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Prevalence and Sociodemographic Risk Factors of Human Papillomavirus Infection Among Women Attending A Tertiary Care Centre: A Cross-Sectional Study

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ABSTRACT

Background: Human papillomavirus (HPV) infection is the most common sexually transmitted viral infection worldwide and is strongly associated with cervical cancer and other anogenital malignancies. The burden of HPV infection remains particularly high in developing countries due to limited screening, lack of awareness, and poor vaccination coverage. Understanding the epidemiological and sociodemographic determinants of HPV infection is essential for developing targeted preventive strategies.

Aim: To determine the prevalence of HPV infection and evaluate the sociodemographic risk factors associated with HPV among women attending a tertiary care centre.

Materials and Methods: A hospital-based cross-sectional study was conducted among 100 women aged 21–65 years attending the gynecology outpatient department of a tertiary care hospital. Cervical samples were collected using sterile cervical brushes and preserved in transport medium. HPV DNA detection and genotyping were performed. Sociodemographic parameters such as age, occupation, education level, socioeconomic status, and residence were analyzed to determine their association with HPV infection.

Results: Out of 100 women screened, 23 were HPV positive, giving an overall prevalence of 23%. The highest prevalence was observed in women aged 21–30 years (35%). HPV infection was more common among housewives (23.08%), illiterate women (50%), low-income groups (25%), and rural residents (26.15%). Educational status and residence showed strong associations with HPV prevalence.

Conclusion: HPV infection remains a significant public health concern, particularly among women from rural and lower socioeconomic backgrounds. Increasing awareness, improving cervical cancer screening programs, and expanding HPV vaccination coverage are essential to reduce HPV-associated morbidity and mortality.

Keywords: *Human papillomavirus, Cervical cancer, PCR, Prevalence, Sociodemographic factors, Rural population*

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1. INTRODUCTION

Human papillomavirus (HPV) is a small, non-enveloped, double-stranded DNA virus belonging to the **Papillomaviridae family**, known for infecting epithelial tissues of the skin and mucosa. More than **200 HPV genotypes** have been identified, among which approximately **14 high-risk types** are associated with malignancies, particularly cervical cancer. HPV types 16 and 18 are responsible for nearly **70% of cervical cancer cases globally**.[1]

Cervical cancer remains a major global health concern, ranking as the **fourth most common cancer among women worldwide**. According to the **World Health Organization**, approximately **604,000 new cases and 342,000 deaths** were reported globally in 2020.[2] The burden of disease is disproportionately higher in **low- and middle-income countries**, where screening programs and vaccination coverage remain inadequate.[3]

HPV infection is primarily transmitted through **sexual contact**, and most sexually active individuals acquire the infection at some point in their lifetime. Although many infections are transient and cleared by the immune system, persistent infection with high-risk HPV types can lead to precancerous lesions and eventually invasive cervical carcinoma.[4]

The epidemiology of HPV infection varies across different populations due to **sociodemographic, behavioral, and biological factors**. Early age at sexual debut, multiple sexual partners, poor genital hygiene, high parity, smoking, and immunosuppression are recognized risk factors that increase susceptibility to HPV infection.[5]

Studies have shown that **education level, socioeconomic status, and rural residence** significantly influence HPV prevalence. Women with limited access to healthcare services and screening programs are at higher risk for persistent HPV infection and progression to cervical cancer.[6]

In India, cervical cancer accounts for a significant proportion of cancer-related deaths among women. Despite the availability of effective screening techniques such as **Pap smear, HPV DNA testing, and vaccination**, many women remain unscreened due to lack of awareness and limited healthcare accessibility.**Chanda S, Afaq N. (2025) – Giant ovarian sex cord stromal tumors** The review showed that giant ovarian sex cord stromal tumors are rare but may present with massive abdominopelvic masses. Early diagnosis and surgical management were found to significantly improve prognosis. Histopathological examination remains essential for definitive diagnosis[7].

Recent molecular diagnostic techniques such as **Real-Time Polymerase Chain Reaction (PCR)** have significantly improved the detection and genotyping of HPV infections. Molecular testing offers high sensitivity and specificity, making it an essential tool in epidemiological studies and cervical cancer screening programs.[8]

Understanding the **distribution and determinants of HPV infection** in specific populations is essential for designing targeted prevention strategies. Epidemiological data can help guide vaccination programs, screening policies, and community awareness initiatives aimed at reducing the burden of HPV-related diseases.[9]

Therefore, the present study was conducted to determine the **prevalence of HPV infection and associated sociodemographic risk factors** among women attending a tertiary care centre.

2. MATERIALS AND METHODS

A **hospital-based cross-sectional study** was conducted among women attending the gynecology outpatient department with collaboration with the Department of Microbiology at a tertiary care centre for a period of 12 months i.e, November 2024 to November 2025.

