their level of acceptance when used as preventive tools against HPV infections and cervical cancer occurrence. The results from knowledge-related questionnaires on HPV vaccination will measure how well respondents understand the benefits together with safety and effectiveness aspects of quadrivalent and nonavalent vaccines. The evaluation plays an essential role because it confronts incorrect information that poses obstacles to vaccination acceptance.

The research identifies major obstacles confronting Indian citizens who want HPV vaccines as an essential part of the study. Various hindrances including financial difficulties and accessibility problems as well as cultural or religious beliefs and fear of negative side effects and deficient medical provider advice are preventing people from getting HPV vaccinations. The development of successful treatment methods for better vaccine coverage needs thorough knowledge of existing barriers.

The present study also measures consumer's willingness to pay additional for vaccine that protects against additional viral strains given the cost of HPV vaccines. The analysis of the financial implications of vaccination could be of great help to derive recommendations for government subsidies along with insurance coverage and affordable vaccination programs.

Based on the findings of this study, significant shifts in public health efforts as well as HPV vaccine education materials and availability to the public will occur. This analysis strives to establish accurate pathways by addressing well-known gaps in knowledge and understanding

barriers while exploring economic impacts efforts to increase HPV vaccine uptake and decrease HPV disease burden in India.

1.3 Aim and Objectives of Research

"To assess the level of knowledge about HPV infection and its vaccination, evaluate its acceptability, find out the barriers to vaccine uptake and analyse the perceived economic burden and willingness to pay among adult men and women in India"

The main objectives of the research are as follows

- To evaluate Knowledge of HPV Infection and its Prevention.
- To assess the level of knowledge and acceptability of HPV vaccination among unvaccinated Indian adults
- To evaluate the barriers to receive the HPV vaccination
- To analyse the perceived economic burden and willingness to pay for quadrivalent and Nonavalent HPV vaccines

1.4 Research Questions

1.4.1 What is the level of knowledge and awareness among adult men and women in India regarding HPV infection, its transmission, associated health risks, and its role in causing cervical cancer and other HPV-related diseases?

1.4.2 How much do Indian adults know about the HPV vaccine and how wilfully do they accept it while which factors impact their views and acceptance toward vaccination?

1.4.3 Which barriers including financial limitations and cultural traditions and inadequate availability of correct information and limited access to healthcare and healthcare provider guidance prevent Indian people from receiving the HPV vaccine?

1.4.4 What is the willingness of Indian consumers to pay for dual or multiple doses of the quadrivalent, and Nonavalent HPV vaccines, and how do economic factors influence their vaccination decisions?

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

As per WHO, HPV was responsible for 620 000 new cancer cases in women and 70 000 new cancer cases in men worldwide in 2019. With over 660 000 new cases and 350 000 fatalities globally in 2022, cervical cancer ranked as the fourth most common cause of cancer and cancer-related deaths among women (WHO HPV, 2024). Human papillomavirus (HPV) is a member of the Papovaviridae family, stands as a non-enveloped DNA virus with double-stranded circular form that activates several epithelial disorders and carcinomas in human bodies. The virus causes two types of warts known as cutaneous warts and anogenital warts and some subtypes can lead to development of carcinoma (WHO HPV, 2024). Each year HPV infection affects 14000000 individuals while this disease will infect 80% of all sexually active people at some point during their life (Harper and DeMars, 2017). HPV affects more than 6.2 million people in the United States yearly which demonstrates the virus extends beyond being an issue limited to developing nations for public health (Araldi *et al.*, 2018).

Discovery of human papillomavirus (HPV) as the necessary cervical cancer causative agent along with the development of effective viral vaccines has generated global optimism which impacts primary and secondary prevention approaches (Muñoz *et al.*, 2003). The HPV virus exists in more than 100 different subtypes. HPV classified into two categories first, low-risk HPVs (LR-HPVs) that responsible for anogenital and cutaneous warts and high-risk HPVs (HR HPVs) responsible for oropharyngeal (oral, tonsil, and throat). The virus causes both cancers of oropharyngeal regions (oral cavity throat patients) and anogenital cancers affecting cervical, anal and the three female genital organs and male genital organ penile cancers (de Martel *et al.*, 2012) (De Martel *et al.*, 2017).

Research indicates that HPV subtypes 6 and 11 function as low-risk varieties because they rarely lead to cervical cancer development. The genotypes responsible for ninety percent of genital wart events result in such developments. HPV types 16 and 18 are defined as high-risk viruses since their strong connection to cervical dysplasia has established their status as carcinogenic subtypes. Scientific research shows that these genotypes infect 70% of squamous cell carcinoma cases in the cervix (Yanofsky, Patel and Goldenberg, 2012). Research suggests HPV types 31, 33, 45, 51, 52, 56, 58, and 59 carry intermediate risk status because they frequently appear with squamous neoplasms although cervical SCC(squamous cell

carcinomas) occurs rarely under their influence (Lombard *et al.*, 1998)**.** HPV infection causes about 60% of penile cancers together with 70% of vaginal and vulvar cancers and 90% of anal and cervical cancers. Research has revealed HPV as the leading cause of oropharyngeal malignancies because it accounts for approximately 70% of these cancers although alcohol and tobacco had traditionally been responsible for this condition. The development of most oropharyngeal cancers depends on the presence of alcohol, tobacco use together with HPV infection (CDC, 2025)**.**

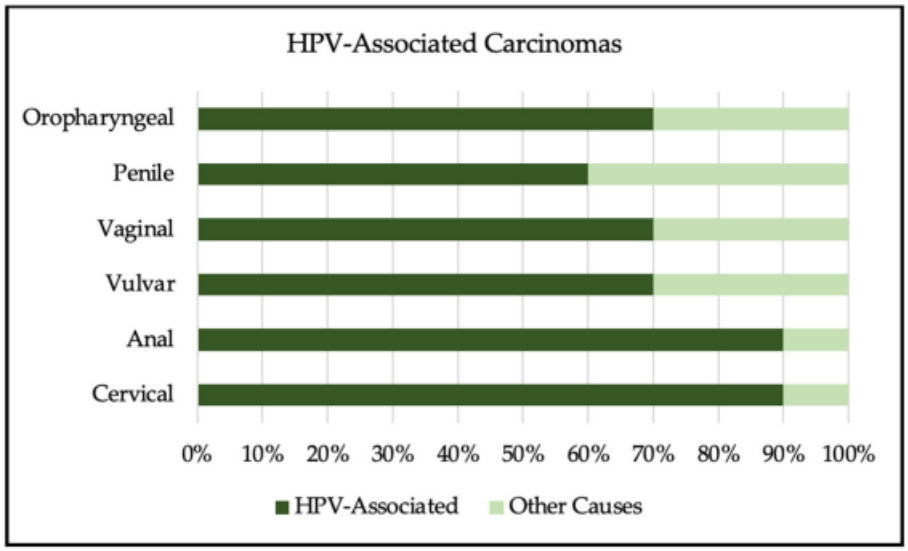


Figure 1: HPV-related cancer rates versus the other known causes *(Jensen* et al.*, 2024a)*

It was seen that HPV infection leads to oropharyngeal cancer in male patients and HPV causes about half of all cervical cancers diagnosed in women. The chances of HPV infection are maximum for males who have HIV and engage in sexual encounters with other men (Smith *et al.*, 2011)**.** The risk for additional HPV subtype infection increases among people who have multiple sexual partners and those who continue to carry an HPV infection. The/latest classification of HPV infection appears as follows:

- Non-genital (Cutaneous)
- Mucosal or anogenital
- Epidermodysplasia verruciformis (EV)

Clinical manifestations of the condition are often easy to spot yet medical teams sometimes require DNA tests for specific scenarios (cases of latent lesions). The principal manifestations of clinical lesions present as warts instead of cancer while most cases of HPV infections exist in latent states (Smith *et al.*, 2011)**.**

The majority of HPV infections create no symptoms and resolve on their own but persistent HPV infection leads to the development of various cancers in addition to genital warts and respiratory papillomatosis. The anogenital skin epithelium and mucous membranes can be infected by about 40 different types of HPV (Hirth, 2018). Most HPV infections exist as latent cases which might need DNA testing for proper detection. Clinical lesions sometimes show visible signs although latent ones must be tested. Most cases of HPV infection remain inactive while warts become the most prevalent clinical manifestations instead of cancerous conditions (Smith *et al.*, 2011)**.**

The 1983 cloning of HPV 16 type from cervical cancer tissue by Durst and his colleagues established the carcinogenic role of HPV. The belief that high-risk HPV triggers most cervical malignancies has become the standard scientific understanding since 1983. The continuation of HPV infection in cervical basal cells leads to cervical cancer development yet HPV often clears by itself without causing symptoms (Hirth, 2018)**.** HPV infections eventually lead to cancer through uncontrolled cellular growth along with mutations across lesions. The immune system naturally eliminates most HPV infections that cause no symptoms within one to two years yet women with cervical cancer may show positive results of high-risk HPV genotypes three to five years prior to their cancer diagnosis (Kjaer *et al.*, 2010).

The continued presence of high-risk HPV strains in the body leads to an increased cancer potential and it increases the possibility of developing high-grade cervical intraepithelial neoplasia (CIN) (Kjaer *et al.*, 2010)**.** Having said that, the ability to cause cancer by HPV was seen during initial examinations of individuals with epidermodysplasia verruciformis. Autosomal recessive epidermodysplasia verruciformis patients develop exophytic trunk and upper extremity lesions within their first ten years because of a 17-chromosome gene locus which leads to poor defence against HPV subtypes 2, 3, 5, 10, and 8. Squamous cell carcinoma was seen to arise from these lesions throughout the period of young adulthood. These lesions of epidermodysplasia verruciformis become non-infectious to healthy persons while HPV causes standard warts to spread to others (Alton B. Farris, 2024)**.**

(Kreimer *et al.*, 2005a) also proved through PCR testing that HPV DNA exists within head and neck squamous cell carcinoma which develops from different anatomical areas. HPV DNA-positive HNSCCs mostly contain HPV16 which represents 90% of the cases (Kreimer *et al.*, 2005b)**.**

A global incidence of approximately 70% cervical cancer cases can be traced back to HPV types 16 and 18 according to highly standardized International Agency for Research on Cancer (IARC) case-control studies. Manufactured vaccines target the two high-risk oncogenic HPV types in accordance with available evidence. The fraction of cervical cancer cases which remains differs based on the responsibility of various HPV types 26, 31, 33, 35, 39, 45, 51, 52, 53, 56, 58, 59, 66, 67, 68, 69, 70, 73, 82 (Muñoz *et al.*, 2003)**.**

HPV links to various cancer types in the area around the anus as well as the lungs and larynx and mouth as modern medical science has shown. The low-risk HPV strains 6 and 11 generally lead to low-grade precancerous conditions as well as condylomata formation. High-grade intraepithelial lesions turning into cancers appear because of high-risk HPV subtypes 16 and 18. The presence of HPV solely does not lead to cancer development because it necessitates certain triggers including smoking and folate deficiency alongside UV ray exposure and immunosuppressed states and pregnancy conditions (Dürst *et al.*, 1983)**.**

2.2 Etiology

Within the Papillomaviridae family there exists HPV which constitutes a circular double-stranded non-enveloped virus. The virus breaches skin layers or mucosal tissue to reach epithelial cells which results in stem cell infection. Virus reproduction depends on the two late (L) phase and seven early (E) phase genes that exist within its genome. The virus DNA exists independently as an episome prior to incorporating into its host genomic material. The human papillomavirus indicates a preference for entering fragile strands of human DNA which have high breakage risks (Araldi *et al.*, 2018)**.**

Risk factors:

- Number of sexual partners, age at which first sexual contact occurred, and sexual activity
- Smoking
- Oral contraceptives (more than 5 years)
- Chewing betel nut
- Radiation and UV light exposure

HPV spreads primarily through sexual activities yet exposes individuals to infection through direct skin to skin contact also. Research indicates that both men and women will experience HPV infection during their lifetime and this happens to 80% of the population. Every sexually

active person faces the risk of acquiring either low or high-risk HPV infection following initiation of sexual activity (Anna Szymonowicz and Chen, 2020). The human immune system usually removes the virus but certain individuals continue to have infection leading to precancerous changes in tissue structure. When immune system control fails to maintain HPV infection control then HPV-infected cells accelerate their multiplication and lead to tumor or precancerous development. Several factors like oral contraceptive use beyond ten years, smoking, repeated pregnancies and immune deficiency and concurrent STD infections with high-risk HPV types can heighten precancerous cervical cells transforming into cancerous tissue (VHL, 2024).

Almost every cervical cancer stem from HPV infection. HPV infection should be considered as a known factor in the development of both head and neck cancers (HNCs) along with genital warts across genders and anogenital cancers of vulvar, vaginal, anal, and penial regions. The prevalence of new anogenital warts touches 0.15% to 0.18% of the male and female population according to statistical data while the yearly occurrence rate stands at 137 per 100,000 males and 121 per 100,000 women (Anna Szymonowicz and Chen, 2020)(Patel *et al.*, 2013).

Medical opinions indicate that penile cancers develop in more than 60% of cases with HPV infection while vaginal and vulvar cancers form in over 70% of cases and HPV causes more than 90% of anal and cervical cancers. On the other hand, whereas alcohol and tobacco have historically been the main causes of oropharyngeal cancers, new research indicates that HPV may be responsible for almost 70% of oropharyngeal malignancies. Many oropharyngeal cancers can result from a combination of alcohol, tobacco, and HPV infection (CDC, 2025). Among heterosexual men, African males who exceeded three female sexual partners showed the most risk for infection. The average prevalence of HPV infection of any kind proved to be nearly double among males with HIV in comparison to unaffected males at 78.2% versus 49.4% (Olesen *et al.*, 2014).

2.3 Prevention and Screenings

Cervical cancer control requires all stages of prevention to work effectively starting from primary prevention by giving HPV vaccinations and continuing to secondary prevention through screening and pre-cancerous lesion treatment along with tertiary prevention for diagnosing and treating invasive cervical cancer and closing with palliative care (Aggarwal, 2014).

The average death rate from cervical cancer has decreased by more than 50% throughout the last thirty years because of the Pap test. The Pap test screening reveals cervical cancer mostly in women who did not receive this test in more than five years or have never undergone screening before (Safaeian and Solomon, 2007)**.**

Two screening tests serve as early detection methods to prevent cervical cancer or detect it early.

- **Papanicolaou Test**
- Recommendations by the United States Preventative Services Task Force (USPSTF) and American Society for Colposcopy and Cervical Pathology state that it is advisable that women over 21 should be taken for Pap tests at an interval of three years. For women over the age of 30, they may choose to have every five years HPV testing with or without a Pap test, HPV testing alone every five years or Pap testing alone every three years, and screening stops when the subjects reach 65 years of age and all the results have been clear. (US Preventive Services Task Force *et al.*, 2018)**.** Doctors use the Pap test method to collect cervical cells for microscopic examination in their office setting. Health care providers perform this procedure during standard pelvic examinations. In cases where the Pap test reveals abnormal cells that might turn into cancer(Melnikow *et al.*, 2018).
- **High Risk (HR) HPV test**

The primary cervical cancer testing method depends on hrHPV tests that detect HPV species with harmful effects in cervical intraepithelial neoplasia (CIN) tissues and cancer. Tests need to demonstrate remarkable precision to identify CIN 2+ and CIN 3+ lesions while keeping unnecessary follow-up monitoring at an optimal level. The standard hrHPV detection tests include Hybrid Capture 2 (HC2) and GP5+/6+ PCR with findings showing they can successfully detect relevant infections. The testing methods demonstrate superior sensitivity than regular cytology studies thus providing critical instruments for screening patients early (Meijer *et al.*, 2009)**.**

A hrHPV test integrated into screening programs needs to pass through multiple validation tests that prove a positive result shows persistent infection instead of temporary infection status. To achieve correct clinical outcomes the right balance of sensitivity together with specificity both serve as critical factors for identifying at-risk individuals while avoiding unnecessary medical interventions. A hrHPV test integrated into screening programs needs to pass through

multiple validation tests that prove a positive result shows persistent infection instead of temporary infection status. In order to obtain accurate clinical results, the proper sensitivity must be combined with specificity, as both are essential for detecting those who are at risk without applying unwarranted medical labels. (Meijer *et al.*, 2009) **(93).**

Population (Female)	USPSTF and CDC	WHO
Under 21	Not recommended	Not recommended
21–30	Pap test every 3 years	Not recommended
30–65	Pap test with HPV co-testing every 5 years, HPV testing every 5 years, or Pap test every 3 years	HPV DNA testing every 5–10 years; complete after 2 negative tests
Living with HIV	Pap test or Pap test with co-testing starting at age 21 yearly for three years then every three years for life	HPV DNA test starting at age 25 every 3–5 years

Table 1: Cervical cancer and HPV screening guidelines by age (Meijer et al., 2009)

2.3.1 Significance of Vaccination and their Efficacy

The World Health Organization (WHO) supports vaccines that protect against HPV 16 and 18 and these vaccines are approved for use throughout many nations. Both male and female individuals between the ages of 9–26 need to receive the HPV vaccine according to recommendations (WHO cervical cancer, 2024)**.** The first healthcare goal should target all female patients aged 9 to 14 with HPV vaccination before their first sexual encounter. The vaccination can be provided through one or more doses. Multiple doses should be administered to strengthen the immune response of people whose system is compromised. The decision to provide HPV vaccination to boys has been adopted by select nations to decrease HPV prevalence rates and stop HPV-related cancer development in males (WHO cervical cancer, 2024)**.**

Research has demonstrated that vaccination for HPV produces secure and successful results among males. Public health initiatives have focused on female immunization yet multiple national governments along with the USA have authorized the use of male vaccines. Little information exists regarding male HPV infection's health impacts among both sexes because of the overemphasis of adolescent girl HPV vaccines. Education regarding HPV infection together with its morbidity, mortality, prevention and transmission rates needs strengthening for men and women throughout countries regardless of their choice between gender-neutral and female-only HPV vaccination programs (Zimet and Rosenthal, 2010)**.**

The US authorized HPV vaccination for its first time in the healthcare market during 2006. There exist three primary vaccination types for the market including bivalent, quadrivalent and Nonavalent. The Merck & Company produced vaccine Gardasil functions as a 9-valent or Nonavalent medication that defends against HPV 6, 11, 16, 18, 31, 33, 45, 52, and 58 strains. The bivalent vaccine protects against HPV 16 and 18 viruses but the quadrivalent vaccine defends against HPV 6 and 11 and HPV 16 and 18 (Jensen *et al.*, 2024b)**.**

The manufacturers use recombinant Saccharomyces cerevisiae cells for Gardasil but Cervarix requires the recombinant baculovirus expression system. The Nonavalent provides additional protection against HPV types 31, 33, 45, 52, and 58. Several continents have undergone initial post-marketing surveillance and clinical trials which demonstrated that each of the three vaccines maintains safety. The reports indicate that anaphylaxis (1.7 cases in 1 million doses) occurs rarely and stands as a dangerous allergic reaction (*Global Advisory Committee on Vaccine Safety, 7–8 June 2017*, 2017)**.**

Characteristic	Bivalent (2vHPV)*	Quadrivalent (4vHPV)†	9-valent (9vHPV)§
Brand name	Cervarix	Gardasil	Gardasil 9
VLPs	16, 18	6, 11, 16, 18	6, 11, 16, 18, 31, 33, 45, 52, 58
Manufacturer	GlaxoSmithKline	Merck and Co., Inc.	Merck and Co., Inc.
Manufacturing	*Trichoplusia ni* insect cell line infected with L1 encoding recombinant baculovirus	*Saccharomyces cerevisiae* (Baker's yeast), expressing L1	*Saccharomyces cerevisiae* (Baker's yeast), expressing L1
Adjuvant	500 μg aluminum hydroxide, 50 μg 3-O-desacyl-4′ monophosphoryl lipid A	225 μg amorphous aluminum hydroxyphosphate sulfate	500 μg amorphous aluminum hydroxyphosphate sulfate
Volume per dose	0.5 ml	0.5 ml	0.5 ml
Administration	Intramuscular	Intramuscular	Intramuscular

Table 2: Features of the three HPV vaccinations approved for use in the US(Wheaton et al., 2015)

The vaccine enhances B cell immunity by changing the range of circulating antibodies. The body produces non-neutralizing antibodies after natural HPV infections develop spontaneously. A person who gets HPV 16 infection after receiving one vaccine dose will generate neutralizing antibodies (Scherer *et al.*, 2016)**.** To evaluate the effectiveness of the HPV vaccine one must examine its capability to stop both low-risk and high-risk HPV infections as well as diseases. The quadrivalent vaccine demonstrated strong reduction of genital warts since it reduced their risk by 97% (OR = 0.03, 95% CI 0.01–0.09) and decreased the likelihood of genital warts developing significantly (OR = 0.36, 95% CI 0.26–0.51)(Lukács *et al.*, 2020)**.**

Palmer *et al* conducted a study in Scotland to detect any HPV vaccine-cancer prevention associations through research of cervical cancer registry data and female vaccination records from 1988 to 1996 national birth cohorts. Research reveals that women taking the bivalent

HPV vaccine at ages 12 through 13 completely prevented them from developing invasive cervical cancer. The risk for women under 100,000 without vaccination turned out to be 8.4 cervical cancer cases yet 3.2 cases arose among 100,000 vaccinated women aged 14 to 22. Early human papillomavirus immunization provides the maximum protection against cervical cancer to girls who are younger than 13 years old (Palmer *et al.*, 2024)**.**

2.4 HPV Vaccination Guidelines and Recommendations

According to CDC guidelines the HPV vaccine should be administered twice to 11-and 12-year-old children from both genders with recommended spacing of six to twelve months between doses. People in the age range from 15 to 26 years need to get three HPV vaccine doses if they did not previously receive any vaccination. According to the CDC's recommendations about early sexual debut and immunocompromised status patients may require vaccination starting from age 9 and should continue vaccination through age 45 (HPV CDC, 2025)**.**

According to WHO guidelines female patients between ages 9–14 need one or two HPV vaccinations and women aged 15–20 require the same. Those over 21 years must receive two doses spaced six months apart. People under HIV treatment so their immune system function poorly or who live with HIV require at least two doses but can benefit from three doses if available (*Human papillomavirus vaccines: WHO position paper, December 2022*, 2022)**.** Healthcare providers have flexibility to choose appropriate ages for their patients when giving HPV vaccinations. The effectiveness of the vaccine reaches its maximum potential before a person begins having sexual intercourse. Each patient requires the performance of risk assessment and shared decision-making processes. Medical staff must decide when to finish the vaccination sequence based on patient assessment (Ellingson *et al.*, 2023)**.**

The review by (Sankaranarayanan, Bhatla and Basu, 2016) demonstrated worldwide HPV vaccine significance along with their specific importance for India. Health authorities implemented more than 280 million doses of HPV vaccines around the globe by 2016 while maintaining excellent safety measures and demonstrating effectiveness against HPV types 16 and 18. The authors maintained that India should include HPV vaccines into its National Immunization Programme because it has substantial cervical cancer rates. HPV vaccines appeared in more than 80 countries as part of their National Immunization Programs at this time. National health initiatives which integrate HPV vaccinations have the potential to decrease cervical cancer cases according to the analysis but require public awareness

campaigns and solutions to vaccine acceptance challenges (Sankaranarayanan, Bhatla and Basu, 2016).

