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Evaluating Human Papillomavirus (HPV) Awareness and Screening Practices in India: A Cross-Sectional Study

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ABSTRACT

Human papillomavirus (HPV) is recognized globally as the predominant cause of cervical cancer, posing a significant public health challenge in India. This study seeks to assess HPV awareness and vaccination trends among the general population, as well as to evaluate screening practices among medical professionals. A cross-sectional study conducted from April 2024 to June 2024 in various regions of India employed convenient sampling to gather data from the general Indian population and medical practitioners involved in HPV and cervical cancer care within the country. Statistical analysis involved descriptive statistics, including percentages and frequency distributions. Among the general population, about 86% of participants were unaware of HPV and 76% did not know about the HPV vaccine. Moreover, 82% had not been vaccinated against HPV, despite more than half correctly identifying the number of vaccine doses required. Awareness of vaccine costs and the recommended age for vaccination was notably low at 40.7% and 46.7%, respectively. Among 13 surveyed medical practitioners, all performed screening for cervical cancer, predominantly using Pap smear tests (92%). Only 38% reported that 90% eligible patients undergo HPV screening, with a follow-up rate ranging from 50%-90%. Challenges identified in HPV screening included prolonged patient convincing times (84%) and cost concerns (54%). The study highlights significant gaps in HPV awareness, vaccine uptake, and screening practices in India. Future efforts should prioritize targeted education campaigns to enhance awareness and address misconceptions. Additionally, improving access to affordable screening services and addressing systemic barriers are crucial steps toward reducing the burden of HPV-related cancers in India.

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Key Words
Human papillomavirus, vaccine, india, cervical cancer, awareness

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INTRODUCTION

Human papillomavirus (HPV), the first identified oncogenic virus, is a non-enveloped, double-stranded DNA virus responsible for 99% of cervical cancer cases. Cervical cancer ranks as the second leading cause of cancer mortality worldwide, resulting in approximately 74,000 female deaths annually[1-4]. HPV is implicated in cutaneous warts on the skin and anogenital region and comprises over 200 related viruses transmissible through oral, anal, or vaginal intercourse[5-4].

HPV is categorized into high-risk and low-risk types. High-risk variants like HPV 16 and 18 are strongly associated with multiple cancers, including cervical cancer. In contrast, low-risk types primarily cause genital, anal, oral and throat warts, with rare progression to cancer[4]. Common low-risk HPV subtypes such as 1, 2, 4, 27 and 57 cause cutaneous warts on the hands and feet and are also responsible for recurrent respiratory papillomatosis and anogenital warts like condylsoma acuminatum. Both low-risk and high-risk HPV are sexually transmitted but can also spread through other forms of personal contact. The Center for Disease Control and Prevention (CDC) reports genital HPV prevalence rates of approximately 45.2% in males and 39.9% in females aged 18-59 years[6-7].

Advances in technology have led to the development of HPV vaccines, effective against genital warts, anogenital malignancies, and cervical cancers[8]. Despite their availability for 15 years, vaccination rates remain low[9]. Data from the Global Cancer Observatory, WHO and UNICEF show varying HPV vaccination coverage globally. High-income and upper-middle-income countries typically achieve better coverage due to higher health spending. In contrast, low- and middle-income countries (LMICs) rely on external funding for high vaccination rates. In LMICs, immunization coverage is currently only at 11.3%, contrasting with 51.5% coverage in high-income countries[10].

The successful implementation of HPV vaccination programs in LMICs faces several significant challenges. Health system constraints, such as limited resources, inadequate infrastructure and ineffective vaccine delivery systems, undermine program effectiveness. Policy barriers also play a role, with inconsistent policies, a lack of prioritization and insufficient funding obstructing large-scale vaccination efforts. Additionally, patient barriers including a lack of awareness, misconceptions about vaccines and safety concerns further hinder vaccine uptake. The COVID-19 pandemic exacerbated these issues by disrupting health priorities, diverting resources, and affecting vaccine supply chains[11-12].