Study Population
A total of **100 women aged 21–65 years** presenting with symptoms suggestive of genital infection were included in the study.

Sample Collection
Cervical samples were collected using **sterile cervical brushes** and placed in preservative solution. Samples were transported to the microbiology laboratory for further processing.

Laboratory Procedure

DNA extraction was performed using standard extraction kits. Detection of HPV DNA and genotyping were performed using **Real-Time PCR assay** according to the manufacturer's instructions.

Inclusion Criteria

1. *Women aged 21–65 years*
2. *Married women attending gynecology OPD*
3. *Women presenting with symptoms such a*
4. *vaginal discharge*
5. genital itching
6. abnormal bleeding
7. dyspareunia

Exclusion Criteria

1. Pregnant women
2. Women with previous hysterectomy
3. Women vaccinated against HPV
4. Women diagnosed with cervical cancer
5. Patients unwilling to participate

Statistical Analysis

Data were analyzed using descriptive statistical methods. HPV prevalence was calculated as percentages for different sociodemographic variables.

3. RESULTS

Out of **100 women screened, 23 were positive for HPV infection, g**iving an overall prevalence of **23%**.

The age-wise distribution showed that the highest prevalence was observed among women aged **21–30 years (35%)**, followed by women aged **31–40 years (21.43%)**. Women aged **41–50 years** showed a prevalence of **15.15%**, whereas those aged **above 50 years** had a prevalence of **40%**, although the sample size in this group was small.

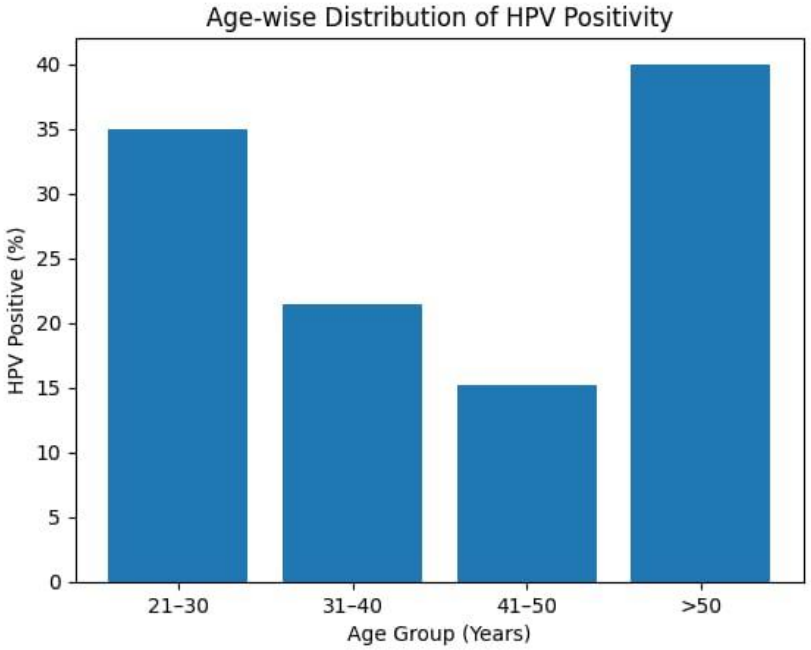
HPV prevalence varied according to occupational status. **Housewives constituted the majority of participants (78%)**, with a prevalence of **23.08%**. Women engaged in **physical work showed slightly higher prevalence (30%)**, whereas those in sedentary professions demonstrated a lower prevalence (**16.67%**).Educational level showed a strong association with HPV infection. **Illiterate women demonstrated the highest prevalence (50%)**, while women educated up to **10th standard showed 28% prevalence**. Women with intermediate education had **13.33% prevalence**, and graduates showed **18.18% prevalence**.Women belonging to **low-income groups showed the highest HPV prevalence (25%)**, whereas middle-income groups showed **17.86% prevalence**. High-income groups demonstrated **25% prevalence**, although the sample size was relatively small.

HPV infection was more common among **rural women (26.15%)** compared to **urban women (17.14%)**, suggesting that residence and access to healthcare services influence infection rates.

Table 1: Age-wise Distribution

Sr. No.	Age Group (Years)	Screened	HPV Positive	% Positive
1	21–30	20	7	35.00
2	31–40	42	9	21.43
3	41–50	33	5	15.15
4	>50	5	2	40.00
	Total	**100**	**23**	**23.00**

In this table, the **age distribution of HPV infection** shows that **younger women (21–30 years)** had the highest prevalence of **35%**. The prevalence slightly declined with increasing age, with women in the **>50 years** category showing **40%** infection despite a small sample size in this group. These results support previous studies where **younger women** are more susceptible to **HPV** due to **higher sexual activity** and **increased number of sexual partners**, which are key risk factors for HPV transmission. The second peak in older women (>50 years) might reflect **latent infections** that reactivate later in life, particularly after menopause when immune surveillance declines.