For instance, Sikkim initiated its HPV vaccine campaign in 2018 to immunize girls from 9-14 years and succeeded up to 97% of the target population. The school-based immunization program carried out through schools comprised intensive training of teaching staff and medical staff which resulted in successful vaccine delivery. The accomplishment of the program mainly stemmed from the high political support through united work between health services and educational departments. Community engagement combined with massive outreach was critical to the success of the HPV vaccination campaign in Sikkim. Project portability was also maintained due to challenges faced by delivery teams in working in far-off areas and vaccine hesitancy. It reaffirmed the lesson learned that dedication to political aspects of the process, community involvement from an early stage and a careful use of communication can lead to positive healthcare results. Due to the high coverage of vaccination achieved by careful planning and community mobilization efforts, Sikkim's HPV vaccination program can be seen as an effective community model for immune protection against HPV (Ahmed *et al.*, 2022).

India will benefit from the reduction of HPV related disease burden as well as an optimal population-wide protection by adopting gender-neutral HPV vaccination policies. There are currently barriers to its implementation but, with thoughtful policies and community education and resources, HPV vaccination has the capacity to be quite successful. Removing these barriers is the most important step forward in order to have a healthier community and decrease healthcare costs associated with HPV infections (Kaur *et al.*, 2024).

2.5 Parent's Influence and Awareness in Willingness in HPV Vaccination

The HPV protection offered by vaccines effectively protects against both cervical cancer and 90% of HPV infections. The combination of HPV vaccination in adolescents along with cervical screening enables significant mortality reduction in cervical cancer by 76% and decreases cervical screening abnormalities by 50%. The positive aspects of HPV vaccines do not change the fact that parental choices in matters of vaccine acceptance steer both the vaccine initiation process and the completion of full vaccination schedules for adolescents (Aragaw *et al.*, 2023). Through a community-based cross-sectional study which included 738 participants (Aragaw *et al.*, 2023) demonstrated that 79.10% of parents planned to vaccinate their daughters. Mass media exposure among parents increased their likelihood of daughter vaccination by 2.74 times and parents who understood HPV and its vaccine were 2.85 times

more likely to vaccinate their daughters. Parents who viewed HPV infection and vaccination positively displayed a vaccination likelihood that was 5.10 times higher for their daughters. Similarly, findings revealed by study conducted by (Destaw, Yosef and Bogale, 2021) that 79.5% of the total sample showed their support for HPV vaccinations for their daughters. Parents who completed at least primary education were among key determinants that made them willing to have their daughters vaccinated. Parental education background, particularly knowledge, but also belief, along with media exposure played a pivotal role in the decision-making process around HPV vaccination. Individuals who attained primary education or more showed higher rates of daughter vaccine willingness when compared to those without educational qualifications. The acceptance of the daughter vaccine campaign by parents seems to correlate with their attained educational level. Educational programs dedicated to HPV vaccinations should be specifically developed for parents without formal education to improve their willingness toward vaccination programs because this will result in better attendance for vaccine appointments among their daughters as a result (Destaw, Yosef and Bogale, 2021).

In addition to the basic education of the parents, previous experience of encounters with STD's had positive for driving them towards vaccination, which was evident during a community-based research study by (Mihretie, 2022) who investigated parental awareness and desire to get HPV vaccines for their female children aged 9–14 years. The research showed that 35.4% of surveyed participants knew about HPV vaccination while 44.8% expressed willingness to get their daughters vaccinated. Government's employees along with parents with a family history of sexually transmitted diseases brought positive effects toward their knowledge base. Research data indicated older parents who had at least a secondary education level together with an anxiety about HPV infection demonstrated a higher intent to vaccinate their daughters because they possessed more knowledge about the HPV vaccination (Mihretie, 2022).

Another factor that influenced the acceptance of vaccination was the cost which showed to be a greater reason than the education of the parents which was evident from when vaccine acceptance reached higher levels when healthcare providers eliminated financial charges. Research within Association of Southeast Asian Nations (ASEAN) countries revealed positive HPV vaccination attitudes from parents who showed deficits in understanding cervical cancer and HPV. Without costs the HPV vaccine program received higher acceptance from parents. Parents relied on different reasons such as medical expenses together with their illnesses and wrong beliefs about vaccine protection when making vaccine decisions for their children

(Wijayanti *et al.*, 2021). Among the explored factors that influenced the vaccination decision, were costs, family history of medicine, negative rumours, and perceived vaccine safety risks (Bittew *et al.*, 2024). Data from this study pointed out the need for targeted intervention programs in health services to assist parents in obtaining a clearer understanding of the HPV vaccine and corresponding willingness to support its use as a prevention measure. Public officials should conduct HPV vaccination promotion through mass media platforms while also providing school-cantered and religious institution and health facility-based educational information (Bittew *et al.*, 2024).

2.6 Barriers in Male HPV Vaccination and Improvement Strategies

In the United States, annually, genital warts were recorded in about 3-4 million men especially aged 25-29 with an incidence rate of 500 for each 100,000. According to public health officials in Hong Kong, in 2009 the incidence of genital warts disease in the male population was 292.2 per 100,000 persons per year. According to the medical records, 472 women were diagnosed with cervical cancer in the year 2014. Male vaccination must urgently be made aware to people (De Martel *et al.*, 2017)**.**

Incidence of mouth and throat cancers due to HPV is increasing in men in the developing nation. A study from the 2020 Cancer Epidemiology, Biomarkers & Prevention journal reports that there has been consistent increase in indicators of HIV-associated cancers in Indian male population. The reported incidence of cancers for HPV-related among Indian men increased from 0.029 to 0.038 for 100000 during the period from 2000 years to 2015. Oropharyngeal cancer accounted for 63.2% of HPV-related cancers and 7.5 % of all diagnosed cancers in Indian men. Other HPV-caused cancers in Indian men include penile cell tumors, anal cell tumors and head and neck region cancers (Ramamoorthy *et al.*, no date). Another study from 2019 edition of Indian Journal of Cancer reported high HPV infection rates among Indian male subjects. Studies indicate that among male Indians HPV infection occurs in 26.6% of people. Research findings indicate that HPV infections exist in 26.6% of Indian males thus one quarter of males have HPV (Ramamoorthy *et al.*, no date)**.**Thus the importance of male vaccination awareness has become essential (De Martel *et al.*, 2017).

The level of parental support for HPV vaccines for their sons depends on how well parents understand HPV infection risks and benefits (De Martel *et al.*, 2017). Health professionals'

strong recommendations about HPV shape parents' and adolescents' acceptance of vaccination activities because they need specific information on how HPV affects males.

A study by (Qendri, 2020) determined the cost-effectiveness of immunizing both males and females in European countries that use tender-based procurement for vaccines. Traditional HPV vaccination programs have mostly provided preadolescent girls with preventive care for cervical cancer. Scholarly studies of HPV disease occurrence within males have become important evidence that fuels discussions about providing the vaccine to boys and exploring gender-agnostic vaccination procedures. But the increased efficiency gained through having males participate in these programs and using a tender based procurement strategies to lower vaccine costs through bulk procurement while maintaining equal opportunity also make these programs more efficient.. As the costs of the vaccine shrink and additional information is uncovered regarding the impact of HPV disease burden on men, reconsidering the approach to vaccinations to cover both genders could as well be a wise an action for public health (Qendri, 2020).

The principal factor preventing male acceptance of HPV vaccines is their insufficient awareness of the subject. Research demonstrates that male populations and their parents consider HPV as only a woman-related condition because of this perception reduced male vaccine necessity. A long-standing gender stereotype regarding the HPV vaccine stands as the biggest challenge that male youths face. Initial HPV vaccination campaigns targeted only female patients because they believed males would not receive enough advantages from the vaccine. The outdated mind set about HPV has minimized the number of males and boys who have received their vaccinations (Qendri, 2020). Healthcare providers have created a challenge by not endorsing HPV vaccination. The study revealed that medical professionals tend to give HPV vaccine suggestions more frequently to female patients than male patients. HPV vaccination rates remain low among boys because of the negative parental outlook toward protecting their sons from the virus. The research showed that numerous parents considered the vaccine useless for boys unless they acknowledged HPV-linked diseases that affect male patients. The acceptance of vaccines is influenced by both community-based attitudes and perceptions of judgment (Qendri, 2020). The findings by (Krokidi *et al.*, 2023) demonstrated that HPV being a sexually transmitted triggers discomfort during discussions thus lowering acceptance rates among certain populations (Krokidi *et al.*, 2023). The acceptance of vaccines becomes higher when individuals understand their benefits which protect against cancer and genital warts**.** Fears about vaccine security and adverse effects together with the negative

cultural associations of STI prevention vaccines prevent individuals from receiving them (De Martel *et al.*, 2017)**.**

Research data demonstrates that individuals from different racial and ethnic backgrounds hold diverging perspectives toward medical services and sexuality-related beliefs which affects their willingness to engage in sexual health intervention programs as presented in (Ferris *et al.*, 2007). Only 33% of male respondents from the community-based region accepted these services according to their research findings. The limited investigation of HPV vaccine acceptance between males and females persists in research as reported by (De Martel *et al.*, 2017)**.** Recent studies show female university students initiate HPV vaccine activities at higher rates than their male counterparts and university students demonstrate substantial differences in their beliefs and attitudes regarding human papillomavirus.

Targeted educational efforts about vaccine advantages should run alongside training healthcare professionals to consistently suggest vaccination to patients of both sexes while pursuing policy reforms for equal vaccine availability. Combining HPV vaccination procedures with adolescent standard immunizations would both increase patient compliance rates and minimize treatment windows missed for child wellness initiatives (Krokidi *et al.*, 2023).

2.7 Influence of Cost in Decision of Vaccination and Integration of HPV Vaccination with Cervical Cancer Screening

Cervical cancer screening functions as a primary preventive measure for cervical cancer together with HPV vaccinations. Studies revealed that HPV DNA testing followed by HPV positive women undergoing cytology screening together with HPV vaccination provided both the highest Quality-Adjusted Life Year (QALY) gain and similar cost efficiency to alternative screening methods. Additional acceptability of the vaccine acted to mitigate the negative impacts of delayed routines along with reduced testing frequencies (Gervais, 2017)**.** This screening and vaccinating method has been very effective and economical who reduce the incidence of cervical cancer in developed countries. Lack of sufficient skilled healthcare personnel and existing infrastructure in India poses economic and logistical challenges to the implementation of the preventive measures. (Chauhan *et al.*, 2020).

A cost-effectiveness analysis made by (Termrungruanglert *et al.*, 2024) found that two doses of the nonavalent HPV 9vHPV vaccine were the most cost-effective alternative using 406 USD per QALY obtained.. This approach demonstrates an acceptable financial investment threshold for developing countries that belong to the Low and Middle Income bracket. The regimen

received an 80% probability of cost-effective status using sensitivity analysis. The vaccination programs proved to be cost-saving against the no-vaccination scenario while producing 41,298–71,057 QALYs along with saving 14.9–19.8 million USD. Single-dose regimens offer cost savings and better coverage but their limited effectiveness compared to two-dose regimens makes them ineffective for long-term protection unless high coverage is simultaneously achieved along with no deterioration of protection. The study conducted by (Michaeli, 2022) in South Africa continuously demonstrated that the HPV vaccination approach yields better cost-effectiveness than South African screening efforts on their own. According to Markov model-based research every available HPV vaccination approach demonstrated superior value over the approach of no vaccine usage (Michaeli, 2022).

The research by (Wang, 2019) found that participant age combined with the number of children they had directly impacted demand for the vaccine but family income together with cervical cancer awareness shaped what participants were willing to pay. The study revealed that users would spend up to 34% of their monthly earnings for the vaccine although some participants only expressed readiness to pay 3% of their income. Indian mothers holding adolescent children displayed high product interest yet expressed limited interest in paying for it which pointed to their diminished evaluation of the health benefit. Both price reduction and enhanced public education about the vaccine need immediate implementation according to the research findings (Wang, 2019)**.**

A Nonavalent vaccine strategy brought 0.14 QALYs along with R1793 costs per person when compared to bivalent vaccines at an incremental cost-effectiveness ratio (ICER) level of R13,013 per QALY. The quadrivalent vaccine proved to be less affordable than the bivalent vaccine because it delivered -0.02 more QALYs at R1748 in additional costs. The nonavalent vaccination stands as the most preferred strategy because it demonstrates a 90.2% chance of being cost-effective at South Africa's established threshold of R23, 630 per QALY. The nonavalent vaccine provides protection against more HPV types than bivalent or quadrivalent vaccines therefore it may achieve higher cervical cancer incidence reductions in the coming years (Michaeli, 2022) (Rosettie *et al.*, 2021)**.**

Several studies demonstrated that bivalent and quadrivalent vaccine programs resulted in cost-efficient cervical cancer prevention throughout Singapore. The ICER ratio showed that the quadrivalent vaccine delivered superior cancer prevention value than the bivalent vaccine. Current rates of vaccination are low, but, in spite of shown efficacy, as there are a number of

barriers to overcome. Research projects should create methods that enhance vaccination uptake along with analysing gender-neutral vaccination service benefits (Lee, 2011)

(Simms, 2016) performed an analysis on the financial sustainability of uniting primary HPV-based cervical screening with the Nonavalent HPV vaccine (HPV9) within Australian healthcare. Through two dynamic simulation models Policy1-Cervix and HPV-ADVISE, the cost-effectiveness of HPV9 in comparison to HPV4 is assessed considering the duration of vaccine protection, vaccine doses as well as costs associated with them. HPV9 stands as a cost-effective replacement for HPV4 unless the price for each additional dose surpasses a specified threshold during policy decision making (Simms, 2016).

Multiple studies have extended the research findings. (Choi, 2023) conducted research to evaluate different cost-benefit aspects of cervical screening during regular HPV vaccination programs. In this sense, the authors validated their models, but, they demonstrated that HPV screening outperforms traditional cytology tests in cost-effectiveness but vaccine uptake rates need to be assessed for particular screening time windows. Healthcare providers should modify screening recommendation approaches based on vaccination coverage rates among the patient groups they serve according to the research data (Choi, 2023).

(Gervais, 2017) have explored the cost- effectiveness of the combined use of HPV vaccination and screening strategies as preventive strategies. The report discussed the importance of having analyses of vaccination and screening programs given the recent availability of a multivalent HPV vaccine. Cost savings were shown by the author when testing by HPV DNA was coupled with vaccination and careful management of timing and intervals of screening. The resistance to the research assessment process was because investigators required appropriate modelling systems to search for the most cost effective prevention strategies. (Gervais, 2017).

Similar results were found by (Diaz *et al.*, 2008) in 2008 in HPV 16 and 18 vaccinations and screening methods for the cervical cancer prevention. The prevention of HPV types 16 and 18 in pre-adolescent girls at 70% coverage would decrease cervical cancer risk by 44% throughout their lifetimes. Cervical cancer chance reduction amounts to 21% to 33% when screening programs perform testing two or three times across an individual's lifespan regardless of the examination method.

When screening programs merged with immunization approaches the risk of developing cervical cancer dropped between 56% and 63%. An economical method of lowering the incidence and death of cervical cancer in India is to combine HPV vaccination with screening three times over one's lifetime (Diaz *et al.*, 2008)**.**

2.8 Gaps in the Research

Below summarizes the gaps in the literatures related to the public awareness and perception towards human papillomavirus (HPV) as well as the acceptability and barriers in its vaccination:

- The researches lacks comprehensive assessments of HPV infection and cervical cancer prevention knowledge levels which should include both men and women over 18 years old. Research focused mostly on younger populations including adolescents and young women fails to address HPV-related diseases affecting adult individuals. More research is needed on levels of knowledge that target specific socio-economic and educational groups in the design of specific awareness campaigns.
- Vaccine awareness in its various components, as well as vaccine acceptability, are concepts that have been poorly studied in adults. The majority of research has focused on perceptions of acceptability of the HPV vaccine among adolescent girls but does not include in-depth research on perceptions of acceptability among adult men. There is a lack of research on the role of health care providers versus mass media and social determinants on beliefs around adult HPV vaccination that prevents the understanding necessary to improve the strategies involved in this vaccine's adoption rates.
- Barriers need to be more closely explored as they are relevant to adult populations utilizing HPV vaccines. Prior studies have included cultural beliefs and misinformation as factors among teens' but lack information on adult populations. Attitudes towards vaccination in the population, seem to be largely driven by gender-based stigma and barriers as well as religious beliefs. More research is needed to understand the unique challenges of different rural and under-served populations in developing effective strategies for wellness interventions.
- Research must investigate how much individuals are willing to spend on bivalent, quadrivalent and Nonavalent vaccines because this topic is not well studied. Limited research exists regarding the effect that price has on adult vaccination choices

throughout India. Studies should explore the potential impact that financial subsidies, in addition to insurance coverage and government programs, would have in HPV vaccine uptake from the population as a means to eliminate the economic barrier to vaccination.

