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SEROPREVALENCE AND RISK FACTORS OF HUMAN PAPILLOMAVIRUS AMONG WOMEN ATTENDING A TERTIARY CARE CENTRE: A CROSS SECTIONAL STUDY

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ABSTRACT

Background: Human papillomavirus (HPV) is recognized as the world's most common sexually transmitted infection and a principal risk factor for cervical cancer. HPV infection rates continue to persist, especially in developing countries, where cervical cancer incidence and prevalence are still high. It is due to different reasons, which include low socioeconomic status, lack of population awareness, and inadequately implemented screening and vaccination programs. It is necessary to continue this discussion and to refocus the attention of specialists and the population worldwide on HPV infection and related diseases.

Aim and Objective: This study was conducted to determine the prevalence of HPV infection and firmly characterize the sociodemographic factors affecting its distribution among women.

Material and Methods: A cross-sectional cohort of 350 patients attending a tertiary care hospital's gynecology outpatient department with collaboration with the department of Microbiology and Pathology with symptoms suggestive of genital infection was screened using Real-Time PCR for HPV genotyping. Sociodemographic, education, occupational, and economic variables were analyzed for correlation with infection rates.

Results: Among 350 women screened, 81 tested positive for HPV, giving a prevalence of 23.14%. Infection rates were highest among women aged 21-30 and those from rural backgrounds, with education and economic status significantly correlated to reduced prevalence.
Conclusion: The study confirms the substantial impact of sociodemographic determinants on HPV prevalence. Enhanced education and economic status were associated with lower infection rates, and public health initiatives should prioritize mass awareness and targeted screening.

Keywords: Human Papillomavirus, Prevalence, Molecular Analysis, Real-Time PCR, Socio-Demographic Factors

INTRODUCTION

Human papillomavirus (HPV), a member of the Papillomaviridae family, is a double-stranded DNA virus bearing icosahedral symmetry and a genome of approximately 7900-8000 base pairs [1]. Over 200 distinct HPV types have been identified, with approximately 14 considered high-risk owing to their oncogenic potential, predominantly implicated in cervical, vulvar, penile, anal, and oropharyngeal carcinomas. Globally, cervical cancer ranked fourth among cancers affecting women in 2020, with estimated 604,000 new cases and over 342,000 deaths [2,3].

Human papillomavirus (HPV) is the most common sexually transmitted infection worldwide and is classified as a carcinogenic infectious agent by the International Agency for Research on Cancer (IARC). The virus was first identified in 1981 and is known for its epitheliotropic properties, infecting cutaneous and mucosal epithelia, leading to benign lesions such as warts and papillomas, as well as malignant tumors in anogenital regions, including the cervix, vagina, vulva, penis, anus, and oropharynx. [4,5]. HPV belongs to the Papillomaviridae family and consists of over 200 different virus types. It is a non-enveloped, icosahedral virus approximately 50-55 nm in diameter, containing a circular, double-stranded DNA genome of about 7900-8000 base pairs. The viral genome encodes two distinct regions: an early region (E) involved in controlling replication and oncogenesis, encoding proteins E1, E2, E4, E5, E6, and E7, and a late (L) region coding for capsid proteins L1 and L2 [6-8].

In developing countries like India, the prevalence and incidence of HPV infection and cervical cancer are high due to factors such as low socioeconomic status, lack of awareness, inadequate screening, and insufficient HPV vaccination coverage. These conditions emphasize the need for continued research, public health interventions, and awareness programs targeting HPV infection and its related diseases [9, 10].

The acquisition and persistence of HPV infection are influenced by a combination of sociodemographic, behavioral, and biological risk factors.HPV infection is highly prevalent among sexually active individuals, with most men and women acquiring HPV at least once in their lifetime, often without symptoms.Peak infection rates occur in younger women shortly after sexual debut, typically in the 21-30 years age group, due to increased exposure and an immature cervical transformation zone that makes the epithelium more susceptible to viral entry.Another observed peak occurs around menopausal ages (~50 years), possibly due to hormonal changes and a diminished immune response leading to viral persistence or reactivation of latent infections [11].

Early age at first sexual intercourse and multiple sexual partners are important behavioral risk factors.Lower socioeconomic status contributes to higher infection prevalence due to limited access to healthcare, poor genital hygiene, and lack of health education.Women with little or no formal education show significantly higher rates of HPV infection, likely related to reduced awareness and health-seeking behavior.Rural residence often correlates with low income and education, compounding vulnerability due to poor healthcare infrastructure and social determinants of health.Other Behavioral and Biological FactorsParity, contraceptive use, smoking, and co-infections with other sexually transmitted infections have been associated with increased HPV risk.Immunocompromised states, such as HIV infection, reduce the ability to clear HPV infection,

increasing persistence and progression risk.Poor menstrual hygiene and lack of regular cervical cancer screening also elevate risk [12, 13].