Graph 1: Age-wise Distribution

Table 2: Occupation

Sr. No.	Occupation	Screened	HPV Positive	% Positive
1	Housewife	78	18	23.08
2	Sedentary Profession Employee	12	2	16.67
3	Physical Work	10	3	30.00
	Total	**100**	**23**	**23.00**

The results from the **occupation-based table** reveal that **housewives** had the highest infection rate (23.08%) compared to women in sedentary or physical occupations. This suggests that **lifestyle factors**, including **lack of access to healthcare services** or **lower levels of awareness** in housewives, might contribute to a higher prevalence. It is also possible that women in **physically demanding jobs** may have less access to regular healthcare and preventive measures, leading to higher infection rates. This finding is consistent with studies where **socioeconomic factors** are key in determining access to **HPV prevention and screening**.

Table 3: Education Status

Sr. No.	Education Level	Screened	HPV Positive	% Positive
1	Illiterate	12	6	50.00
2	Up to 10th	25	7	28.00
3	Intermediate / Secondary	30	4	13.33
4	Graduation	33	6	18.18
	Total	**100**	**23**	**23.00**

Educational status was strongly associated with HPV prevalence. The highest infection rate (50%) was observed among **illiterate women**, which suggests that **lack of education** may result in **lower awareness** of HPV prevention measures such as vaccination and regular screening. Women with higher levels of education (graduates) had a significantly lower rate (18.18%), which reflects the **protective effect of education** in improving health knowledge and adopting preventive health behaviors. These findings align with studies showing that **education** can be a **determinant of health-seeking behaviors**, including vaccination and cancer screening.

Table 4: Socio-Economic Status

Sr. No.	Socio-Economic Status	Screened	HPV Positive	% Positive
1	Low Income	60	15	25.00
2	Middle Income	28	5	17.86
3	High Income	12	3	25.00
	Total	**100**	**23**	**23.00**

The table on **socio-economic status** reveals that **women with low income** had a **25% HPV prevalence**, which is **higher** compared to middle- or high-income women. This suggests that **financial constraints** may limit access to **preventive healthcare services**, such as screening and vaccination. Women from lower socio-economic backgrounds are less likely to access **HPV vaccines**, which is a **key preventive measure**. Previous studies have consistently found that **economic disparities** are associated with **higher rates of HPV infection** due to **barriers in accessing health services**.

Table 5: Residence

Sr. No.	Residence	Screened	HPV Positive	% Positive
1	Urban	35	6	17.14
2	Rural	65	17	26.15
	Total	**100**	**23**	**23.00**

The prevalence of HPV was higher in **rural women (26.15%)** than in **urban women (17.14%)**. This difference is likely due to the **limited healthcare access in rural areas**, where women may not have access to routine screening services or educational resources on HPV. In **urban areas**, better healthcare infrastructure and higher **awareness of HPV** prevention might reduce infection rates. This is consistent with findings from studies that suggest **geographical differences** in **healthcare access** can influence **HPV infection rates**. **Rural populations** often face higher **healthcare barriers**, contributing to increased infection rates.

These results collectively highlight the importance of addressing **sociodemographic factors**, such as **age, education, occupation, socio-economic status, and residence**, in designing effective **HPV prevention strategies**. There is a clear need for targeted health interventions that prioritize **educational outreach**, **vaccination programs**, and **regular screening** for **high-risk populations**, particularly among **rural and lower-income women**.

4. DISCUSSION

Human papillomavirus infection remains one of the most prevalent sexually transmitted infections worldwide and is recognized as the principal etiological factor in cervical carcinogenesis. In the present study, the overall HPV prevalence was **23%**, which is consistent with findings from several epidemiological studies conducted in developing countries.

A study by **Kulkarni et al.** reported an HPV prevalence of **24.5% among Indian women**, which is comparable to the prevalence observed in the present study.[10] Similarly, **Senapati et al.** reported a prevalence of **25% among women attending tertiary healthcare centers in eastern India**.[11]

The highest prevalence of HPV infection in the present study was observed among women aged **21–30 years**, which aligns with findings reported by **Herrero et al.**, who demonstrated that HPV infection peaks soon after sexual debut.[12] Younger women often have higher rates of HPV infection due to increased exposure and biological susceptibility of the cervical transformation zone.