The effective implementation of HPV vaccination in India demands a solution for these unidentified research gaps. More studies are needed to look in depth into economic issues in combination with social and cultural factors that shape perceptions and acceptability of vaccination. The closing of this knowledge gap will help policymakers to develop better educational efforts and policies that would increase adult vaccine acceptance

2.9 Conceptual Framework

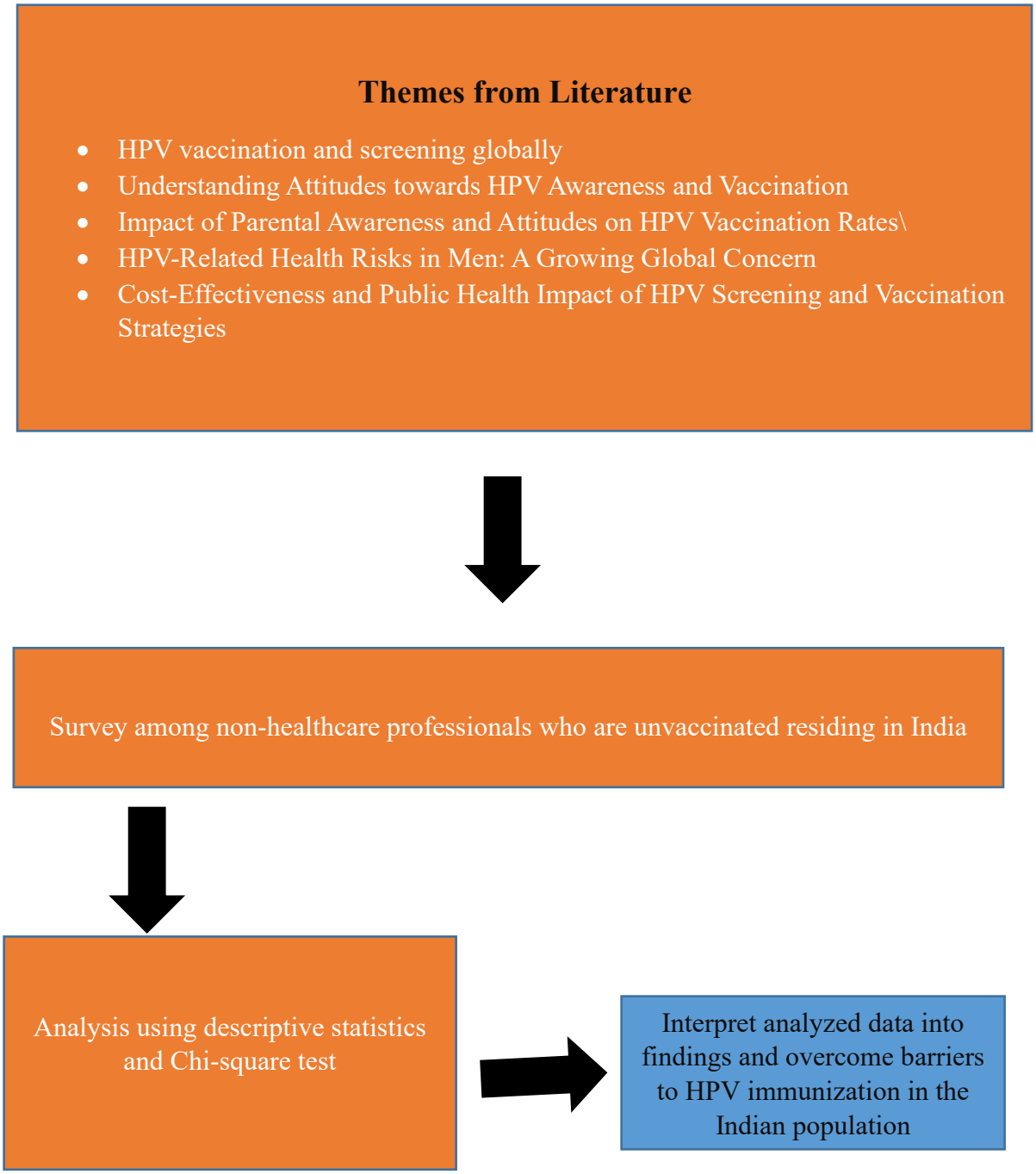
Flowchart below demonstrates the conceptual framework of this study. One of the key findings from the literature review is that there is lack of data regarding the awareness of HPV vaccination among men. From the observed literature, there has been no quantitative research undertaken to date to explore the research which evaluates willingness to pay for bivalent, Quadrivalent, and Nonavalent vaccine types. This will form the major reasoning behind the research being undertaken.

Research Topic

"A Study on Knowledge, Acceptability, Barriers and Economic Considerations of Human Papillomavirus and its Vaccination among Unvaccinated Indian Adults"

Objectives:

- To evaluate Knowledge of HPV Infection and its Prevention.
- To assess the level of knowledge and acceptability of HPV vaccination among unvaccinated Indian adults
- To evaluate the barriers to receive the HPV vaccination
- To analyse the perceived economic burden and willingness to pay for Quadrivalent and Nonavalent HPV vaccines



2.10 Conclusion

The availability of the HPV vaccination should be better understood by the adult population in India since it may lower the prevalence of HPV infections, such as cervical cancer. The availability of an effective HPV vaccine prevents a large number of patients from developing cervical cancer along with other HPV-related conditions. Their lack of knowledge around HPV transmission and pathophysiology, as well as cervical cancer association is reflected in the low levels of HPV vaccination reported amongst the adult population. Widespread education campaigns combined with awareness activities must address what the population does not

know about HPV infection for improved vaccine acceptance rates. Multiple obstacles to HPV vaccination exist according to the studies because people face financial barriers along with cultural misunderstandings and do not receive support from healthcare providers and face gender-based preferences.

The successful adoption of the HPV vaccine requires a three-part strategy which combines education for the public together with healthcare provider support and governmental policy changes. The impact of HPV vaccination will increase when programs add it to standard adolescent immunization schedules alongside cervical cancer screening programs. The implementation of barrier-specific interventions combined with identified study results will help lower HPV-related healthcare problems while benefiting public wellness in India.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Methodology Outline

This research used non-interventional quantitative cross-sectional methods through survey. This chapter provides details about the research execution process which includes research philosophy together with research approach and methods and the route to achieve complete results. The validity and reliability of a study depend on the selected methodology. This study details all aspects of research participants as well as exclusion-inclusion criteria and data collection methods and research execution methodology. The evaluation method establishes both the trustworthiness and the research quality which renders it an essential component in scientific investigations. The Saunders research onion presents the research process through its stages which are illustrated in **Figure 4**.

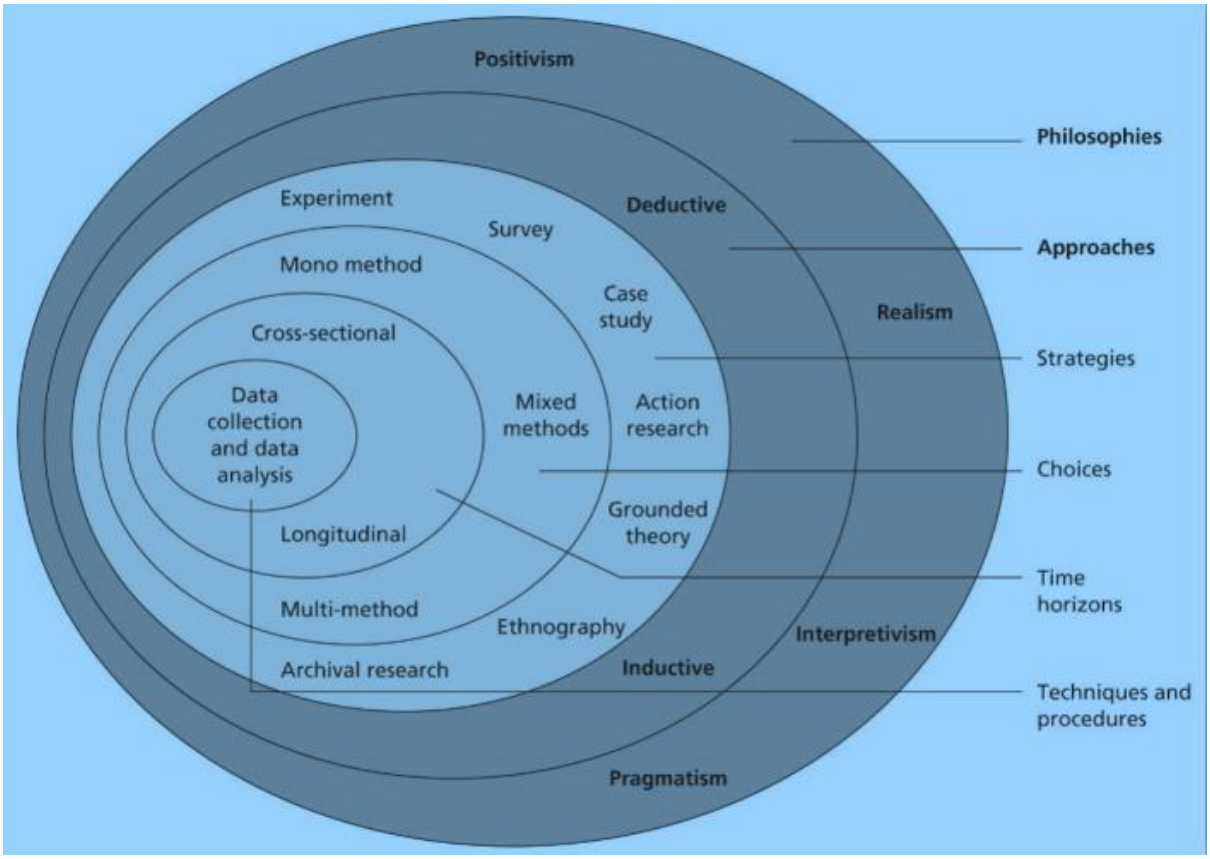


Figure 2: Research Onion *(Saunders, 2025)*

3.2 Research Philosophy

Research philosophy describes the framework of concepts which controls how researchers perceive research objectives and identifies optimal execution methods. Research philosophy diversity exists but the research subject decides which philosophy provides the best approach. The study technique and research plan obtain their base from this research philosophy.

The fundamental goal of research consists of examining and acquiring complete knowledge about specific fields. Researchers possess both assumptions and plans for conducting their study (Saunders, 2025).

The research objective utilizes philosophical strategies to obtain extensive knowledge regarding HPV vaccination practices in India. The study used quantitative methods to conduct a survey as its research approach. The study was a cross-sectional design spanned from March 2025 to early May 2025. The research approach selected for this investigation relied on the quantitative survey method. The survey design included closed-ended multiple-choice questions which were applied to the participants.

The research philosophy adopted in this study best matches with the approach of Positivism. Structured approaches survey methods and statistical analysis of quantitative data in adults in India obtain objective findings on intent to HPV vaccination and willingness to pay. Statistical methods have been implemented to extract data about HPV vaccination willingness and payment factors. Positivism depends on statistical tools to reveal patterns along with proving causal relationships in research analysis.

The research focuses on measurable statistics instead of making thoughts and conclusions based on personal opinion. The research traces specific knowledge scores, health beliefs along with socioeconomic variables through a standardized assessment process. This research positivism matches the study objective which investigates public understanding about the importance of HPV vaccination (Saunders, 2025)**.**

3.3 Research Approach

The choice of research methodology is essential because it guides researchers toward developing designs for data collection and analysis methodology development. The right selection of research technique enables to identify appropriate methods and options for the study. The studies might test the theory, or a theory would be developed from the results. The research approach is usually based on how the theory is tested or developed in the study. In

this study, a deductive approach was used. The deductive approach involves examining an issue, developing a theory or hypothesis and followed by testing the theory. The results of the study were analysed, and the theory was confirmed or modified based on the findings of the study.

Literature review established a connection between quantitative survey-based studies that used survey results to validate or amend their findings. Thus, this research adopts a deductive research design.

3.4 Research Strategy

The study design for investigating the public awareness about HPV vaccination in India included using questionnaire surveys with confined response questions. A survey functioned as the main research strategy throughout this investigation which follows a quantitative approach.

Survey participants answered questionnaire about vaccination awareness together with their readiness to pay for vaccination and their perceptions. Very few studies have examined how people across India perceive and understand HPV vaccination programs. The study consisted of adults older than 18 years who were unvaccinated and could comprehend English to reply to the questionnaire. The survey took place in India making questionnaire surveys the suitable method because they enabled the distribution of research links to remote participants more efficiently. The study adopted a cross-sectional approach because data collection occurred only at one single point in time. The study used cross-sectional research design because of its time constraints. The data collection will occur in a specific timeframe for analysis purposes.

3.5 Study Participants

Participants consisted of adults who reached the age of 18 years or older who were non healthcare professionals and were unvaccinated residing in India and showing willingness to join the study. The research employed random sampling technique. Various sections of India included participants from urban areas and rural areas were included. The research excluded vulnerable populations as well as participants who were minors. The participants entered the study once they consented in the survey to participate in the study.

3.6 Sample Calculation

To determine sample size, technique of estimating sample size for proportion was used:

$$n = \frac{(Z_{1-\alpha/2})^2 \, p(1-p)}{d^2}$$

Where,

p = Anticipated knowledge of HPV infection (58%)

α = Significance level (5%)

d = Precision (6.15%)

$$n = \frac{(1.96)^2 * 0.58(1 - 0.58)}{(0.0615)^2} = 248$$

Thus, the sample size for this study is determined as 248 (Machin *et al.*, 1997)

3.7 Time line of the Study

The time horizon of a study refers the number of time points at which data are collected. An approach to data collection may involve a one-time cross-sectional or multiview longitudinal methods. Collecting data at multiple points over extended periods in order to answer research questions in longitudinal studies. Research using cross-section methods only obtains data points from one specific time interval and tends to happen quickly (Institute for work& health, 2015)**.**

Study was cross-sectional study requiring data collection during a single point in time. During three months of research the data collection phase ran from March 2025 to early May 2025

3.8 Design of the Study

This research employed a cross-sectional plan which collected single-time data to evaluate awareness and perception of participants of HPV vaccination and also reporting obstacles in taking them. Participants included adults older than 18 years living in India and excluded the health care professionals assuming they will be more informed about HPV vaccination

The data collection happened through an online survey with closed-ended questions. The four sections of the survey design had 33 survey questions that adhered to the research objectives. Participants received the questionnaire through email, linked in and whatsapp platforms as well as other social media channels and got detailed information about the study. The survey used English as the language format to provide participants ensuring ease in understanding. Data

privacy was protected through an anonymised data collection process and all information was managed according to General Data Protection Regulation, or GDPR, guidelines.

3.9 Questionnaire Structure and Data Collection

A cross-sectional data collection approach using a pre-structured questionnaire was employed in the study. Unvaccinated adults above 18 years of age from various socioeconomic backgrounds were involved in this study across India. The researcher collected data through online survey distribution to participants who accessed it from healthcare centres, universities and community outreach programs. The survey consisted of predetermined set questions which allowed for statistical analysis.

The study was conducted by analysis on quantitative data through descriptive statistics. Data presentation took the form of bar graphs together with pie charts. The questionnaire found its basis in English through a review of literature articles and regulations. The study included background information on its development of a cover page which also showed completion estimation for research duration.

The questionnaire consisted of four separate sections to gather necessary data for studying the research objectives. The sections are as follows:

Section 1: Demographic information

In part 1, general personal information from participants which included demographic questions about age and education level and vaccination statuses in order to screen for study eligibility.

Section 2: Awareness and Acceptability of the HPV Vaccine

In this section investigates participant's knowledge on HPV infection and its vaccination and the elements which affect their vaccination choices. The questionnaire explores if participants have become aware of HPV vaccinations and their types and their perception on the necessity of vaccination. The knowledge assessment included closed-ended multiple choice questions. The gathered data from this section allowed to determine how much information people know about HPV vaccines.

Section 3: Barriers to Receiving the HPV Vaccination

This section explores several of these factors in relation to all participants' decision making around HPV vaccine acceptance. A survey analyses different challenges people encounter when getting vaccinated which include expenses along with the absence of knowledge and faith beliefs and logistical challenges. This part evaluates how people feel about speaking with healthcare providers about sexual health as well as effects of stigma alongside HPV vaccine information availability. The study analyses how parents make vaccination choices for their children through their gender-based preferences and vaccination-related fears and misbeliefs. The obtained feedback serves to discover significant barriers toward HPV vaccine adoption so that suitable strategies can be developed.

Section 4: Economic Burden and Willingness to Pay

Section 4, delves into economic aspects to understand vaccination cost acceptance along with payment willingness of Indian adults regarding HPV vaccines. This assessment determines what vaccine choices people prefer while examining their financial resources for vaccines and evaluating how payment support and health expenses influence their choice decisions. Additionally, it investigates how vaccine acceptance behaves along with elements that affect uptake such as the understanding of benefits versus costs and prioritization of health expenses as well as awareness of risks associated with HPV. The section evaluates barriers in taking vaccines in male population as well as the influence of knowledge in other STD has on vaccination choices.

3.10 Ethical Considerations

The present study employed an introductory segment in the survey design for presenting the research background to survey recipients. The survey separated its sections for both obtaining consent for participation and ensuring voluntary enrolment. The study obtained personal participant data such as age range and occupational details but these specific information points posed no ethical consequences. A warranty of absolute data confidentiality was given to all participants in the study. The participants which included only non-health professionals received information about their flexibility to join or decline the survey along with their ability to withdraw at their will at any point during the study. The survey was drafted respecting privacy of participant and eliminate any requirement for personal data disclosure. The questionnaire maintained relevance towards the research goals by including questions appropriate to those objectives. The Google Forms system was set to run duplicate checks by

restricting each email to one response. We obtained ethical approval from the committee following submission of the ethics application for primary data collection.

3.11 Approach to Data Analysis

The survey responses from participants was recorded in excel for data logging. Research utilized a structured online survey to collect data that underwent assessment before determining how Indian adults understood HPV vaccine concepts and assessments of perceptions together with financial barriers to HPV vaccine adoption. The researcher cleaned the data resulting in 248 usable responses available for analysis. Data summary for respondent demographic data alongside HPV infection and vaccination awareness showed settings through descriptive analysis methods. The analysis also included analysis of vaccination barriers and parental payment intentions and opinions. The analysis showed data through bar graphs and pie charts as well as tables which displayed the categorical data percentages and frequencies. The scoring of participant knowledge and acceptability relied on the count of correct responses combined with positive responses. The researcher established low, moderate and high score groups through statistical percentile calculations. The research evaluated the connection between participant knowledge and age gender education income and residential area by conducting chi-square (χ^2) tests

All statistical significance was determined by a p-value at or below 0.05. The survey mostly included questions with fixed options which enabled quantitative evaluation of results. Participants gave their recommendations through a single question leading to very limited conclusions. Suitable survey statistical evaluation techniques functioned specifically for analysis of survey data

3.12 Conclusion

In an overview, this chapter discussed the overview of the activities performed for conducting this study. The present study was a non-interventional and cross-sectional quantitative study with a positivist research philosophy to gather the primary data. This study involves a deductive research approach using a survey. The researcher conducted surveys using a questionnaire that includes close-ended questions to record public awareness and perception of HPV vaccination were assessed using a self-administered questionnaire. The collected data were analysed using descriptive statistics and conclusions were drawn based on the results obtained.

CHAPTER 4: FINDINGS AND ANALYSIS

4.1 Analysis of Data

The researcher conducted the study through an online survey to assess HPV infection knowledge levels and vaccination awareness and behavioral acceptance toward the vaccine as well as barriers to vaccine adoption and analyze the perceived economic burden. The researcher made an initiative to reach out to as many participants as possible since 300 active participants attempted the survey however, 52 did not meet the inclusion criteria and were not able to continue with the survey to meet the study criteria. This resulted in an inclusive analysis of the 248 respondents. Many pieces of data were received. This chapter presents findings in an organized manner through descriptive analysis together with pie charts and bar charts and tables. A statistical analysis procedure was applied to the results in this section. The following sections present results gathered from the survey.

4.2 Demographic Characteristics

Human papillomavirus (HPV) functions as a typical sexually passed infection that produces cervical cancer together with other cancers. Despite available effective vaccines the vaccination rate stays low among the adult Indian population. The research investigates knowledge levels in addition to acceptance, barriers and financial aspects of HPV and vaccination among unvaccinated Indian adults. The research explores population groups which affect vaccine recognition and immunization behaviors and reveals common misunderstandings while showing obstacles found in society and financial preparedness and preferred vaccines. Detailed knowledge of these elements helps developers create specific health education initiatives together with policy strategies to promote HPV vaccine acceptance rates and minimize infections in India.

The demographic details (**Figure 3 a**) of the respondents indicate that the majority are aged between 25-34 years (59.7%) followed by 31% in the 18–24 range. 3% were aged 35–44, only 7 participants belonged to the 45–54 age group, and just 4 participants were over 55.

Females constitute a larger portion of the sample (70.6%) compared to males (29.4%) (**Figure 3 b**). In terms of education, most respondents are completed degree, majority about 117 which was 47% of the participants were post graduates. Graduates made the second majority of about 43%, reflecting a highly educated group (**Figure 3 c**).