Therefore, the present study was undertaken to study the seroprevalence and Risk Factors of Human Papillomavirus among women attending a tertiary care centre as this study aims in strengthening the analysis of how age, occupation, socioeconomic status, education, and residence contribute to infection risk. Given persistently high cervical cancer morbidity, rigorous regional data are necessary for effective public health policy and intervention designs.

MATERIAL AND METHODS

A hospital-based cross-sectional study was performed in 350 patients attending a tertiary care hospital's gynecology outpatient department with collaboration with the department of Microbiology and Pathology with symptoms suggestive of genital infection was screened using Real-Time PCR for HPV genotyping. Sociodemographic, education, occupational, and economic variables were analyzed for correlation with infection rates.

Inclusion Criteria

1. Age 21-65 years, married women
2. Non-pregnant and no prior hysterectomyPresenting with symptoms such as vaginal discharge, genital itching, abnormal/intermittent bleeding, contact/post-coital bleeding, dyspareunia.

Exclusion Criteria

1. Widows, pregnant women
2. Women vaccinated for HPV, with confirmed cervical cancer, or had undergone hysterectomy
3. Refusal to participate

Sample Collection

Cervical scrapings were collected using sterilized brushes and stored in SurePath Preservative Solution. All specimens underwent DNA extraction and were processed by Real-Time PCR amplification for HPV genotyping using TRUPCR HPV High-Risk Genotyping Plus Kit as per manufacturer's instructions.

Data Analysis

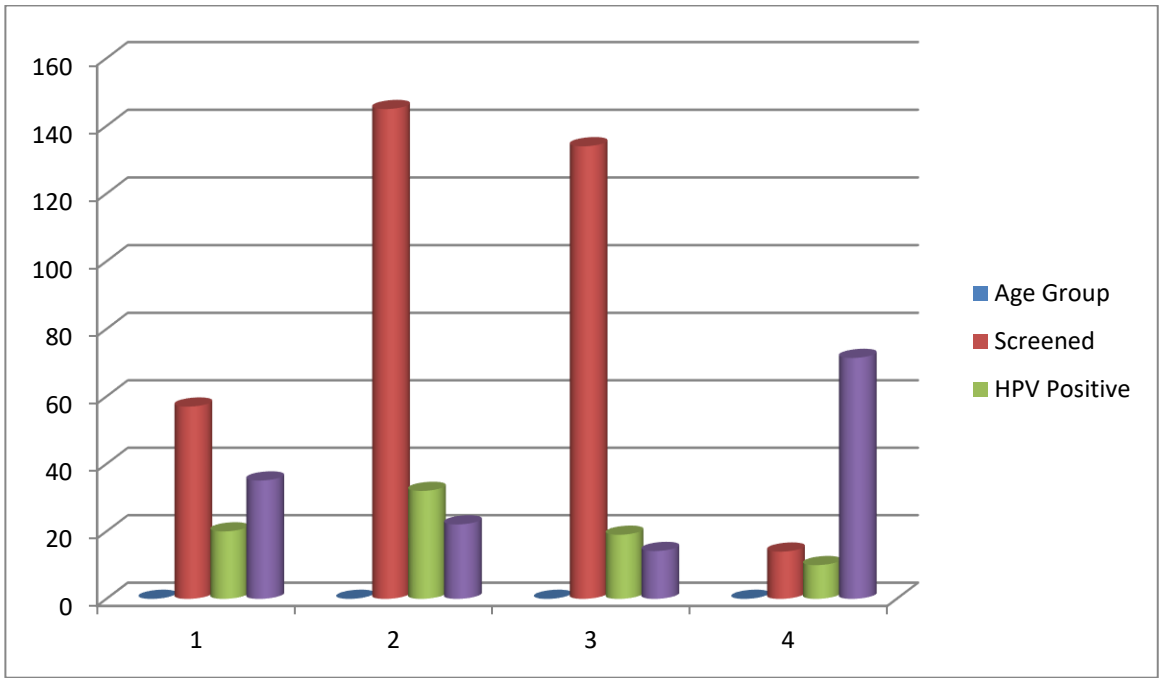
Sociodemographic and clinical data were recorded, and prevalence rates recalculated for all variables proportional to the new sample size. Comparative analysis of education, occupation, residence, and socioeconomic status was performed.

RESULTS

Among 350 women screened, 81 tested positive for HPV, giving a prevalence of 23.14%. Infection rates were highest among women aged 21-30 and those from rural backgrounds, with education and economic status significantly correlated to reduced prevalence.