Numerous efforts have been undertaken to address this health issue. In 2016, the Delhi State Government launched campaigns demonstrating the effectiveness of both two-dose and three-dose regimens. Following this, Punjab initiated campaigns in Bathinda and Mansa in 2017. Looking forward to 2024, India's finance minister plans to introduce a nationwide vaccination campaign aimed at raising public awareness and protecting girls aged 9-14 from HPV. However, the effectiveness of these public health campaigns remains under explored. To address this gap, the following study aims to evaluate the awareness of HPV within the Indian population, assess awareness levels regarding the HPV vaccine and examine screening practices among medical practitioners.

MATERIALS AND METHODS

Study Design: A cross-sectional descriptive study was conducted among general population as well as doctors of India from April 2024 to June 2024. The study employed a convenient sampling method to collect data from the general Indian population and medical practitioners. Sample size determination adhered to standard parameters, maintaining a confidence level of 95% (Z =1.96) and a margin of error (d) of 5%.

Eligibility Criteria: For the Indian general population, the inclusion criteria comprised all Indian citizens residing within Indian territory, while all nationals residing outside India were excluded from the sample. Medical practitioners actively engaged in HPV and cervical cancer healthcare services in India, were included in the study, while those residing outside the country were excluded.

Data Collection: Data for the Indian population was collected through a questionnaire-based survey distributed both in person and online. Healthcare practitioners were engaged through face-to-face encounters and telephone conversations for data collection.

Study Instruments: The study utilized two distinct questionnaires: one tailored for the general population and another specifically designed for medical practitioners. Both surveys employed a nominal scale for data measurement and analysis. The questionnaire for the general population consisted of nine questions (Qs), covering demographic details (3Qs), awareness of HPV (1Q), knowledge about the HPV vaccine (1Q) and its cost (1Q), required doses (1Q), dosage by age group (1Q), and vaccination status (1Q).

The questionnaire administered to medical practitioners comprised 8 Qs. It sought demographic information (3Qs), questions about screening practices and methods for cervical cancer (2Qs), challenges encountered in screening (1Qs), number of eligible patients screened HPV positive (1Q), and the follow-up rate among screened patients (1Q).

Statistical Analysis: The data was meticulously scrutinized for consistency and completeness before being assembled and entered into the MS Excel Sheet. The data set was presented concisely using summary statistics, such as frequencies and percentages and the results were visually represented in the form of tables.

Ethical Approval: Formal agreement was gained once it was made clear that participation in the study would be entirely voluntary and that anonymity and confidentiality would be strictly maintained. Using Google Forms, all study participants provided written consent.

RESULTS AND DISCUSSIONS

HPV Awareness and Vaccination Status in Indian Population: Among the 216 individuals surveyed, the majority were graduates (n=139; 64.35%), predominantly aged between 18 and 30 years (n=93; 43%) and resided in Karnataka (n=130; 60%) (Table 1). A significant portion of the participants were neither aware of HPV (n=186; 86%) and the HPV vaccine (n=164; 76%), nor vaccinated (n=178; 82%). However, more than half of the cohort correctly identified the required number of vaccine doses (n=113; 52%), while fewer were informed about its costs (n=88; 40.7%) and the recommended age for HPV vaccination (n=101; 46.7%) (Table 2) (Figure 1).

HPV Screening Practices Among Doctors in India: Of the 13 medical practitioners surveyed, the majority fell within the age group of 40-59 years (n=9; 69%), with most practicing in Tamil Nadu (n=7; 54%) and Karnataka (n=5; 38%). Only one participant (7.6%) practiced in Azzam. The majority (n=12; 92%) of practitioners in this cohort have >10 years of experience (Table 1), with the widely practiced method being the Pap smear test (n=12; 92%). Only one-third of doctors (n=5; 38%) reported that 90% of eligible patients had undergone HPV screening, with a follow-up rate ranging from 50% to 90%. The major challenges in screening were the time taken to convince patients (n=11; 84%) and cost concerns (n=7; 54%) (Table 3).