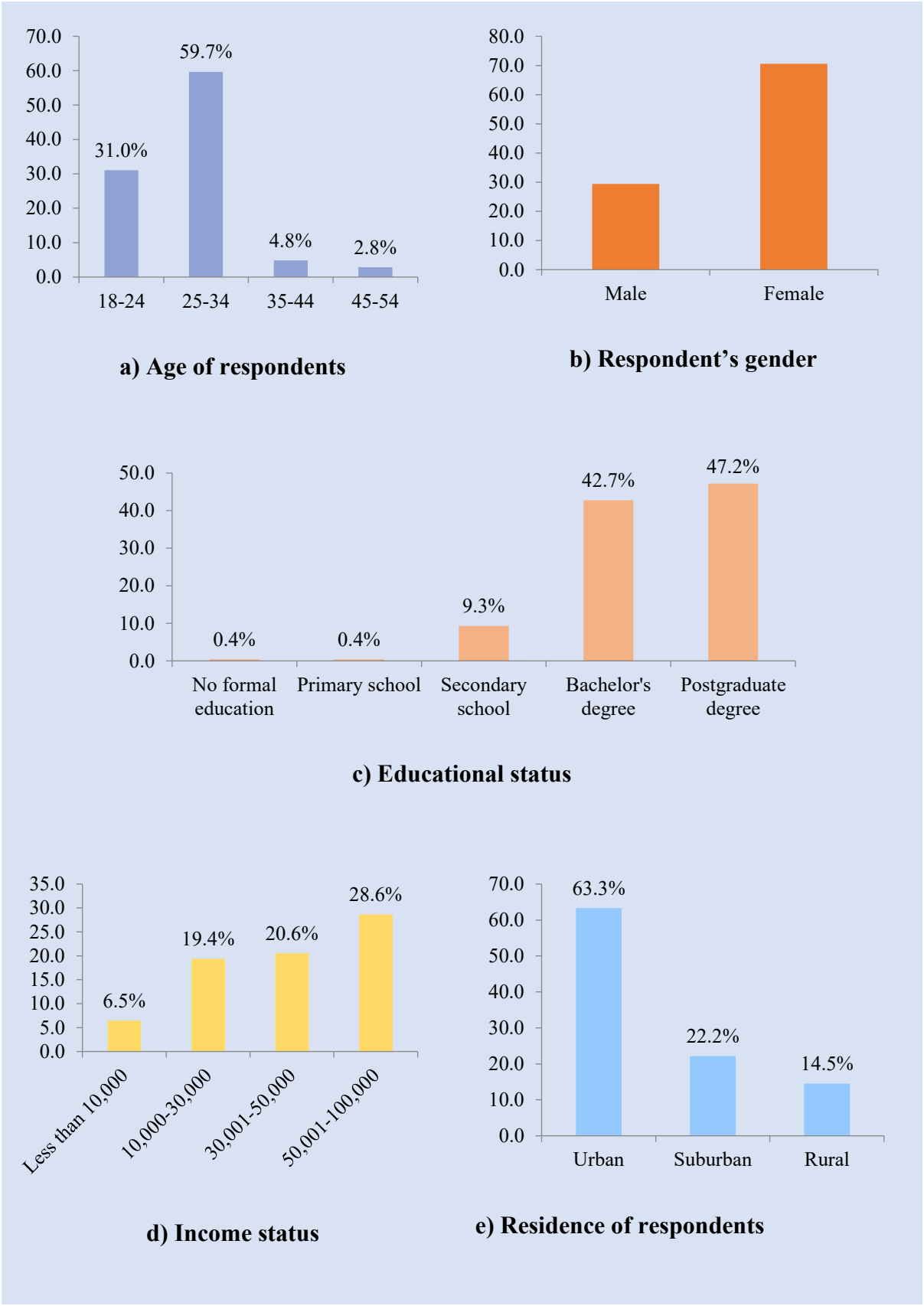


Figure 3 Demographic data of the surveyed population; a) Age of respondents; b) Respondent's gender; d) Income status: e) Residence of respondents **(Author´s own)**

By the distribution of income status most of the respondent earn above 50,000 averagely, a majority of 28.6% of the respondents belong to the income bracket of ₹50,001 and ₹100,000 per month while another 25% earns more than ₹100,000. A significant number of 53.63 % families belong to the higher income bracket according to survey results indicating the well-off nature of this segment. The research data indicates that middle-income households make up 20.60% of the total population which receives between ₹30,001 and ₹50,000 monthly income. The lower-income brackets represent a minority segment of the population because 19.40% make between ₹10,000 and ₹30,000 monthly and 6.50% earn lower than ₹10,000 each month. The collected data illustrates financial optimism throughout the area because middle- and higher-income households make up the majority among the population **(Figure. 3 d).**

Followed by residence, the majority live in urban areas (63.3%), while fewer reside in suburban (22.2%), while rural areas have the smallest share at 14.52%. The trend highlights that most of the participants were from urban living over rural or suburban areas **(Figure 3 e).**

4.3 Awareness and Knowledge of the HPV Infection

The survey responses reveal a diverse range of participant understanding about HPV. Results show that 83.06% of respondents view cervical cancer as a major health challenge thus demonstrating widespread understanding of severe HPV-related diseases. Public awareness about the vaccine has risen to a satisfactory point thanks to educational campaigns and contacts with healthcare providers. General awareness appears to exist regarding HPV but participants lack a similar degree of knowledge about how it spreads and how people can avoid exposure.

Only 30.65% of participants were informed about HPV transmission routes despite HPV being among the most widespread sexually transmitted infections therefore indicating a severe limitation in basic health education knowledge. Responses indicated that 43% of participants could identify HPV symptoms yet the screening process was known to only 6% of respondents (**Figure 4**). The statistics indicate that people lack vital knowledge about detection practices that help to both diagnose early symptoms and prevent enduring health complications.

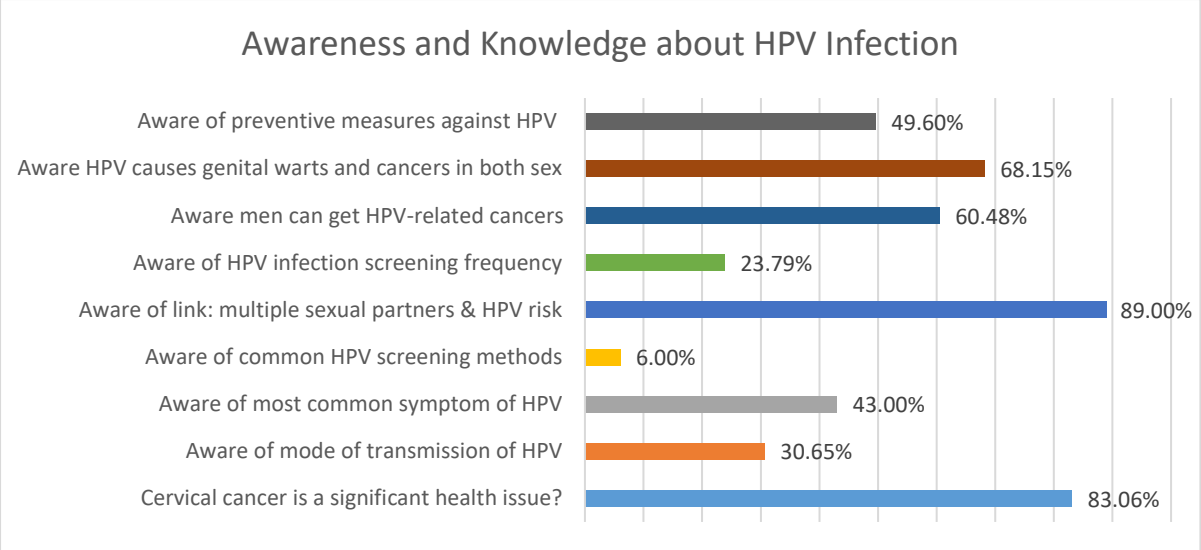


Figure 4: Correct response to knowledge items (N=248)

Awareness was significantly higher (at 89%) when it came to recognizing the relationship between having multiple sexual partners and an increased risk of HPV. This suggested that people possess awareness of behavioural risks although they might lack complete knowledge regarding HPV's biological and medical pathways through which HPV operates

The results revealed that most respondents were unaware about the appropriate frequency of HPV screening (23.79%). People without sufficient knowledge about recommended frequency of HPV tests may miss early detection chances for HPV-related diseases (London, 2023). Growing awareness emerged through the 60.48% of participants who recognized men could develop HPV-related cancers and 68.15% acknowledged that HPV can cause both genital warts and cancers in both men and women, indicating growing awareness that HPV is not solely a women's health issue.

Finally, Only 49.60% of the participants showed knowledge about how to prevent HPV infection through practices such as safe sex and proper screenings along with vaccination timing. The low awareness level shows health education needs improvement to show people HPV concepts along with protecting themselves through practical preventive measures.

4.3.1 Association between Infection & Prevention Knowledge Level with Demographic

The study assessed participants' knowledge regarding HPV infection and its prevention using a set of nine questions. The percentile score of the sum of the right answers were used to calculate the level of knowledge using 9 (Q6, Q8, Q9, Q10, Q11, Q12, Q13, Q14, Q16) questions in **(Figure 4).** Based on the percentile scores derived from correct responses,

participants were categorized into low (≤25th percentile), moderate (26th–50th percentile), and high (>50th percentile) knowledge levels.

Out of the total participants, 27% demonstrated a low level of knowledge infection and prevention of HPV, while 24.6% had a moderate level of knowledge, and 48.4% exhibited a high level of knowledge in **(Figure 5)**. This distribution suggests that nearly half of the unvaccinated Indian adults in the study had a good understanding of HPV infection and its prevention strategies. However, approximately 51.6% still fall into the low or moderate knowledge categories, indicating a significant scope for improving awareness.

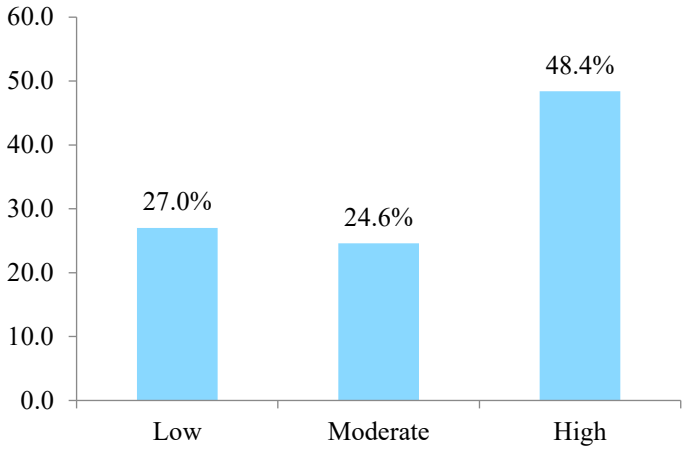


Figure 5: Knowledge level of HPV infection and its prevention

Table 3 presents the association between participant's knowledge of HPV infection and its prevention and various demographic characteristics. Across age groups, the highest proportion of participants with high knowledge was observed in the 25–34 age group (50.7%), followed by the 18–24 age group (46.8%). Older age groups had smaller sample sizes, and although some showed relatively high knowledge levels, the overall association between age and knowledge was not statistically significant ($\chi^2 = 6.852$; $p = 0.553$).

	Low	**Moderate**	**High**
Age			
18-24	22 (28.6%)	19 (24.7%)	36 (46.8%)
25-34	40 (27%)	33 (22.3%)	75 (50.7%)
35-44	3 (25%)	4 (33.3%)	5 (41.7%)
45-54	2 (28.6%)	2 (28.6%)	3 (42.9%)
55 and older	0 (0%)	3 (75%)	1 (25%)
	Chi-square = 6.852; p = 0.553		
Gender			
Male	22 (30.1%)	20 (27.4%)	31 (42.5%)
Female	45 (25.7%)	41 (23.4%)	89 (50.9%)

	Chi-square = 1.452; p = 0.484		
Education			
No formal education	1 (100%)	0 (0%)	0 (0%)
Primary school	0 (0%)	1 (100%)	0 (0%)
Secondary school	6 (26.1%)	8 (34.8%)	9 (39.1%)
Bachelor's degree	28 (26.4%)	21 (19.8%)	57 (53.8%)
Postgraduate degree	32 (0%)	31 (0%)	54 (0%)
	Chi-square = 9.086; p = 0.335		
Income			
Less than 10,000	5 (31.3%)	4 (25%)	7 (43.8%)
10,000-30,000	17 (35.4%)	12 (25%)	19 (39.6%)
30,001-50,000	16 (31.4%)	14 (27.5%)	21 (41.2%)
50,001-100,000	20 (28.2%)	14 (19.7%)	37 (52.1%)
More than -1, 00,000	9 (14.5%)	17 (27.4%)	36 (58.1%)
	Chi-square = 9.192; p = 0.326		
Residence			
Urban	42 (26.8%)	37 (23.6%)	78 (49.7%)
Suburban	12 (21.8%)	17 (30.9%)	26 (47.3%)
Rural	13 (36.1%)	7 (19.4%)	16 (44.4%)
	Chi-square = 3.188; p = 0.527		

Table 3: Association between infection & prevention knowledge level with demographic

Gender-wise, 50.9% of females and 42.5% of males had high knowledge of HPV infection and prevention, but this difference was also not statistically significant ($\chi^2 = 1.452$; $p = 0.484$).

Educational qualification appeared to influence knowledge levels, with 53.8% of participants with a bachelor's degree and a comparable percentage with postgraduate degrees showing high knowledge. However, participants with no formal or only primary education had extremely low knowledge levels. Despite this trend, the association between education and knowledge was not statistically significant ($\chi^2 = 9.086$; $p = 0.335$).

With respect to income, those earning more than ₹1,00,000 per month had the highest proportion of participants in the high knowledge category (58.1%), while lower income groups showed lower proportions. Still, the association between income and knowledge level was not statistically significant ($\chi^2 = 9.192$; $p = 0.326$).

Regarding residence, urban participants had slightly higher knowledge (49.7%) compared to suburban (47.3%) and rural (44.4%) participants, but these differences were minimal, and the chi-square test did not reveal a significant association ($\chi^2 = 3.188$; $p = 0.527$). Overall, none of

the demographic factors showed a statistically significant association with knowledge of HPV infection and its prevention, indicating that knowledge is fairly evenly distributed across demographic groups in this study population.

4.4 Assessment of Knowledge and Acceptability of HPV Vaccination

4.4.1 Correct Response to Knowledge Items of HPV Vaccination

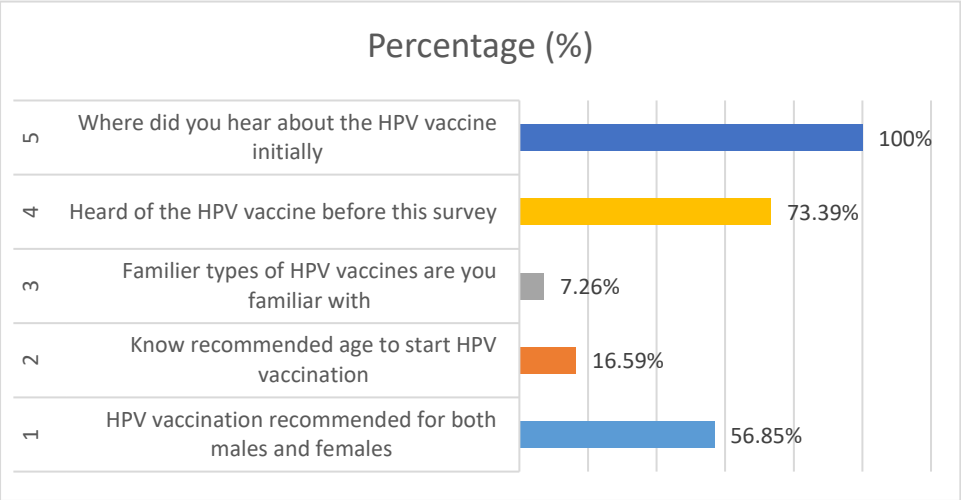


Figure 6: Correct response to knowledge items (N=248) (Author´s own)

Participants demonstrated various levels of knowledge about human papillomavirus vaccination. A significant number of participants (73.39%) reported they have heard about the HPV vaccine and its significance for adolescents, yet knowledge about its recommendation for both males and females reached only 56.85%. Specific knowledge about HPV vaccination showed concerning deficits because participants demonstrated low awareness regarding the recommended starting age (16.59%) and an even lower understanding of vaccine types (7.26%). Every participant (100%) reported hearing about the HPV vaccine from at least one information source thus showing knowledge of HPV activism exists yet lacks detailed comprehension.

4.4.2 Knowledge and Acceptability of HPV Vaccination among Demographics

Knowledge of HPV vaccination was measured using five questions mentioned in **Figure 6**(Q7, Q15**,** Q8**,** Q17 and Q20**)**. The percentile score of the sum of the right answers was used to calculate the level of knowledge. A percentile score up to 25 were categorised into low knowledge, while 26-50 percentile score as medium and above 50 percentile score were categorised into high knowledge.

Acceptability of HPV vaccination was measured using three questions (Q19, Q24B, Q29), and the score up to 0-2 categorised as low acceptability, while 3-4 as medium and 5-6 as high acceptability.

Questions used for analysis of acceptability where as follows:

- How important do you think it is for adolescents to receive the HPV vaccine?
- Do you feel willing to get your child vaccinated against HPV? Please specify your preference for vaccinating your child based on gender?
- If offered a vaccination which is subsidized or insurance program, how likely would you be to participate?

Table 4 and Figure 7 reveals that the majority of participants (67.3%) possess a medium level of knowledge regarding HPV infection and its prevention, while only 11.3% demonstrate high knowledge and 21.4% have low knowledge, indicating a general awareness but with limited in-depth understanding. In terms of acceptability, responses are more evenly distributed, with 35.9% showing high acceptability, 29.8% medium, and 34.3% low.

This contrast indicates that despite moderate knowledge levels, there is a polarization in the willingness to accept HPV prevention measures such as vaccination, highlighting the need for targeted education that not only improves knowledge but also addresses cultural beliefs, misconceptions, and other barriers influencing acceptance.

	Low	**Medium**	**High**
Knowledge	53 (21.4%)	167 (67.3%)	28 (11.3%)
Acceptability	85 (34.3%)	74 (29.8%)	89 (35.9%)

Table 4: Knowledge and acceptability level of HPV infection and its prevention

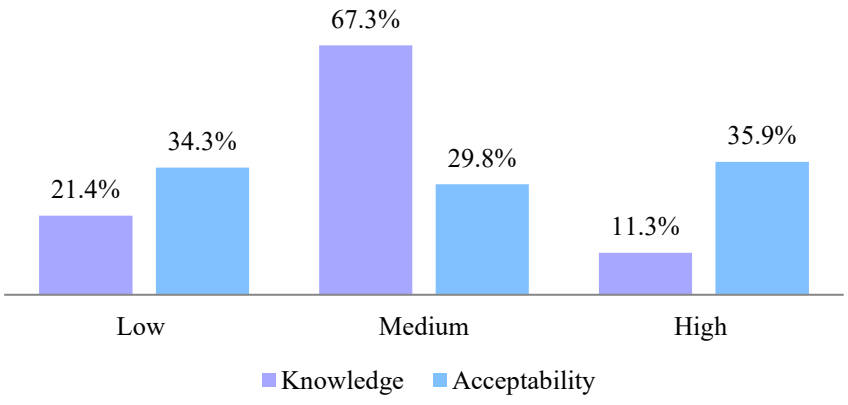


Figure 7: Knowledge and acceptability of HPV vaccination

4.4.3 Association of Knowledge of HPV Vaccination among Demographics

Across age groups, the highest proportion of participants with high knowledge was observed in the 25–34 age group (37.2%), followed by those aged 18–24 (37.7%). Older age groups also showed relatively higher levels, but their sample sizes were small. However, the chi-square test ($\chi^2 = 5.001$, $p = 0.757$) indicated no significant association between age and knowledge levels (**Table 5**).

Similarly, gender did not show a significant relationship with knowledge; 41.1% of males are fell into the high knowledge category, and 36.6% of females are comes under low knowledge of HPV vaccination, with a chi-square value of 1.701 and p-value of 0.427.

Education level also did not significantly influence knowledge level, as indicated by the chi-square test ($\chi^2 = 4.431$, $p = 0.816$), although for the side of high knowledge on HPV vaccination a slightly higher proportion of postgraduate participants (37.6%) showing their interest.