Table 1: Age-wise Distribution

Sl .No.	Age Group	Screened	HPV Positive	% Positive
1	21-30yr	57	20	35.09
2	31-40 yr	145	32	22.07
3	41-50yr	134	19	14.18
4	50yr	14	10	71.43



Graph No. 1`: Table 1: Age-wise Distribution

Table 2: Occupation

Sr. No.	Occupation	Screened	HPV Positive	%Positive
1	Housewife	274	64	23.36
2	Sedentary Profession Employees	45	9	20.00
3	Physical work	30	8	26.67

Table 3: Education

Sr. No.	Education	Screened	HPV Positive	%Positive
1	Illiterate	39	20	51.28
2	Up to 10^{th}	86	25	29.07
3	Intermediate / Secondary	101	15	14.85
4	Graduation	124	20	16.13

Table 4: Socio-Economic Status

Sr. No.	Socio- Economic	Screened	HPV Positive	%Positive
1	Low annual income	233	62	26.61
2	Middle Annual Income	117	19	16.24
3	High Annual Income	81	19	23.14

Table 5: Residence

Sr. No.	Residence	Screened	HPV Positive	%Positive
1	Urban	117	19	16.24
2	Rural	223	62	26.61

The highest HPV prevalence was noted among women aged 21-30 years (35.09%), closely followed by the 50+ years subgroup (71.43%) though sample sizes differ.Housewives and physical workers had somewhat higher prevalence than professionals; factors may relate to education and economic status.Illiteracy correlated strongly with infection (51.28%), with rates falling dramatically with higher education levels.

Women with low annual income exhibited highest infection prevalence, supporting the role of economic disadvantage as a risk enhancer
.Rural participants were over 1.6 times as likely to contract HPV compared to urban participants, possibly due to health system access, hygiene, and awareness deficits.

DISCUSSION

HPV is the most common sexually transmitted infection globally, affecting both men and women during their lifetime. Many infections are asymptomatic but can persist and lead to malignant transformations if caused by high-risk HPV types [3].
The age-specific pattern continues to show increased susceptibility at young adulthood and again after 50 years, in line with research by Kulkarni et al. (2023), Senapati et al. (2017), and others reporting bimodal peaks. Lifetime sexual exposure, hormonal changes around menopause, and immune-related viral persistence support these findings[11, 15-18,24-25].The dramatic decrease in prevalence correlates with rising education, paralleling the observations of Saxena et al., Ganju et al., and prior studies in Ethiopia, Bangladesh, and China that found lack of awareness and low literacy compound the risk[27-32]. In this region, literacy is tightly knit with rural residence, evidencing the compounded vulnerability of rural, low-income, and poorly educated women to high-risk HPV[29-31].
The predominance of rural cases is consistent with work by Kadian et al. (2019) [25] , and Senapati et al., who reported 20-fold elevated risk linked to residence, as well as prior work on barriers to access and health-seeking behavior in low-resource, marginalizedcommunities. Recommendations from WHO and other bodies stress multi-tier screening programs involving community-level engagement, linking improved screening rates to training and mobilization of health workers[35]
HPV infection is the primary risk factor for cervical cancer, which ranks as the fourth most common cancer among women worldwide. In 2020, there were an estimated 604,000 new cervical cancer cases and 342,000 related deaths globally, highlighting the significant mortality burden associated with HPV-related cancers [36].
The prevalence of HPV and cervical cancer remains particularly high in developing regions, such as India, primarily due to low socioeconomic conditions, insufficient awareness, and inadequate execution of screening and HPV vaccination programs
HPV enhances understanding of its epidemiology, genotype distribution, and sociodemographic risk factors, which is essential for developing effective screening strategies, vaccination policies, and educational programs. This can substantially reduce the incidence and mortality of cervical and other HPV-associated cancers . Research into HPV helps clarify how factors such as age, education, occupation, residence, and economic status influence infection rates, thereby aiding tailored public health interventions targeting higher-risk populations .Therefore, ongoing research and surveillance on HPV infections are pivotal for controlling HPV-related disease burden, improving women's health outcomes, and guiding global and regional cervical cancer prevention and control efforts
STIs impose a major health and economic burden globally [38]. If left untreated, STIs may cause some serious complications, leading to increased morbidity and mortality. Unfortunately, the general public is unaware of HPV infection, and it is even lower in high-risk populations such as FSWs [39,40]. Hence, this study was planned with an aim to determine the seroprevalence of HPV infection in women attending a tertiary care hospital and with the main objective of emphasizing the necessity of HPV vaccination among FSWs to prevent the risk of developing cervical cancer.

Conclusion

Sociodemographic and behavioral factors are major determinants of HPV infection risk among Indian women. Age, education, residence, and economic status all play significant roles, with younger and rural, less educated, and economically challenged women facing higher infection rates. Strategic public health campaigns focusing on awareness, screening, and vaccination—especially

targeting rural and underprivileged women—are crucial to reduce HPV-related morbidity and mortality.

DECLARATIONS

Conflicts of interest: There is no any conflict of interest associated with this study
Consent to participate: There is consent to participate.
Consent for publication: There is consent for the publication of this paper.
Authors' contributions: Author equally contributed the work.

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