HPV infection is one of the very few that can be eliminated. With effective screening, vaccination and concerted efforts, many developed countries have successfully reduced prevalence rates drastically. However, developing countries face significant challenges due to limited healthcare infrastructure, insufficient public health funding and low levels of awareness about HPV and its vaccines[13]. In our study, we found a widespread lack of awareness among the Indian population regarding HPV, with only 14% aware of the virus and 24% aware of its vaccines, alongside misconceptions about cost and the optimal vaccination age. In 2009 study, a significant proportion of graduates and high school students in India remain minimally informed about HPV and its vaccine. About 11% of students had heard of the term "Pap test", 15% were aware of HPV and 75% expressed a desire to receive protective vaccination[14]. Similarly, studies in

Table 1: Demographic Details of Study Participants

Demographic	General Population n(%)	Medical Practitioners n (%)
	Educational Levels	
Elementary Pupils	17(7.8)	-
Secondary Students	43(19.9)	-
Graduates	139(64.3)	-
Post-Graduates	14(6.4)	-
Illiterate	3(1.3)	-
	Age Distribution	
Under 18 years	8(3.7)	
18-30 years	93(43)	1(7.6)
31- 40 years	59(27.3)	-
41- 50 years	45(20.8)	4(30.7)
51-59 years	11(5.0)	5(38.4)
>60	-	3(23)
	Geographic Distribution	
Chandigarh	6(2.7)	-
Delhi	1(0.4)	-
Karnataka	130(60.1)	5(38.4)
Madhya Pradesh	5(2.3)	-
Odisha	2(0.9)	-
Punjab	1(0.4)	-
Tamil Nadu	70(32.4)	7(53.8)
Assam	-	1(7.6)
	Years of Experience	
0-10	-	1
11-20	-	4
21-30	-	5
31-40	-	3

Table 2: HPV Awareness and Vaccination Status in Indian population

Questions	Responses	n(%)
Have you heard of HPV?	Yes	30 (14)
	No	186 (86)
Are you aware of a vaccine available for HPV?	Yes	52 (24)
	No	164 (76)
Doses required for HPV vaccine	One dose	13 (6)
	Two doses	19 (8.8)
	Three doses	113 (52.3)
	Not sure	71 (32.9)
Idea of HPV vaccine cost range	100-1000	14 (6.5)
	1000-3000	114 (52.8)
	10,000 +	88 (40.7)
Recommended age for HPV vaccine	<1yr	54 (25)
	9-45 years	101(46.7)
	>45 years	12 (5.5)
	Not sure	49 (22.6)
Are you vaccinated for HPV?	Yes	38 (18)
	No	178 (82)

Table 3: HPV Screening Practices Among Doctors in India

Question	Response	n (%)
Do you screen for cervical cancer?	Yes	13(100)
	No	0
Method of Screening	VIA test	0
	Pap smear	12(92.3)
	HPV test	1(7.7)
Challenges for Screening	Time taken for convincing	11(84.6)
	Cost	7(53.8)
	Facilities of quality control labs not available	1(7.7)
Eligible Patients Screened	10%	3(23.1)
	50%	5(38.5)
	90%	5(38.5)
Follow-up Rate	10%	5(38.5)
	50%	5(38.5)
	90%	2(15.4)
	Not sure	1(7.7)

North India conducted between 2009-2011 have reported low awareness, with only 15% of children and parents demonstrating knowledge about HPV. Urban females tend to be more informed that HPV primarily causes cervical cancer in women, yet only 13% expressed eagerness for HPV vaccination upon learning about cervical cancer and HPV[2]. The lack of awareness in the Indian cohort can be attributed to insufficient public health education in schools and colleges, cultural taboos surrounding sexual health[15] and prevalent misconceptions about the cost and optimal vaccination age[16]. Additionally, limited targeted awareness campaigns and community outreach programs contribute to the widespread lack of knowledge about HPV and its vaccines[17].