In terms of income, participants earning less than ₹10,000 per month exhibited the highest proportion in the high Knowledge level (62.5%), followed by those in the ₹10,000–₹30,000 (41.7%) and ₹30,001–₹50,000 (39.2%) income. Conversely, participants in the ₹50,001–₹100,000 income group had a higher representation in the medium knowledge level (43.7%). The association between income levels and the response categories was not statistically significant ($\chi^2 = 14.711$, $p = 0.065$), indicating that income did not have a definitive influence on the distribution of responses.

Likewise, place of residence urban, suburban, or rural did not significantly affect knowledge levels ($\chi^2 = 0.677$, $p = 0.954$), with relatively similar distributions across all areas.

Overall, the analysis revealed that none of the demographic variables examined showed a statistically significant association with knowledge of HPV vaccination, suggesting a relatively uniform distribution of awareness and attitudes across the studied population.

	Low	**Moderate**	**High**
Age			
18-24	29 (37.7%)	25 (32.5%)	23 (29.9%)
25-34	52 (35.1%)	41 (27.7%)	55 (37.2%)
35-44	2 (16.7%)	4 (33.3%)	6 (50%)
45-54	1 (14.3%)	3 (42.9%)	3 (42.9%)
55 and older	1 (25%)	1 (25%)	2 (50%)
	Chi-square = 5.001; p = 0.757		
Gender			

	Low	Moderate	High
Male	21 (28.8%)	22 (30.1%)	30 (41.1%)
Female	64 (36.6%)	52 (29.7%)	59 (33.7%)
	Chi-square = 1.701; p = 0.427		
Education			
No formal education	0 (0%)	0 (0%)	1 (100%)
Primary school	0 (0%)	0 (0%)	1 (100%)
Secondary school	9 (39.1%)	6 (26.1%)	8 (34.8%)
Bachelor's degree	37 (34.9%)	34 (32.1%)	35 (33%)
Postgraduate degree	39 (33.3%)	34 (29.1%)	44 (37.6%)
	Chi-square = 4.431; p = 0.816		
Income			
Less than 10,000	4 (25%)	2 (12.5%)	10 (62.5%)
10,000-30,000	17 (35.4%)	11 (22.9%)	20 (41.7%)
30,001-50,000	17 (33.3%)	14 (27.5%)	20 (39.2%)
50,001-100,000	22 (31%)	31 (43.7%)	18 (25.4%)
More than -1, 00,000	25 (40.3%)	16 (25.8%)	21 (33.9%)
	Chi-square = 14.711; p = 0.065		
Residence			
Urban	53 (33.8%)	45 (28.7%)	59 (37.6%)
Suburban	20 (36.4%)	17 (30.9%)	18 (32.7%)
Rural	12 (33.3%)	12 (33.3%)	12 (33.3%)
	Chi-square = 0.677; p = 0.954		

Table 5: Association between Knowledge levels of HPV vaccination

4.4.4 Association between Acceptability of HPV Vaccination and Various Demographic Characteristics

Across age groups, the highest proportion of participants with moderate level of acceptability was observed in the 25–34 age group (73.6%), followed by those aged 18–24 (62.3%). However, the chi-square test ($\chi^2 = 52.333$, $p < 0.001$) indicated that significant association between age and acceptability levels **(Table 6)**.

Similarly, gender did not show a significant relationship with acceptability; 68% of females are fell into the high acceptability category, and 65.8% of females are comes under low acceptability of HPV vaccination, with a chi-square value of 1.952 and p-value of 0.377.

Education level also did not significantly influence acceptability level, as indicated by the chi-square test ($\chi^2 = 13.291$, $p = 0.102$), although for the side of moderate and high acceptability on HPV vaccination a slightly higher proportion of bachelor and postgraduate participants showing high interest.

In terms of income, participants earning ₹30,001–₹50,000 per month showed the highest acceptability of vaccination, with 72.5% falling in the medium acceptability, followed closely by those in the ₹50,001–₹100,000 (66.2%) and more than ₹1,00,000 (67.7%) income brackets. Across all income groups, the medium acceptability level was predominant. However, the association between income and acceptability of vaccination was not statistically significant ($\chi^2 = 9.419$, $p = 0.308$), indicating that income did not have a meaningful impact on participants.

Likewise, place of residence urban, suburban, or rural did not significantly affect acceptability levels ($\chi^2 = 6.344$, $p = 0.175$), with relatively similar distributions across all areas. Overall, the analysis revealed that none of the other demographic variables except age examined, showed a statistically significant association with acceptability of HPV vaccination, suggesting a relatively uniform distribution of awareness and attitudes across the studied population.

	Low	**Moderate**	**High**
Age			
18-24	28 (36.4%)	48 (62.3%)	1 (1.3%)
25-34	22 (14.9%)	109 (73.6%)	17 (11.5%)
35-44	2 (16.7%)	7 (58.3%)	3 (25%)
45-54	1 (14.3%)	2 (28.6%)	4 (57.1%)
55 and older	0 (0%)	1 (25%)	3 (75%)
	Chi-square = 52.333; p = p< 0.001		
Gender			
Male	19 (26%)	48 (65.8%)	6 (8.2%)
Female	34 (19.4%)	119 (68%)	22 (12.6%)
	Chi-square = 1.952 ; p = 0.377		
Education			
No formal education	1 (100%)	0 (0%)	0 (0%)
Primary school	1 (100%)	0 (0%)	0 (0%)
Secondary school	9 (39.1%)	13 (56.5%)	1 (4.3%)
Bachelor's degree	20 (18.9%)	72 (67.9%)	14 (13.2%)
Postgraduate degree	22 (18.8%)	82 (70.1%)	13 (11.1%)
	Chi-square = 13.291 ; p = 0.102		
Income			
Less than 10,000	5 (31.3%)	10 (62.5%)	1 (6.3%)
10,000-30,000	14 (29.2%)	31 (64.6%)	3 (6.3%)
30,001-50,000	11 (21.6%)	37 (72.5%)	3 (5.9%)
50,001-100,000	14 (19.7%)	47 (66.2%)	10 (14.1%)
More than -1, 00,000	9 (14.5%)	42 (67.7%)	11 (17.7%)
	Chi-square = 9.419; p = 0.308		
Residence			
Urban	32 (20.4%)	110 (70.1%)	15 (9.6%)

	Low	Moderate	High
Suburban	12 (21.8%)	32 (58.2%)	11 (20%)
Rural	9 (25%)	25 (69.4%)	2 (5.6%)
	Chi-square = 6.344; p = 0.175		

Table 6: Association between Acceptability levels of HPV vaccination

4.5 Barriers Involved in HPV Vaccination

4.5.1 Barrier to Receiving the HPV Vaccine

Various barriers reported by participants in receiving the HPV vaccine is given in **Table 7** and **Figure 8**. A total of 248 participants provided survey feedback which resulted in analysis of five barriers against treatment including cost, lack of education and awareness, cultural beliefs, logistical issues, and lack of family support. Researcher obtained the percentage of respondents who did not view obstacles as problems by subtracting their stated percentages from 100. Among the 248 participants, the most commonly cited barrier was lack of education and awareness, reported by 211 individuals, accounting for a significant 85.1%. This indicates a critical gap in knowledge dissemination and public health education regarding HPV and its vaccination. The cost of the vaccine was the second most reported barrier, with 112 participants (45.2%) identifying it as a hindrance, suggesting financial accessibility remains a major concern. Cultural beliefs were mentioned by 68 participants (27.4%), reflecting the influence of societal norms and traditions on vaccine acceptance. Lack of family support was reported by 55 participants (22.2%), indicating the role of family approval and encouragement in health decisions. Finally, logistical issues such as accessibility, availability, or distance to healthcare facilities were noted by 39 participants (15.7%). These findings indicate the need for targeted interventions addressing awareness, affordability, cultural sensitivity, and accessibility to improve HPV vaccine uptake among Indian adults.

Barrier	Frequency	Percentage
Cost	112	45.2%
Lack of education and awareness	211	85.1%
Cultural beliefs	68	27.4%
Logistical issues	39	15.7%
Lack of family support	55	22.2%

Table 7: Barrier for receiving HPV vaccine

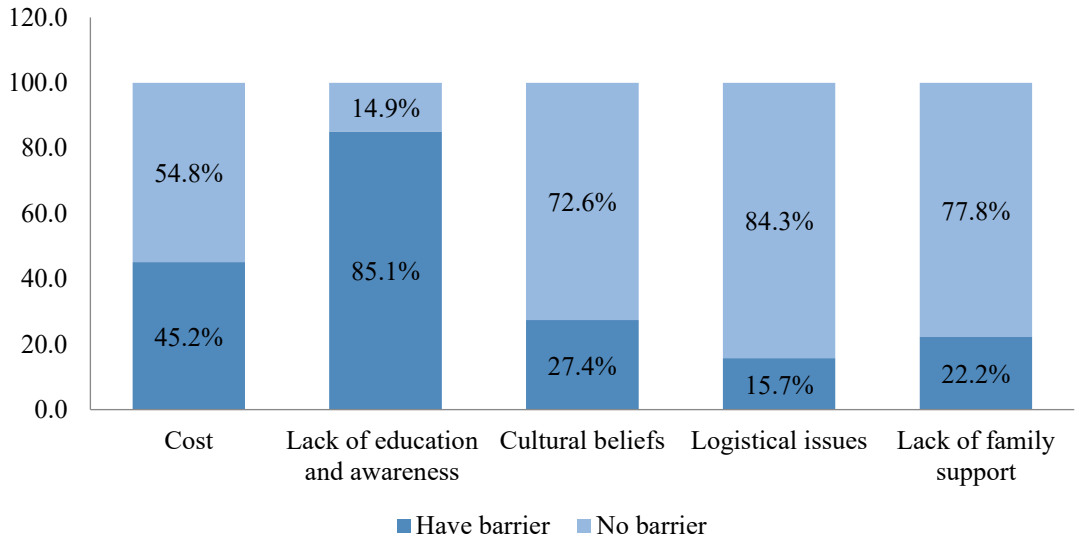


Figure 8: Barrier for receiving HPV vaccine

4.5.2 Encountering any Stigma or Cultural Beliefs that Resist in Receiving the HPV Vaccine

Among the 248 participants, only 14% reported that stigma or cultural beliefs acted as a deterrent to receiving the vaccine (**Table 8**). The percentage for each response was calculated by dividing the number of respondents who selected each option by the total number of participants and multiplying by 100. The low percentage demonstrates cultural perceptions persist as factors which occasionally affect vaccine acceptance rates among minorities but does not significantly impact population-wide uptake. This finding highlights the importance of culturally sensitive health education and outreach programs to address and dispel myths or negative perceptions surrounding the HPV vaccine in certain communities.

Stigma or cultural beliefs	Frequency	Percentage
Yes	34	14%
No	214	86%

Table 8: Stigma or cultural beliefs that resisted in receiving the HPV vaccine

The data in **Table 9** indicated important social and cultural difficulties according to five respondents. Participants noted that receiving a vaccine made others believe they engaged in promiscuous activities thus blending with the discrimination linked to STI testing. Others pointed out that open conversations about sexual health are hampered by the taboo nature of sex-related subjects in their families. Vaccines were believed to cause others to see patients as promiscuous while also conveying high sexual activity levels. Despite being a minority, these opinions are indicative of myths and cultural standards that affect vaccine acceptance. The

research evidence shows the necessity of developing culture-based educational efforts to treat HPV vaccines as preventive medical procedures and eliminate public misconceptions about them.

Responses	Frequency
HPV vaccination prompts assumptions of multiple partners	1
STI testing is often linked to those having many partners	1
Sex-related topics remain taboo at home	1
Some view it promotes for having more sexual partners	1
People think that he or she is very sexually active	1

Table 9: Distribution of respondents who faced stigma during HPV vaccination

4.5.3 Barriers to HPV Vaccine Acceptance among Males

Data in **Table 10** outlines the primary barriers faced by male participants in accepting the HPV vaccine. The most frequently reported barrier was limited knowledge about HPV-related risks in men, cited by 77.0%. This suggests a significant gap in awareness regarding the fact that HPV can also cause serious health issues in males, such as genital warts and certain cancers. The second most common barrier was the misconception that HPV only affects females, reported by 61.7%, highlighting the need for gender-inclusive health education. Additionally, 49.2% indicated that there is insufficient information available for specific groups, pointing to a lack of tailored communication strategies that address the concerns and informational needs of diverse male populations. Furthermore, 44.8% cited lack of recommendation from healthcare providers as a barrier, emphasizing the crucial role of medical professionals in promoting vaccine uptake. Overall, these findings underscore the importance of increasing targeted awareness, correcting misconceptions, and improving healthcare communication to enhance HPV vaccine acceptance among men.

Barriers	Frequency	Percent
Limited knowledge about HPV related risk on men	191	77.0
Misconceptions that HPV only affects females	153	61.7
Lack of recommendation from healthcare providers	111	44.8
Insufficient information for specific groups	122	49.2

Table 10: Barriers to HPV vaccine acceptance by males

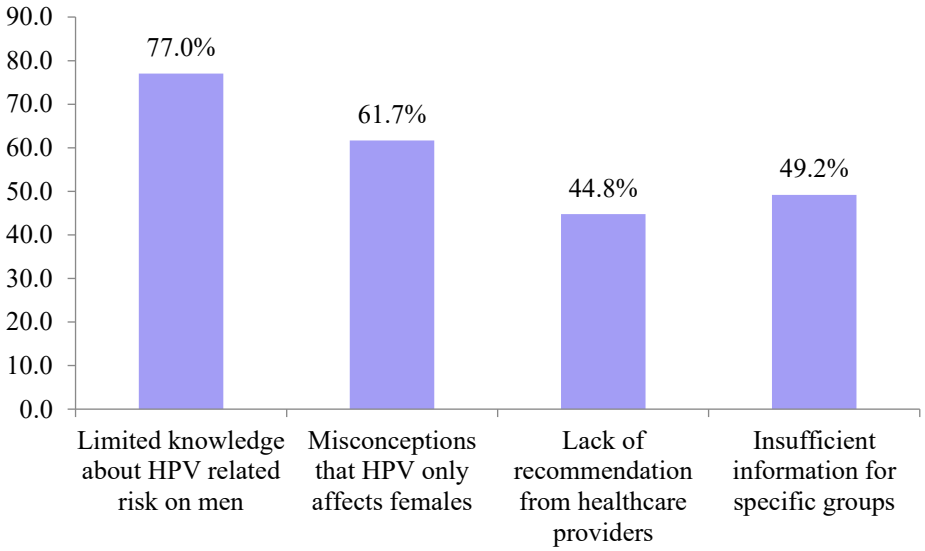


Figure 9: Barriers to HPV vaccine acceptance by males

4.5.4 Parental Attitudes and Preferences toward HPV Vaccination

Out of 248 participants, the majority (86.7%, n = 215) reported that they do not have children, while only 13.3% (n = 33) reported having children. Among those with children, 54.5% had children under the age of 5, 21.2% had children aged 5–12, and 24.2% had children aged 13–17, which is the most relevant age group for HPV vaccination

4.5.4.1 Parental Attitudes toward HPV Vaccination Based on Sex of the Child

When asked about their willingness to vaccinate their children against HPV, 79% reported being equally willing to vaccinate both sons and daughters, showing a gender-neutral approach toward prevention. A small portion of participants expressed gender-specific preferences, with 12% willing to vaccinate only their daughters and 6% only their sons. Only 3% indicated an unwillingness to vaccinate either child.

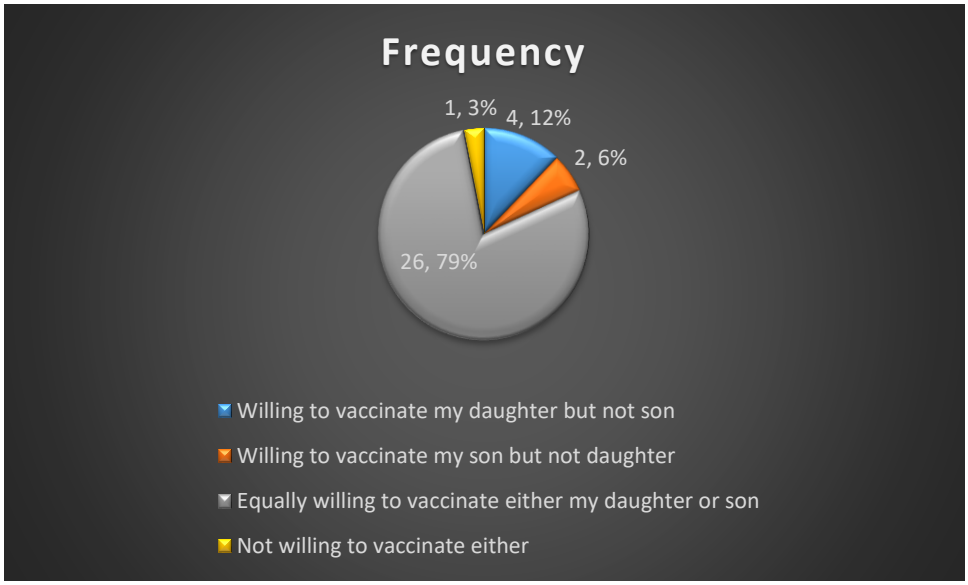


Figure 10: Pie chart depicting parental Attitudes toward HPV Vaccination based on sex of the child

These findings suggest that while the overall number of participants with children is low, most of those who do have children are positively inclined toward vaccinating them against HPV, particularly with a gender-equitable mind-set.

4.5.4.2 Reason People Choose Not to Vaccinate their Children against HPV

The reasons for not vaccinating the children by participants were calculated for the 33 participants who have children. The most common reason why people choose not to vaccinate their children against HPV is a lack of knowledge about HPV or the vaccine, cited by 57.6% of respondents. This is followed by the belief that the vaccine is not needed or necessary at 42.4%, and safety concerns and lack of recommendation from healthcare providers, each at 36.4%. Other less frequently mentioned reasons include concerns about promoting sexual activity (24.2%), cost of the vaccine (18.2%), and both religious beliefs and the perception that the child is not sexually active, each at 9.1%.

Reasons for not vaccinating children against HPV	**Frequency**	**Percent**
Safety concerns	12	36.4
Belief that the vaccine is not needed or necessary	14	42.4
Lack of recommendation from healthcare provider	12	36.4

Lack of knowledge about HPV or the vaccine	19	57.6
Child is not sexually active	3	9.1
Religious beliefs	3	9.1
Concerns about promoting sexual activity	8	24.2
Cost of the vaccine	6	18.2

Table 11: Distribution of reasons for not vaccinating children against HPV

4.6 Perceived Economic Burden and Willingness to Pay

4.6.1 Willingness to Invest More in Broader Protection: Preference for Nonavalent vs. Quadrivalent HPV Vaccine

The following question was asked to the participants: Do you consider spending more for an HPV vaccine which protects against multiple virus strains (e.g. Nonavalent vaccine vs. quadrivalent)?

Factors	Frequency (f)	Percentage (%)
I'm not sure. I would need more information	85	34.30%
It depends on how much more it costs	46	18.50%
No, I would not be willing to pay more for additional strains	19	7.7%
Yes, I am willing to spend additional money on vaccines that protect against extra strains of virus	98	39.50%

Table 12: Table reveals the willingness to spend more on an HPV vaccine protecting against multiple virus strains

The data in **Table 12** shows different levels of participant financial willingness to purchase HPV vaccines which guard against additional strains as they demonstrate varied economic understanding. The survey revealed that 39.50% of participants showed definite interest in paying extra for vaccines which safeguard against additional HPV strains.

A significant portion of 34.30% remained indecisive about their choices until they obtained more information thus demonstrating the necessity of economic awareness. The study data shows 18.50% of participants base their willingness to pay on the specific price because they demonstrate price sensitivity towards financial costs. A segment of 7.7% of respondents

indicated financial limitations and uncertainty about the added worth among the population that declined to pay additional costs for better protection. The willingness to pay extra for better protection exists among many people but economic factors together with lack of information play a substantial role in the decision process.

4.6.1.1 Association between Willingness to Spend Additional Money on HPV Vaccines and the Monthly Income of the Family

	< 10,000	**10,000-30,000**	**30,001-50,000**	**50,001-100,000**	**> 1, 00,000**
Yes, I am willing to spend additional money on vaccines that protect against extra strains of virus.	8 (8.2%)	17 (17.3%)	19 (19.4%)	29 (29.6%)	25 (25.5%)
It depends on how much more it costs.	2 (4.3%)	12 (26.1%)	7 (15.2%)	13 (28.3%)	12 (26.1%)
I'm not sure. I would need more information.	6 (7.1%)	15 (17.6%)	18 (21.2%)	27 (31.8%)	19 (22.4%)
No, I would not be willing to pay more for additional strains.	0 (0%)	4 (21.1%)	7 (36.8%)	2 (10.5%)	6 (31.6%)
	Chi-square = 9.742; p = 0.639				

Table 13: Association between spending cost for HPV with monthly income of family hold

The association between willingness to spend additional money on HPV vaccines and the monthly income of the family (**Table 13**). Among the respondents, those in the Rs. 50,001–100,000 income, were the most willing to spend extra on extended vaccine coverage (29.6%), followed closely by those earning over Rs. 100,000 (25.5%) and Rs. 30,001–50,000 (19.4%) and they need more information about the vaccination of HPV for those who earn more than Rs. 50,001–100,000 (31.8) are followed closely by those earning over 100,000 (22.4%) and Rs. 30,001–50,000 (21.2%). Remaining participants showed less willingness about the money spend on the vaccination of HPV. Despite these observed trends, the chi-square test ($\chi^2 = 9.742$, $p = 0.639$) revealed no statistically significant association between monthly income and willingness to pay more for broader HPV vaccine protection.

4.6.2 Estimated Willingness to Pay for a Complete Course of HPV Vaccination

The following question was asked to the participants: How much would you spend to get a complete course of HPV vaccine

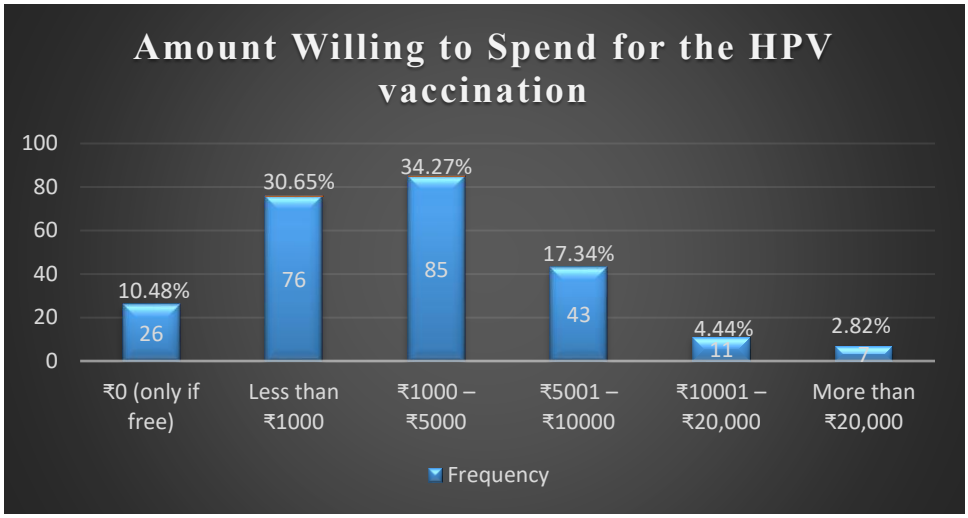


Figure 11: Represents willingness to spend to get a complete course of HPV vaccine

The analysis of willingness to pay for full HPV vaccination depicted in the **Figure 11** shows wide variations between those surveyed. The survey results show approximately 34.27% of participants fall within the ₹1000–₹5000 price range because this payment amount shows them moderate affordability costs even though almost a third of the respondents choose to pay less than ₹1000. 10.48% of respondents expressed their willingness to receive a vaccine only if it was free due to existing economic obstacles.

Among the participants 17.34% expressed their willingness to invest between ₹5001 to ₹10000 while demonstrating middle-level financial readiness. Only a very small percentage of 4.44% and 2.82% would find it acceptable to pay costs equal to or above ₹10001–₹20000 and above ₹20000 respectively due to unacceptability of high prices. The data evidence illustrates widespread support for affordable options because government financial aid and price controls would help establish equal healthcare equality throughout different economic strata.

4.6.3 Willingness to Pay for the Nonavalent HPV Vaccine (Gardasil 9 at ₹10,000 per Dose)

The following question was asked to the participants: Considering the price of the Nonavalent HPV vaccine (Gardasil 9 at ₹10,000 per dose), would you be willing to pay for it

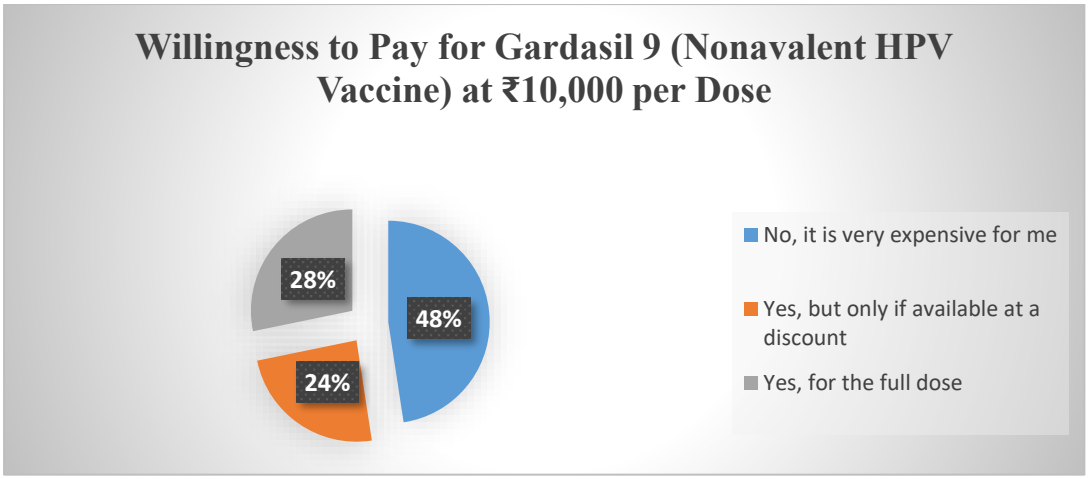


Figure 12: Pie chart depicting the willingness to pay for Gardasil 9 (Nonavalent HPV Vaccine) at ₹10,000 per Dose

The data revealed that a large proportion of respondents are deterred by the high cost of the Nonavalent HPV vaccine, according to the data shown in the pie chart (**Figure 12**), with 47.58% saying it is too costly and 24.19% saying they would only pay if it were given at a reduced price. Just 28.23% are willing to pay the full ₹10,000 price per dose. This implies that the vaccine's current pricing structure serves as a significant barrier that keeps many potential recipients from getting it. The majority of participants express concern about cost, indicating that financial considerations play a significant role in their vaccination choice. A price cut or the creation of financial assistance programs would increase vaccination rates.

4.6.4 Preferred Payment Option for Quadrivalent HPV Vaccine Based on Its Price

The following question was asked to the participants: Considering the price of Quadrivalent HPV vaccines, which option would you be consider to pay for?

According to the data in the **Figure 13**, 69.76% of respondents are willing to pay for Cervavac, which costs between ₹200 and ₹400 per dose, indicating a strong preference for the less expensive option. Conversely, only 14.92% of respondents said they would be willing to pay for the much more costly Gardasil, which costs ₹4,000 per dose. Furthermore, 15.32% of respondents said they would not be prepared to pay for either choice. This implies that most people choose the less expensive option, indicating that pricing plays a significant role in decision-making.

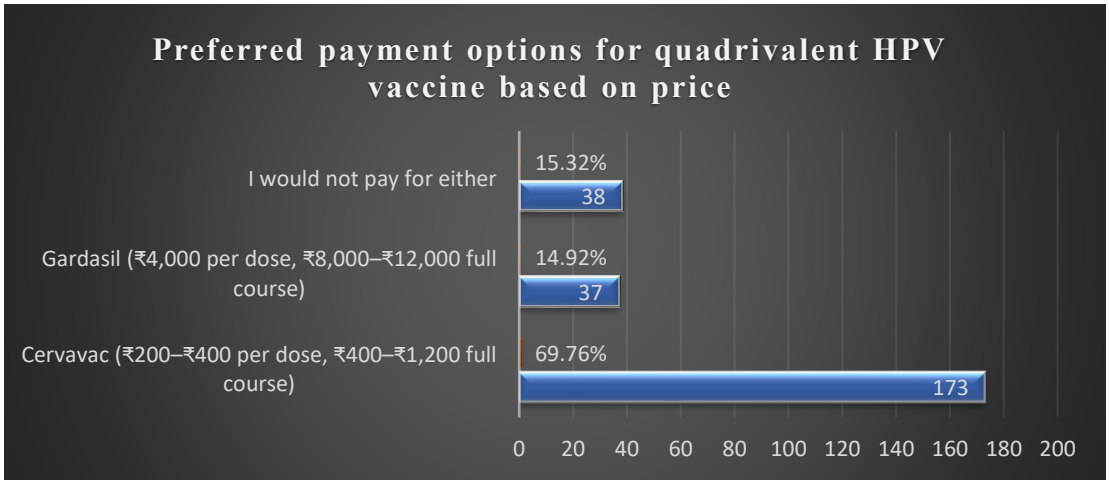


Figure 13: Bar chart illustrating preferred payment options for quadrivalent HPV vaccine based on price

Although Gardasil is a well-known brand, the low willingness to pay for it emphasizes how higher vaccine costs may restrict access and acceptance. The fact that a small but significant percentage of respondents said they would not pay at all further suggests that there may be underlying problems with affordability or that vaccination is not of value the expense.

4.6.5 Willingness to Participate in Subsidized or Insurance-Based HPV Vaccination Initiatives

The following question was asked to the participants: If offered a vaccination which is subsidized or insurance program, how likely would you be to participate?

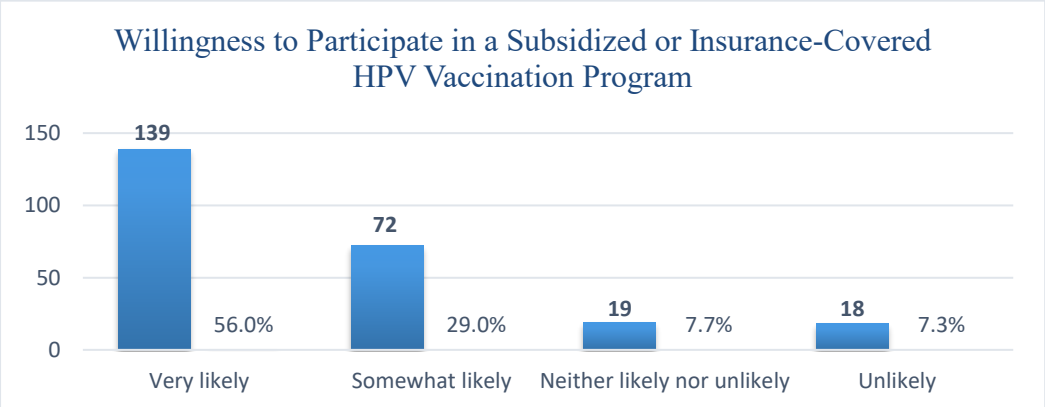


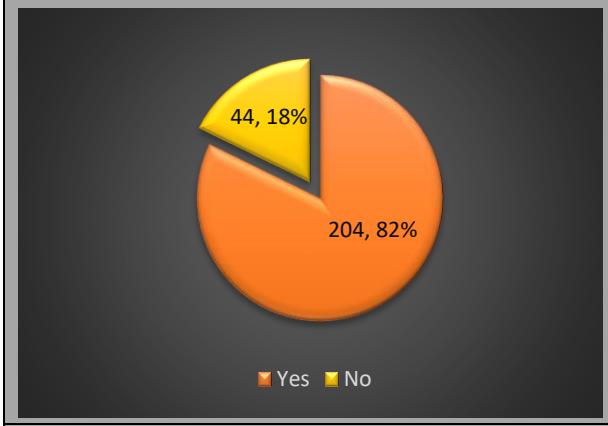
Figure 14: Bar chart depicts willingness to participate in a subsidized or insurance-covered HPV vaccination program

The data show that participants are particularly keen on taking part in immunization programs when there is monetary support. For example, assistance would be given, in which case 56.05% reported that they would very likely take the vaccination, if it was insured or subsidized. Also,

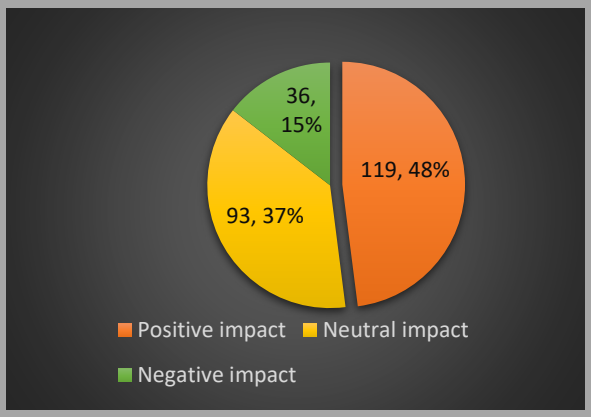
29.03% said they would be somewhat likely to do so. Far fewer, 7.26%, said they would be unlikely to take part, and 7.66% would be neutral about it. This means that accepting vaccines is still greatly influenced by the cost. The acceptance level toward receiving the vaccine greatly increases when there is no cost incurred through either subsidy payments or insurance coverage. The data illustrate the need of such insurance or taxpayer financed induction associated with immunization programs in increasing participation rates.

4.6.6 The following questions were asked to the participants

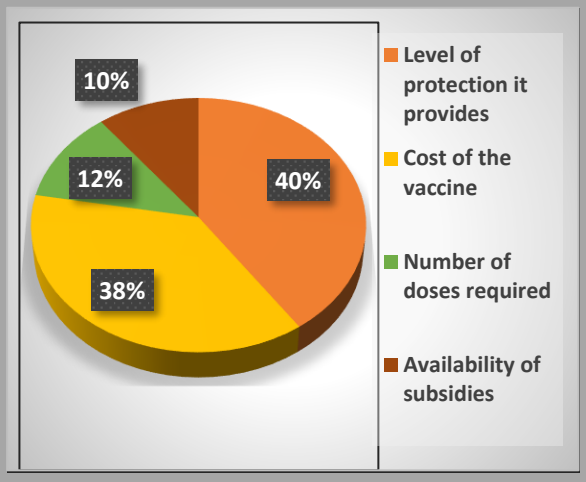
A) Would knowing that vaccination could prevent healthcare costs in the future related to HPV infections influence your decision



B) How does your economic conditions in your home affect your decision about health expenditures on vaccinations?



C) What is the most important factor in your decision to pay for an HPV vaccine?



D) Do you plan to get more information regarding HPV vaccines and medical consultation for more insight from health professionals in the future?

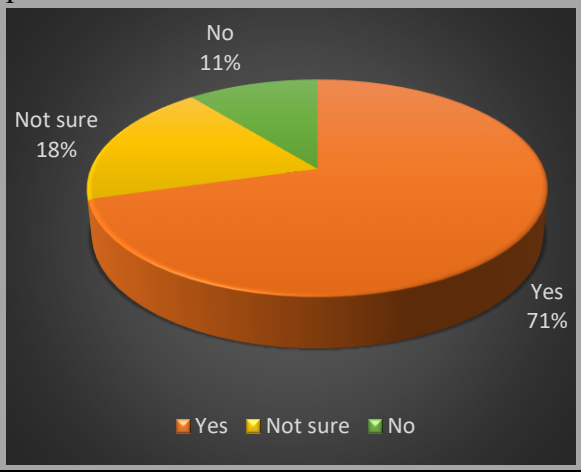


Figure 15: Impact of vaccine costs in the decision to get vaccinated

The responses from questions A to D collectively highlight the important role that perceived cost, financial considerations, and information availability have in influencing decisions about

HPV vaccination. A strong majority (82.26%) of participants in **Figure 15(A)** stated that knowing vaccination could help avoid future healthcare costs would influence their decision. This suggests that willingness to vaccinate can be positively impacted by knowledge of the long-term financial benefits.

According to this, **Figure 15(B)** demonstrated that nearly half (47.98%) of the respondents were of the opinion that the home economic situation positively influenced their willingness to pay for vaccination, while 14.52% believed it adversely affected. This means that for some respondents, financial limitations impeded their capacity to pay. This financial aspect is further highlighted in **Figure 15(C)**, where cost was considered the second most salient factor after protection conferred by the vaccine for determining whether or not to pay for the HPV vaccine, accounting for 40.32% of the response. This demonstrates how affordability and perceived health benefits interact, with both playing a crucial role in decision-making.

Finally, **Figure 15(D)** indicates that 70.56% of participants would attempt to obtain additional medical information about HPV vaccines. The desire to seek out health information demonstrates strong interest in making informed choices about vaccination which indicates most people would choose vaccination based on receiving adequate education about its protective functions.

Summing up, the research data revealed that economic access programs together with educational campaigns would boost HPV vaccine acceptance because individuals use both health protection needs with economic logic to make their decisions.

Thus, from analysing the perceived economic burden we understood that majority of respondents (39.5%) expressed willingness to pay more for HPV vaccines that offer protection against multiple virus strains, while 34.3% required more information to decide. Regarding the Nonavalent HPV vaccine (Gardasil 9) priced at ₹10,000 per dose, nearly half (48 %) found it too expensive, whereas 28% were willing to pay the full price, and 24% preferred a discounted rate. When asked about their willingness to pay for a complete course of the HPV vaccine, 34.27% were comfortable spending between ₹1,000–₹5,000, and 30.65% were only willing to pay less than ₹1,000. Only a small fraction (2.82%) were willing to pay more than ₹20,000

For the quadrivalent HPV vaccine, 69.76% favoured Cervavac (₹200–₹400 per dose), indicating strong preference for cost-effective options, while 15.32% were unwilling to pay for either vaccine. Additionally, 56% of participants were likely to participate in a subsidized or

insurance program. A significant 82 % believed that future healthcare cost savings would influence their vaccination decision.

Regarding the impact of family economic conditions, nearly half (48%) reported a positive influence on their health spending decisions, while 37% reported a neutral effect. The main factors influencing willingness to pay were the level of protection provided (40%) and the cost of the vaccine (38%). Lastly, a strong majority (71%) indicated plans to seek more information or consult healthcare professionals about HPV vaccination.

Thus, the cost remains a barrier, awareness of health benefits and financial incentives like discounts or subsidies significantly affect willingness to pay.

4.7 Conclusion

This study explores knowledge, acceptability, barriers, and economic factors related to HPV infection and vaccination among unvaccinated Indian adults. Most respondents were educated urban females aged 25–34. While 48.4% had high knowledge of HPV infection, only 11.3% showed high vaccine knowledge and 35.9% showed high acceptability of HPV vaccines. No significant link was found between demographic factors and knowledge or acceptability. Major barriers included lack of awareness (85.1%), cost (45.2%), and cultural beliefs. For males, misconceptions and lack of doctor recommendations hindered acceptance. Although few participants had children, most were open to vaccinating them. Preference leaned toward affordable vaccines, with cost and healthcare savings influencing willingness to pay.

4.8 Discussion

Human papillomavirus (HPV) is one of the most commonly spread sexually transmitted infection worldwide since it results in different cancers but primarily induces cervical cancers (Santé, 2022). The success of HPV vaccinations remains limited because India continues to experience major public health challenges stemming from limited awareness together with wrong social beliefs alongside financial limitations and inconsistent medical service quality across the country. The research establishes significant value from its investigation of various factors stopping people in India from receiving the HPV vaccine through extensive investigation methods. This research implements various evaluation points to determine critical problem elements that will help advance HPV prevention methods

Full understanding of these levels of awareness is important because awareness informs action. Education and vaccination are critical to and the sole form of defence against HPV, as the virus

typically does not show signs until it has progressed. Gaps in knowledge of HPV transmission as well as signs and prevention of HPV were found in participant's understanding. The global studies corroborate these findings which emphasize the need for a better HPV education in every part of the world.

The low level of vaccine acceptance occurs when one gets misinformation that prevents them from accepting the vaccines despite them being available. This study investigates the intention of Indian adults to take HPV vaccines and the main behavioural parameters that would provide the necessary behavioural data. Lack of knowledge about the vaccine among individuals is highly correlated with their low willingness to accept it that pinpoints a need for easy and culture-sensitive education efforts.

There are challenges to the vaccination drives such as cultural shocks, fake news, and lack of support from health workers, and gender issues. As in every society, conservative patriarchal communities are not without challenges because the committee considers sexual health issues as taboo. It becomes important in the Indian context because family practices, religious beliefs and lack of appropriate information does influence male health.