In our study, about 92.3% of study participants employed Pap smear tests and 7.7% opted for HPV tests. Malo et al. found a high provision rate of Pap tests among physicians, with 91% providing this service to eligible patients. Notably, 80% of family physicians and obstetrician-gynecologists reported infrequent use of HPV testing and 77% had no intention of changing Pap screening frequencies, with approximately 41% adhering to recommended Pap test practices[18]. In another study, only a minority of providers report that the HPV test alone is adequate for cervical cancer screening (18%) while 96% indicated that women should regularly have both Pap and HPV screenings[19]. Conversely, Saraiya *et al.* (2010) documented that among 1212 clinicians, 82% of primary care physicians recommended HPV testing. The practice varied significantly by specialty, with family practitioners at 64.2%, general internists at 44.7% and obstetrician-gynecologists at 78.2%, primarily recommending HPV testing for abnormal Pap test follow-ups[20]. The disparity regarding the adoption rates of HPV testing among physicians can be attributed to varying factors such as differences in professional guidelines and recommendations, familiarity with and confidence in the effectiveness of each screening method, as well as patient preferences and healthcare system influences on screening practices[21].

In our study, we observed a 90% follow-up rate among 15.40% of patients, whereas 76.9% experienced poor follow-up. Similar to our findings, Diaz *et al.* reported a 15% loss to follow-up rate between each visits[22]. Mittal *et al.* documented poor compliance (23.2%) of follow-up among HPV-positive women at one year[23]. Other studies also highlighted the widespread challenge of high loss to follow-up rates (ranging from 10%-70%), which can significantly reduce the effectiveness of screening programs, especially those requiring multiple visits[25-24]. The differences in follow-up rates across these studies can be attributed to variations in study design, such as follow-up duration and criteria for completion[26]. Other contributing factors include demographic differences among patients, such as socio-economic status, education and cultural influences[27]. Additionally, varied healthcare infrastructure, including access to facilities and transportation, as well as differences in follow-up protocols, such as reminder systems and patient education efforts, also contribute to these disparities[28].

Several challenges highlighted in our study regarding HPV screening include patient reluctance, which necessitates considerable time investment (84.60%), cost implications (53.80%) and the absence of quality control facilities in laboratories (7.70%). In other studies, cost is a major barrier (25.9% to 80%), especially with the absence of publicly funded screening programs. Cultural norms and societal stigma also contribute significantly, with 68% of participants citing societal perceptions as a barrier[29-30]. Other socioeconomic factors, such as a lower monthly income (5,000 INR) and having only primary education, further compounded the difficulty in persuading patients to undergo screening[31].

This study highlights critical gaps in HPV and cervical cancer awareness as well as screening practices in India, emphasizing the need for targeted education and improved access to services. Targeted efforts, including education, implementing cost-effective screening programs, improving access to healthcare facilities (especially in under served areas), enhancing provider training and community engagement and implementing reminder systems for screenings, can support efforts to overcome barriers such as patient reluctance and financial concerns[32].

CONCLUSION

This study highlights significant gaps in awareness regarding HPV and its vaccine among the Indian population, with low levels of knowledge reported for both. While most respondents were aware of the number of doses required for the HPV vaccine, the majority lacked knowledge about the cost and recommended age for vaccination. Additionally, more than three-fourths of the population remains unvaccinated. Healthcare providers predominantly use Pap smears rather than HPV tests for cervical cancer screenings. They perceive that only a few eligible patients undergo HPV screening and receive adequate follow-up. Major challenges include patient persuasion and cost concerns. These findings underscore the

urgent need for comprehensive educational campaigns and policy reforms to increase vaccine acceptance and improve screening practices nationwide. Long-term studies are essential to monitor changes in awareness and behaviors over time.

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