Hence the research provides evidence to the existing literature on affordability as one of the main factors influencing healthcare consumption in low- and middle-income countries. This information also supports the notion that subsidy for the government, insurance policies, and differential pricing scheme should remain fundamental strategies to increase vaccination coverage rates. First, the vaccination rates for adolescents remain comparatively low due to the parent's perception, which the parents administer actively. The early age of child vaccination is effective in providing maximum HPV protection as children in most cases have not been exposed to sexual activities. In this case, the study provides crucial details for designing specific awareness campaigns that increase the rates of young people's vaccination by unveiling how decision-making by parents is influenced by their education level and availability of health information and safety perspective.

4.8.1 Level of Knowledge about HPV infection and its prevention

Study results indicated that people displayed a good understanding regarding HPV health issues especially regarding cervical cancer detection (83.06%). The assessment revealed major deficiencies in particular areas of knowledge since only 30.65% correctly identified the transmission methods and two-thirds of respondents did not know the symptoms and less than 10% understood screening methods. A small percentage at 49.60% demonstrated limited

understanding about protective practices that included vaccination and safe sexual behaviors and routine exams. Knowledge levels reached their peak among people aged 25–34 and graduate students but no demographic characteristic established a statistically important relationship with knowledge levels.

Researches showed the same results because according to (Santé, 2022), Indian young adults had low awareness about HPV (Holman *et al.*, 2014) U.S. participants associated HPV with cervical cancer but they lacked important prevention information. A UK-Based research conducted by (Waller, Waite and Marlow, 2024) to reveal the increased general awareness of HPV more than half of them performed poorly in terms of identifying signs, symptoms and screening methods and prevention measures.

College students in U.S. demonstrated confusion regarding HPV as per (Gerend and Shepherd, 2012) since they mistakenly thought it was another type of STI while failing to recognize its complete medical consequences past cervical cancer. WHO reports demonstrate that 80% of sexually active individuals will face HPV infection at least once in their lives since the virus exhibits no symptoms.

In the same regard, assessment of the levels of knowledge revealed that 27 % of the participants had poor knowledge, 24.6% moderate knowledge while the 48.4% expressed high level of knowledge. Educational programs could target a wide educational gap since between half of the study participants displayed high knowledge but the other half showed insufficient knowledge. The research results indicated that demographic variables showed no statistical connection with the knowledge and awareness of HPV vaccination. In this case, this study revealed different findings from the awareness and knowledge of HPV in Canada because the study by (Krawczyk *et al.*, 2015) established that university students with residence in cities exhibited better results. In the study carried out in Nepal made by (Pandey *et al.*, 2012), the correlation between education and income and HPV knowledge was also discovered. The findings of the present study reveal that HPV knowledge is not selective of the population and affects everyone in the society. Data from the study revealed outcome of the study was that female students had slightly higher knowledge levels than their male counterparts (50.9% and 42.5% respectively) though the difference was statistically insignificant. The study by (Danish Medical Journal, 2025) indicate that, even though women have better understanding of HPV they noted that the awareness among males is increasing when information include it for both male and female.

The investigation results showed the findings of the investigation which indicated that there is indeed no difference in knowledge differences by demographic characteristics proving that education concerning HPV should be conducted on the population level targeting a particular group of people.

4.8.2 Knowledge and acceptability about HPV vaccination

Study found that middle-level knowledge of HPV vaccination existed among 67.3% of participants yet high knowledge levels were present only in 11.3% of the surveyed population. The perception about the acceptability received balanced responses as 35.9% of people considered it high while 29.8% rated it medium and 34.3% considered it low so awareness is not enough to drive acceptance rates.

This aligns with studies, (Holman *et al.*, 2014) observed and that although the parents in America had reasonable knowledge on HPV vaccine they remained reluctant to take the vaccine for various reasons including misconceptions, safety concerns, and cultural beliefs. (Singh and Baliga, 2021) noted that although Nigerian health promotion materials averted misunderstanding on HPV vaccines, the rates of vaccination remained low in Nigeria owing to religious beliefs and low confidence in health facilities. The results of this research align with our research outcome which showed many participants with moderate or high knowledge levels did not demonstrate matching acceptability towards vaccination

The study however lacks the demographic factors that include the gender, education level or income and residence and knowledge rates which contradicts with the theory observed in (Dorell *et al.*, 2011, pp. 2008–2009) and (Adjei Boakye *et al.*, 2018) that found knowledge differences that emanate from limited rural access or educational achievement. In the current situation, public education seem to have stretched its reach to all corners of the nation. It was also noted that participants, above the age of 45 years, had a higher level of acceptability towards adoption of vaccines, although health awareness was not a possibility ($p< 0.001$). The above study contradicts with study (Fernández *et al.*, 2014) which showed that young adults are likely to accept vaccination due to easy access to paediatric care and campaigns at school. Education and income were not significant predictors of vaccination, but the data indicated that postgraduate students and people with higher income are more likely to accept vaccination. This supports (Allen *et al.*, 2009) a study that showed that individuals from higher classes or those with high levels of education, engage in the use of health services and preventive services. The insufficient statistical data indicates that more education and economic health do not

translate directly to improved immunization uptake when treatable behavioural, cultural, and perceptual barriers are not addressed. The analysis indicates residence does not have any impact on engagement so rural population could be as involved as urban residents because of improved digital access and outreach.

4.8.3 Barriers involved in HPV vaccination decisions

Among barriers faced by survey respondents, most lack of awareness as a challenge (85.1%) followed by cost of vaccine (45.2%), cultural beliefs (27.4%), parental or family opposition (22.2%), and issues on accessibility (15.7%) among others. Responses from male participants published data on the widespread misinformation about HPV differences being gender-based since 77% was unaware of HPV infections in men, 61.7% incorrectly thought the virus only occurs in females and 44.8% selected not consulting their doctor as the main reason to avoid vaccination. These results are supported by the literature as (Allen *et al.*, 2009) and (LaMontagne *et al.*, 2011) found that gendered stereotypes of the virus led to the exclusion of men in HPV related discussions.

The study established that the respondent's HPV awareness was at 73.39% while the acceptance rate of HPV vaccine was at a high of 32.7% and a low of 41.9%. All observed acceptability ratings were similar in regards to acceptability ratings in the different subject age group separations and gender distributions and their respective agricultural status. All of the research participants heard about the HPV vaccine, but only a small minority were knowledgeable about correct age of vaccination (16.59 %) or the types of the vaccine (7.26 %). These findings discusses the results in line with the findings of (Holman *et al.*, 2014) and (Singh and Baliga, 2021) to the effects of thorough educational programs that enhance the level of vaccine acceptance among the masses. (Adjei Boakye *et al.*, 2018) revealed that, the vaccine that is given before adolescence ensures that the probability of getting progressive cervical cancer is reduced. In addition, the literature highlighted the increasing prevalence of HPV-related cancers in men while calling for increased vaccination. Realization rates of HPV vaccines are poor among male subjects mainly due to cultural beliefs and the absence of physicians who take personal interest to involve themselves in organized vaccination.

4.8.4 Parental Preferences toward Vaccinating Children

In the surveyed group of parents (13.3%) almost 80% stated they wished to vaccinate their daughters as well as their sons. The 42.4% of participants who never received the HPV vaccine

stated that there are variables that they are not sure that they need the vaccine that they have fear over the safety of the vaccine (36.4%), and feeling that the HPV vaccine leads to early sexual behaviours (24.2%). The reason why the study findings correspond to the data points in (Holman *et al.*, 2014) and (Reiter *et al.*, 2009) is because both address the same parents' doubts about the security of vaccines and behaviour associated with vaccines.

A study (Shapiro *et al.*, 2017) discovered Australian parents base their choices on the advice of school nurses and general practitioners. Thus, a Kenyan survey research (Kolek *et al.*, 2022) described that parents received improved trust as well as willingness to take the vaccination through the education that those community health workers provided to them. It is seen that School and community education play as the most important approaches through which parental perceptions of the disease and acceptance to the vaccination can be changed and utilization rates increased.

Parents develop their health-related attitudes based on what they learn and the media they engage with as well as how they personally think about their health. The awareness level of parental STD vaccination was highly likely when either contracted an STI or worked in public sectors indicating the need to educate the community. The effectiveness of parenteral fears and usage of intensive information and extra information pointing to the potential benefits of extended periods for achieving better results of the prevention work has been shown time and time again.

4.8.5 Perceived Economic Burden and Willingness to Pay

The findings provided in the study revealed that self-interests have a great effect when it comes to taking any form of vaccines. The one-dose Gardasil 9 was expensive and thus 48% of participants who estimated one dose to be about ₹10,000 preferred Cervavac which was priced between ₹200 to ₹400. Specifically, the participant's willingness to pay was modelled based on how much they earned and the perceived value of the vaccine. It was further established that 56% of the respondents wanted government financial support for their programs and 82.26% acknowledged reduced long term health care cost as the incentive.

According to the study done by (Kim, Ortendahl and Goldie, 2009), the level of vaccination drops when an individual incurs more cost except when the government introduces the right measures. Nigeria is cited in the research conducted by (Ohaeri, Adefolaju and Onyeneho, 2020) where the author postulated that financial barriers were still present to remain as the

main barriers even if there is adequate knowledge and uptake of vaccines. The study acknowledges that health sector partnerships and financing programs increased the scale of vaccination in various African countries and several countries in South East Asia(Ohaeri, Adefolaju and Onyeneho, 2020). The results of the above inquiries reveal that economic policy coupled with the price of the vaccines are some of the crucial factors that can help improve the uptake levels.

Willingness to cover the extra cost of broader HPV vaccines was tested in relation to a person's monthly income by this research. The data showed no significant relationship between increased vaccine spending and the income level of Rs. 50,001–100,000 and greater than Rs. 100,000 ($\chi^2 = 9.742$; $p = 0.639$). Both high and low income group respondents indicated that they still required more information before they can make payment decisions hence establishing that knowledge is as important as ability to pay when making a purchase.

Cost consciousness in the previous studies by (Reiter *et al.*, 2011)and (Gilkey *et al.*, 2016) further supports the suggestion that those who are conscious about costs are likely to be lacking in knowledge while it is agreed that perceived value of vaccines is more of concern than income; (Laz, Rahman and Berenson, 2013) concluded that the wealthy classes did not embrace the notion of additional coverage as they did not understand the benefits accruing from it. Again, the author states in (Holman *et al.*, 2014) that quality communication, particularly one that recognizes culture has enough influence to increase the vaccination acceptance level among the different economic classes. A few studies on income level distribution reveal that while there is some indication of better income level, the best way to increase the acceptance for extending the coverage of HPV vaccine is through correcting misunderstandings accompanied with improved communication (Holman *et al.*, 2014)**.**

The results stressed that the economic factors influence the manner individuals choose to vaccinate themselves. A 48% of the reactant group found Gardasil 9 at ₹10,000 too costly because it was beyond their budget. Similarly, 69.76% opted for Cervavac as it was administer between ₹200 to ₹400. Cervavac costs between ₹600–₹1200, these are affordable as per the existing market rates and it is affordable since it is included in the programme for Universal Immunisation Programme (Raihana Maqbool, 2022)**.**

The cost of Gardasil 9 costing between ₹11,000 – ₹15,000 for a full course is prohibitive and most cannot afford thus the need for public funding to ensure vaccination reaches those who need it most (Rao M *et al.*, 2024) (ETHealthworld, 2023). Government intervention through a

combination of price regulation and financial help is crucial as it helps provide equal health care accessibility across all strata of the population. Despite the fact that many experts find Gardasil 9 is far superior to the Cervavac, it is relevant to the present financial situation while Gardasil 9, although still very expensive if there is no insurance or bonuses for it.

The willingness to pay for a vaccine was related to participants' income and their attitude towards the issue. The study showed that 56% supported government funding; 82.26% pointed out future savings on healthcare expenses as incentives for gene therapy. These results support findings done by author (Kim, Ortendahl and Goldie, 2009) in a study that points out that self-medication becomes a preserve of government when the prices of vaccines are high. From the literature review, it has been shown that families spend a minimum of three percent of their earnings on vaccination costs as they are fully aware of the benefits of vaccination. Studies across ASEAN regions showed similar hesitancy based on costs because subsidies prove to be powerful practices to boost vaccination rates (Kim, Ortendahl and Goldie, 2009)**.**

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

This study evaluated the understanding as well as belief system and behaviour patterns of Indian adults regarding HPV infection and vaccination status. The research detailed elements that affected HPV vaccine acceptance through financial limitations as well as stigma and incorrect beliefs regarding vaccine security. The study included study on parent's thoughts about HPV child vaccinations while measuring cost concerns along with the price they would accept to pay for HPV vaccines. This section contains an overview of study results and conclusion drawn from them with showcasing of the relevance of this study. It also identifies the limitations of research when it comes to increasing HPV vaccination rates and outlines study strategies for more effective education programs and economical encouraging programs and culturally comprehensive heath promotions.

5.1. Summary:

The study covers various factors such as awareness, acceptability, barriers, and economic factor in context with HPV infection and vaccination among Indian adult. There is hence the need to increase the knowledge of the Indian adults on the availability of the HPV vaccines as well as its acceptance. They have a reasonable level of knowledge about HPV and its relation to cervical cancer, but they seem to lack sufficient knowledge about how HPV is transmitted and what measures one should and shouldn't take and the available vaccination measures.

Most participants demonstrated moderate HPV vaccination knowledge but lacked thorough in-depth understanding. The vaccine was accepted at same level though the participants showed various level of willingness, however the knowledge and acceptance level was more or less similar. The findings indicated that the level of knowledge did not differ across the age, gender, educational, income and residential status of the respondents. Evaluation showed a meaningful relationship between acceptability and age due to the difference in their receptiveness where the old participants were less receptive than the young ones. The acceptability of the vaccine did not reveal a direct relation with gender, level of education or income or any other factors associated with the place of residence. From the study it can therefore be inferred that educational programmes are required to inform people about vaccines and how to overcome possible barriers towards acceptance of same.

In addition, consequently, cultural attitudes together with family values restricted the open discussions and decision-making regarding the HPV prevention particularly among the young

adults. Societal cultural attitudes hinder vaccine acceptance while hindering proactive health-protective behaviour and hence the need to introduce HPV vaccination as a normal routine health preventive practice not a sexual indicator.

The attitudes and knowledge displayed during these survey bring out clear behavioural aspects of the parents when it comes to HPV vaccination for their children. In the study, there was a conception of gender equality in prevention measures toward diseases since most of the parents supported the use of vaccines for both the male and female children. The most common reasons for not getting HPV vaccine cited by the parents include safety concerns regarding the vaccine as well as questions as to whether the vaccine is really needed, in addition to concerns regarding early promotion of sexual activity and lack of advice from the health care providers. These identified concern from the parents reveal the need to improve the safety information and healthcare communication where parents can build trust.

They also declined to pay for expensive prices without the intervention of the government stating that the cost of vaccination also played an imperative role in the decision making. Perceived willingness to pay for vaccines can be predicted by three things: prices that various vaccines cost the people, their financial capability, and price of other vaccines within the market. The study also revealed that financial constraints such as vaccine costs and lack of subsidies are other barriers to vaccine use amongst people who have little knowledge of its importance. Social mobilization and free access to one and other through public funded insurance schemes must be promoted to enhance the acceptance of vaccines among the people. Therefore, a multilevel and comprehensive solution includes public sensitization and policy-covered vaccine costs and healthcare providers' accessibility and cultural adaption. Combining all of these gaps will improve the overall rates of HPV vaccination among the public and reduce HPV disease risks and lead to improved public health among the people of India.

5.2. Relevance of the Study:

This study aims at addressing a significant gap in public health by examining the Indian adults' awareness levels pertaining to HPV infection, and the perceived vaccination challenges and costs. Specifically, knowledge about HPV and its vaccination as HPV vaccination remains low across the world although it is significant leading cause of death this is because acceptance barriers need to be identified. The study also compares knowledge with existing misconceptions concerning vaccines and stigma towards vaccines and genders, and choice of vaccines for their children among parents.

Moreover, this study identifies the economic costs concerning individuals and their perceived economic burden of medical issues related to HPV, which is important to understanding the themes of financial concern and health behaviours and their impact. The collected information helps bet raise future educational interventions and implement gender-neural vaccines besides determining how to negotiate and build good relations with physicians to develop policies related to insurance and reimbursement subsidies. On the same note, the study has implication on increasing acquisition of HPV vaccines, prevention of HPV cancers as well as enhancement on preventive health in India.

5.3 Limitations of the Study

While this study provides valuable insights into HPV knowledge, vaccine acceptance, perceived barriers, and economic factors among Indian adults. Several limitations should be made clear regarding the conclusions deduced from this research study. These shortcoming arising from the use of the survey method might have given a biased result in the sense that the survey was online and maybe difficult to reach rural dwellers and those with low income, most of whom own only a few possessions, including devices. Since they are based on self-reports, they could be influenced by problems such as recall bias and social desirability bias.

The cross-sectional design reflects perceptions at a single point in time make it difficult to track modifications or associated effects of interventions. Only one question where participants gave their opinions on the stigma they faced in the study collection process led to restricted participant reasoning and personal experiences. Some of the survey participants, who are parents, placed restrictions on evaluating the richness of their views about vaccination of their children. The examination based on willingness-to-pay data collection methods yet did not verify actual purchase decisions when financial obligations were necessary.

5.4 Recommendations for Future Study

Based on the findings and limitations of this study certain recommendations for future research and studies are discussed. Future research about HPV awareness and vaccination acceptability should examine a diverse range of representative groups including individuals from rural regions and people from lower socioeconomic classes in addition to those with limited internet access to make study results applicable across the wider Indian population. Research using mixtures of quantitative surveys and qualitative interviews or focus groups would boost the

investigation of participant beliefs along with attitudes and barriers by extending beyond structured survey responses.

Longitudinal studies are recommended, which follow patients throughout time because it enables assessments of knowledge and willingness to pay which changes among individuals relative to educational interventions and vaccine market shifts. Research needs to focus on developing better methods to fight cultural stigma and misleading information through both education programs run by community members and awareness initiatives led by healthcare professionals.

Further, research should analyse how individuals behave financially regarding HPV vaccine purchasing to compare stated willingness-to-pay responses with genuine purchasing behaviour. Enhancing research on how parents decide about their children's vaccines particularly for families representing different demographic backgrounds should yield important data to improve HPV vaccine delivery to adolescents.

CHAPTER 6: REFERENCES

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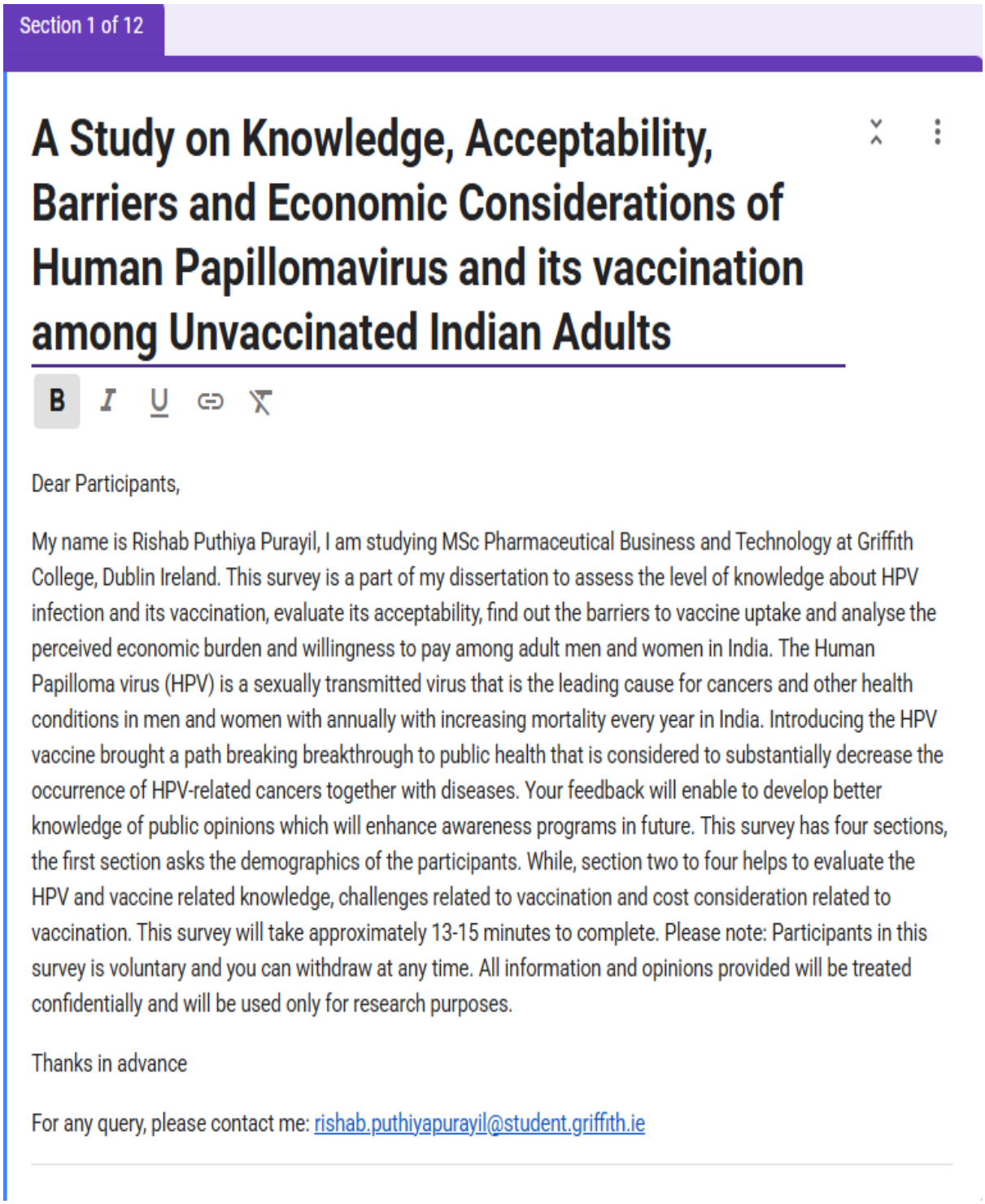
APPENDIX:

APPENDIX A: SURVEY

Link:
https://docs.google.com/forms/d/e/1FAIpQLSeE5H7lEA6MVcTOHNmfhF2O6EGqeQM7rhkdNll2cNRsqMX3UA/viewform?usp=header



Section 2 of 12

Participants consent

Description (optional)

Do you understand the reason for the study? *

- Yes
- No

I voluntarily agree to participate in this study? *

- Yes
- No

Participant inclusion criteria

Description (optional)

Have you received the HPV vaccine? *

- Yes
- No

After section 3 Continue to next section

Section 4 of 12

Participant inclusion criteria

Description (optional)

Are you a healthcare professional (Doctor, Nurse, or Pharmacist)? *

- Yes
- No

Section 5 of 12

Section 1: Demographic characteristics

Description (optional)

1. How old are you? *

- ◯ 18-24
- ◯ 25-34
- ◯ 35-44
- ◯ 45-54
- ◯ 55 and older

2. What is your gender? *

- ◯ Male
- ◯ Female
- ◯ Prefer not to say

3. Which level of education have you finished this far? *

- ◯ No formal education
- ◯ Primary school
- ◯ Secondary school
- ◯ Bachelor's degree
- ◯ Postgraduate degree

4. What is your household income level per month? *

- ◯ Less than ₹10,000
- ◯ ₹10,000-₹30,000
- ◯ ₹30,001-₹50,000
- ◯ ₹50,001-₹100,000
- ◯ More than ₹1, 00,000

5. In which type of area do you currently reside? *

- ◯ Urban
- ◯ Suburban
- ◯ Rural

Section 6 of 12

Section 2: Awareness and Acceptability of the HPV Vaccine

Description (optional)

6. Do you believe that cervical cancer is a significant health issue in India? *

- ◯ Yes
- ◯ No
- ◯ Unsure

7. Have you heard of the HPV vaccine before this survey? *

- ◯ Yes
- ◯ No

8. How HPV is primarily transmitted? (Select all that apply) *

- ☐ Blood transfusion
- ☐ Sexual contact
- ☐ Airborne droplets
- ☐ Sharing utensils
- ☐ Not sure

9. What are most common symptoms of HPV infection? (Select all that apply) *

- ☐ Warts
- ☐ No symptoms
- ☐ I don't know

10. Which of the following are common HPV screening methods? (Select all that apply) *

- [ ] Pap smear (Cytology test)
- [ ] HPV DNA test
- [ ] VIA (Visual Inspection with Acetic Acid)
- [ ] I am not aware of screening methods

11. What is the relationship between multiple sexual partners and HPV risk? *

- ◯ No relationship
- ◯ Increased risk
- ◯ Decreased risk

12. How often should women in India undergo cervical cancer screening? *

- ◯ Every year
- ◯ Every 3 years
- ◯ Every 5 years
- ◯ Only when symptomatic

13. Can men also be affected by HPV-related cancers? *

- ◯ Yes
- ◯ No
- ◯ Unsure

14. Do you know that HPV can cause genital warts and cancers in both men and women? *

- ◯ Yes
- ◯ No

15. Where did you hear about the HPV vaccine initially? *

- ◯ School/Collage
- ◯ Healthcare provider
- ◯ Media
- ◯ Friends/Family

16. What are preventive measures against HPV infection? (Select all that apply) *

- [ ] Vaccination
- [ ] Safe sex practices
- [ ] Regular screenings
- [ ] Unsure

17. Do you know that HPV vaccination is recommended for both males and females? *

- ◯ Yes
- ◯ No
- ◯ Unsure

18. At what age is it recommended to start receiving the HPV vaccine? *

- ◯ 9 years old
- ◯ 12 years old
- ◯ 18 years old
- ◯ 26 years old and above

19. How important do you think it is for adolescents to receive the HPV vaccine? *

- ◯ Very important
- ◯ Somewhat important
- ◯ Not important

20. Which types of HPV vaccines are you familiar with? (Select all that apply) *

- [ ] Bivalent HPV vaccine
- [ ] Quadrivalent HPV vaccine
- [ ] Nonavalent HPV vaccine
- [ ] I am not familiar with any types

Section 3: Barriers to Receiving the HPV Vaccination

Description (optional)

21. What do you consider as the biggest barrier to receiving the HPV vaccine? (Select all that apply) *

- [ ] Cost
- [ ] Lack of education and awareness about HPV and its vaccine in your community
- [ ] Cultural beliefs
- [ ] Logistical issues
- [ ] Lack of family support
- [ ] Other...

22. What do you believe are the main barriers to HPV vaccine acceptance among males? (Select all that apply)

- [ ] Limited knowledge about HPV related risk on men
- [ ] Misconceptions that HPV only affects females
- [ ] Lack of recommendation from healthcare providers
- [ ] Insufficient information for specific groups (e.g., men who have sex with men)
- [ ] Other...

23. Have you encountered any stigma or cultural beliefs that resisted you in receiving the HPV vaccine? *

- ( ) Yes
- ( ) No

a. If you have experienced any stigma mention in brief(optional)

Short answer text

Analyzing the attitude towards the vaccination of children

Description (optional)

24. Do you have children? *

- Yes
- No

If you have children answer the below questions

Description (optional)

a. If you have children, what are their age group?

- Under 5 years old
- 5-12 years old
- 13-17 years old
- 18 years and older

b. Do you feel willing to get your child vaccinated against HPV? Please specify your preference for vaccinating your child based on gender.

- Willing to vaccinate my daughter but not son
- Willing to vaccinate my son but not daughter
- Equally willing to vaccinate either my daughter or son
- Not willing to vaccinate either

c. What do you think is the main reason why people do not choose to vaccinate their children against HPV? (Select multiple)

- [ ] Safety concerns
- [ ] Belief that the vaccine is not needed or necessary
- [ ] Lack of recommendation from healthcare provider
- [ ] Lack of knowledge about HPV or the vaccine
- [ ] Child is not sexually active
- [ ] Religious beliefs
- [ ] Concerns about promoting sexual activity
- [ ] Cost of the vaccine
- [ ] Other...

Section 4: Perceived Economic Burden and Willingness to Pay

Description (optional)

Image title

Information for participants:

Vaccine Type	Vaccine Name	Age Group	Number of Doses
Quadrivalent	Gardasil and Cervavac	9–14 years	2 doses
		15–26 years	3 doses
Nonavalent	Gardasil 9	9–14 years	2 doses
		15–45 years	3 doses

25. Do you consider spending more for an HPV vaccine which protects against multiple virus strains (e.g. Nonavalent vaccine vs. quadrivalent)? *

- ( ) Yes, I am willing to spend additional money on vaccines that protect against extra strains of virus.
- ( ) No, I would not be willing to pay more for additional strains
- ( ) I'm not sure. I would need more information
- ( ) It depends on how much more it costs

26. How much would you spend to get a complete course of HPV vaccine (two or three doses as per age)?

- ○ Less than ₹1000
- ○ ₹1000 – ₹5000
- ○ ₹5001 – ₹10000
- ○ ₹10001 – ₹20,000
- ○ More than ₹20,000
- ○ ₹0 (only if free)

27. Considering the price of the Nonavalent HPV vaccine (Gardasil 9 at ₹10,000 per dose), would you be willing to pay for it? *

- ○ Yes, for the full dose
- ○ Yes, but only if available at a discount
- ○ No, it is very expensive for me

28. Considering the price of Quadrivalent HPV vaccines, which option would you be consider to pay for?

- ○ Cervavac (₹200–₹400 per dose, total ₹400–₹1,200 for full course)
- ○ Gardasil (₹4,000 per dose, total ₹8,000–₹12,000 for full course)
- ○ I would not pay for either

29. If offered a vaccination which is subsidized or insurance program, how likely would you be to participate? *

- ○ Very likely
- ○ Somewhat likely
- ○ Unlikely
- ○ Neither likely or unlikely

30. Would knowing that vaccination could prevent healthcare costs in the future related to HPV infections influence your decision?

- ○ Yes
- ○ No

31. How does your economic conditions in your home affect your decision about health expenditures on vaccinations? *

- ○ Positive impact
- ○ Negative impact
- ○ Neutral impact

32. What is the most important factor in your decision to pay for an HPV vaccine? *

- ○ Cost of the vaccine
- ○ Number of doses required
- ○ Level of protection it provides
- ○ Availability of subsidies

APPENDIX B: ETHICS FORM

Innopharma education

GRIFFITH COLLEGE

Ethics Application & Declaration Form

DISSERTATION TITLE: A STUDY ON KNOWLEDGE, ACCEPTABILITY, BARRIERS AND ECONOMIC CONSIDERATIONS OF HUMAN PAPILLOMAVIRUS AND ITS VACCINATION AMONG UNVACCINATED INDIAN ADULTS

RESEARCHER'S NAME: Rishab Puthiya Purayil

PROGRAMME OF STUDY: MSc in Pharmaceutical Business & Technology

SUPERVISOR'S NAME: Cecilia Vasquez

DECLARATION:

The information in this application form is accurate to the best of my knowledge. I undertake to abide by the principles outlined by Innopharma/Griffith College ethics policy in my research dissertation. I confirm that I have completed a full ethics assessment for my research dissertation as per the college guidelines. I will not begin my primary research until such approval from my supervisor and/or ethics Committee has been obtained.

I pledge to carry out my research according to the Innopharma/Griffith College academic integrity standards. Any results presented in my dissertation will be from my own, original research, I will reference and/or acknowledge any material or sources used in its preparation and I will not plagiarise the work of anyone else.

For Student:

STUDENT SIGNATURE: 

DATE: 16-03-2025

The research contained within this research dissertation proposal has been approved.

For Supervisor:

Ethics Committee Approval Required: Yes ☐ No ☒

SUPERVISOR SIGNATURE: 

DATE: 16.03.2025

For Ethics Committee (if required):

Ethics Committee Approval Given: Yes ☐ No ☐

ETHICS COMMITTEE MEMBER SIGNATURE:

DATE:

NOTE: Supervisors are responsible for ensuring their students fill in this form correctly and that all ethical areas have been considered

SECTION 1: DESCRIPTION OF RESEARCH STUDY

1.1 Purpose and objectives of research

There is a lack of knowledge and awareness regarding HPV infection, its association with cervical cancer, and the HPV vaccination, particularly among low-income groups, those without a medical degree, and in men. Knowledge is linked to HPV vaccine acceptance.
As a result, in order to boost vaccination acceptance, it is essential to run efficient education campaigns to promote awareness and understanding. Therefore, there was a strong need to evaluate the level of awareness of this virus and the acceptability of its vaccination. Researchers will be able to evaluate the current extent of HPV awareness and attitudes on vaccination in various demographics by using this cross-sectional survey approach. The results will demonstrate how much more needs to be done to promote HPV vaccine awareness and remove barriers to HPV vaccination.
The key objectives of the study are as follows:

- To evaluate Knowledge of HPV Infection and its Prevention.
- To assess the level of knowledge and acceptability of HPV vaccination among unvaccinated Indian adults
- To evaluate the barriers to receive the HPV vaccination
- To analyse the perceived economic burden and willingness to pay for quadrivalent and nonavalent HPV vaccines

1.2 Research methodology:

This research uses the survey method to collect data from selected target and later analysis according to its research goals. Structured questionnaires enable successful implementation of this technique. The surveys collect quantitative data regarding general public who are non-healthcare professional's knowledge of HPV alongside their beliefs about vaccination and potential vaccination-related challenges as well as HPV vaccination program expenses. The proposed questionnaire will contain 4 sections. In section 1, the demographics of the participants will be collected which includes age group, gender, occupation and income level. Section 2 will assess the knowledge of the participants on HPV, types of vaccines available and willingness of parents to vaccinate their children. Section 3 purely focuses on the barriers in receiving the vaccination. Finally in section 4 will focus on the influence of cost of vaccines towards the willingness to pay. The questionnaire will be prepared in goggle forms and will be shared with participants in India through platforms like Whatsapp and Linkedin. The data obtained will be analysed and to obtain the level of awareness that people in India have toward HPV and its vaccination.

SECTION 2: POSSIBLE ETHICAL ISSUES

SUBJECT MATTER

Does the research proposal involve:

Research into specific company activities that would be deemed sensitive or confidential	No
Research into politically and/or racially/ethnically and/or commercially sensitive areas	No
Sensitive, personal, professional or corporate issues	No

RESEARCH PROCEDURES

Does the research proposal involve:

Research that might damage the reputation of companies or participants	No
Research that may negatively affect the reputation of Griffith College/Innopharma	No
Use of personal records without consent	No
Use of company data without consent	No
The offer of any inducements to participate	No
Audio or visual recording without consent	No
Using a language other than English	No

PARTICIPANTS

Does the research proposal involve:

People who are not competent and/or fluent in English	No
Does your research group include any of the following vulnerable groups	No

(Adults with psychological impairments; Adults with learning difficulties; Adults under the protection/control /influence of others (e.g. in care/prison); Relatives of ill people (e.g. parents of sick children); Hospital or GP participants recruited in a medical facility; persons under the age of 18)

If you have answered NO to ALL questions, please go straight to Section 4.

If you have answered YES to ANY question in SECTION 2, you must fill in SECTION 3.

SECTION 3: STEPS TAKEN TO AVOID ETHICAL ISSUES

[Only fill in this section if you answered YES to ANY of the questions in Section 3. For example, if you answered yes to including participants who are not fluent in English, you might put forward a plan that offers your survey in two languages to take this into account. Another example could be a study where the researcher wants to include information about the care received by children with a long-term condition but it would not be ethical to approach the children directly but it might be acceptable to instead ask parents questions about their child's care. If these plans are acceptable to your supervisor, you may not need to apply for ethical approval from the Ethics Committee].

3.1. If your ethics relates to ***Subject Matter***, outline your action plan to work around any sensitive issues.
3.2. If your ethics relates to ***Research Procedures***, outline your action plan to deal with possible ethical issues in your research procedures.
3.3. If your ethics relates to ***Participants***, outline how you will protect vulnerable persons or those that do not have English as their first language.

SECTION 4: ABOUT YOUR PARTICIPANTS

4.1. Outline your participant profile and why you have chosen them for this study

The research will enrol participants who are non-healthcare professionals and meet the age requirement of 18 years old or above and are non-vaccinated. This demographic can legally grant consent while understanding HPV-related questions and vaccine information. The research sample incorporates both men and women in order to understand knowledge bases and beliefs along with perception patterns equally among genders. The study exclusively comprises citizens from India because the research aims to measure healthcare knowledge and practices that are shaped by the country's social and medical system. All research participants must be willing to participate before undergoing the study and volunteers do so of their own choice within the boundaries of ethical standards. This preliminary selection process will develop a diverse and comprehensive demographic which leads to significant information about Indian adult perspectives on HPV-related matters.

Collection of this knowledge about social perspectives enables the creation of effective awareness initiatives and vaccination programs.

4.2 How do you plan to gain access to/contact/approach your participant(s).

The Google Form serves as the main instrument for participant recruitment in this study. Potential participants can access this study through different online platforms that include social media networks (WhatsApp, Facebook, Instagram, and Twitter) and relevant community or healthcare forums. The survey link will be distributed through academic institutions and workplaces as well as public health groups to access people from various backgrounds.
Before forwarding the survey link researchers will provide patients with essential study information about its objectives along with pertinent eligibility requirements and HPV recognition value. Before beginning the questionnaire users must sign an informed consent document which they must input manually at the form. Such data collection methods provide broad accessibility and automatic convenience together with optional response options which makes them suitable for gathering information.

SECTION 5: INFORMATION, CONSENT AND CONFIDENTIALITY

5.1 **Participant Information Letter (PIL) for participants**

Please confirm below that your information letter covers:

Description of the research topic and method	Yes
Details of what participation will involve	Yes
Rights to anonymity	Yes
Confidentiality	Yes
Rights to withdraw from the research	Yes
The contact details of the researcher and supervisor (if necessary)	Yes

5.2 **Informed Consent Form (ICF) for participants**

Please indicate below if your research requires a signed consent form by selecting the relevant option only:

No: my research study involves an online survey only and/or does not require signed consent

SECTION 6: STORAGE OF DATA

6.1. How will you store the research data and for how long? How will you manage data protection issues?

The collected data will be stored in a password protected laptop. The raw data will be disclosed to the supervisor and will be submitted to the college in electronic format. The raw data will be achieved for 2 years in secure folders and will be destroyed after 2 years.

SECTION 7: NON-DISCLOSURE AGREEMENT & STUDENT CONSENT

7.1 **Non-Disclosure Agreement (NDA)**
Will the final dissertation contain any information pertaining to any source what would warrant the use of a Non-Disclosure Agreement (NDA) e.g. industry-based research?

No

7.2 **Student consent**
If a Non-Disclosure Agreement (NDA) is not required, does the Student consent to allow their completed dissertation to be held/published by Innopharma/Griffith College?

Yes

SECTION 8: RECORDING AND RETENTION OF DISSERTATION VIVA

8.1 **Viva Recording**
The Dissertation viva will be recorded. This recording may be used to facilitate assessment by Innopharma staff, a third reader if necessary and/or if requested by the external examiner for the Programme. The recording will be held in line with current GDPR guidelines and will not be made publicly available.

SECTION 9: DOCUMENT CHECKLIST

NOTE: Applicants must attach the following documents in electronic format to the appendix.

Which documents are added to the appendix? Please tick N/A if not applicable:

9.1 Participant Information Letter (PIL) for participant	Yes
9.2 Informed Consent Form (ICF) for participant	N/A
9.3 Questions/survey for interviewees/focus groups etc *(can be in draft form)*	Yes
9.4 Any other documents e.g. Non-Disclosure Agreement	N/A

I confirm that this application is complete and all required documents are included in the appendix.

For Student:

STUDENT SIGNATURE: 

DATE: 16-03-2025

APPENDIX C: PARTICIPANT INFORMATION PARAGRAPH

GRIFFITH COLLEGE

Participant Information Paragraph

A Study on Knowledge, Acceptability, Barriers and Economic Considerations of Human Papillomavirus and its vaccination among Unvaccinated Indian Adults

My name is Rishab Puthiya Purayil, I am studying MSc Pharmaceutical Business and Technology at Griffith College, Dublin Ireland. This survey is a part of my dissertation to assess the level of knowledge about HPV infection and its vaccination, evaluate its acceptability, find out the barriers to vaccine uptake and analyse the perceived economic burden and willingness to pay among adult men and women in India.

The Human Papilloma virus (HPV) is a sexually transmitted virus that is the leading cause for cancers and other health conditions in men and women with annually with increasing mortality every year in India. Introducing the HPV vaccine brought a path breaking breakthrough to public health that is considered to substantially decrease the occurrence of HPV-related cancers together with diseases. Your feedback will enable to develop better knowledge of public opinions which will enhance awareness programs in future.

This survey has four sections, the first section asks the demographics of the participants. While, section two to four helps to evaluate the HPV and vaccine related knowledge, challenges related to vaccination and cost consideration related to vaccination. This survey will take approximately 13-15 minutes to complete.

Please note: Participants in this survey is voluntary and you can withdraw at any time. All information and opinions provided will be treated confidentially and will be used only for research purposes.

THANK YOU

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