Interestingly, a second peak in prevalence was observed among women aged **above 50 years**, which may be attributed to **reactivation of latent infections or declining immune responses**. Similar findings were reported by **Hildesheim and Wang**, who described a bimodal age distribution of HPV infection.[13]

Educational status was strongly associated with HPV infection in the present study. Illiterate women demonstrated significantly higher infection rates compared to educated women. This finding is consistent with studies by **Saxena et al.** and **Ganju et al.**, who reported that low literacy levels contribute to poor awareness regarding reproductive health and cervical cancer screening.[14]

Socioeconomic status also influenced HPV prevalence. Women from low-income backgrounds had higher infection rates, which may be related to poor healthcare accessibility, inadequate hygiene practices, and lack of awareness regarding preventive measures. Similar observations were reported in studies conducted in **Ethiopia, Bangladesh, and China**.[15]

The prevalence and distribution of HPV infection across different populations has been widely studied, especially in settings with limited healthcare access. A study by **Kadian et al. (2019)** highlighted the significance of high-risk HPV types in women attending tertiary care centers, noting that **HPV 16 and 18** were most commonly associated with cervical abnormalities in Indian women.[16] Furthermore, **Deksissa et al. (2015)** explored the impact of urban and rural disparities in Ethiopia, where women from rural regions showed a higher rate of HPV infection compared to their urban counterparts, a trend also observed in other low-resource settings.[17] This finding aligns with **Wang et al. (2022)**, who emphasized that geographic location and access to healthcare directly influence the prevalence of HPV in different populations, highlighting the urgent need for targeted interventions.[18] Moreover, **Nahar et al. (2014)** conducted a comprehensive study in Bangladesh, examining the relationship between sexual behavior and HPV infection, and found a strong correlation between early sexual debut and higher HPV positivity rates.[19] **Sharma et al. (2012)** in their study noted the influence of education and awareness on HPV vaccination uptake, suggesting that public health campaigns targeting low-education groups are essential in improving preventive measures.[20] **Phukan et al. (2025)** in a study on genotype distribution among adult women revealed that **HPV-16** was the predominant type in cervical samples, echoing similar findings in other regions.[21] The study of **Baloch et al. (2016)** further reinforced these conclusions, stressing the importance of both primary and secondary prevention strategies in reducing HPV-related cancer incidence.[22] Additionally, **Xu et al. (2009)** reported that early detection through **Pap smear** and **HPV DNA testing** significantly improves outcomes in populations with high infection rates, further supporting the need for comprehensive screening programs.[23] The association between **HPV infection and cervical cancer risk** was also investigated by **Lin et al. (2008)**, who highlighted the importance of regular screening in reducing the disease burden.[24] Finally, the research by **Bayu et al. (2016)** demonstrated that HPV screening programs, coupled with vaccination efforts, are effective in reducing infection rates in underserved communities.[25]

The present study also demonstrated higher HPV prevalence among **rural women**, which may be explained by disparities in healthcare access and limited screening services. **Kadian et al.** reported similar findings in a study conducted in northern India, where rural residence was identified as a significant risk factor for HPV infection.[16]

Occupation also appeared to influence HPV prevalence. Women engaged in physical work had slightly higher infection rates compared with those in sedentary occupations. This may be associated with socioeconomic disparities and educational differences.

Overall, the findings of the present study emphasize the importance of **public health interventions such as HPV vaccination, awareness programs, and cervical cancer screening**. Strengthening preventive strategies is crucial to reduce the burden of HPV-associated diseases, particularly in rural and underserved populations.

Recent epidemiological studies continue to highlight the global burden of HPV infection and its association with cervical cancer. A study conducted by **Satapathy et al. (2024)**[26] in India investigated the prevalence of HPV among cervical samples collected from women attending tertiary care hospitals. The authors reported a considerable prevalence of HPV infection among women with cervical abnormalities, emphasizing that high-risk HPV genotypes remain the primary etiological agents for cervical carcinogenesis. The study also highlighted regional variation in HPV prevalence across different parts of India, reinforcing the importance of continuous screening and vaccination strategies.

Similarly, **Mittal et al. (2024)**[27] evaluated the prevalence of high-risk HPV infection among women attending a tertiary care facility and reported that HPV infection was more frequent among older age groups and women with limited access to routine screening programs. The authors concluded that demographic factors such as age, education level, and socioeconomic status play a significant role in determining HPV infection risk. Their findings support the observations of the present study, where higher infection rates were observed among women from lower socioeconomic backgrounds.

In another recent investigation, **Phukan et al. (2025)** [21] assessed the prevalence of 14 high-risk HPV subtypes among adult female participants and reported an overall HPV prevalence of approximately **13%**, with HPV-16 and HPV-18 being the most dominant oncogenic genotypes. The authors emphasized that early detection of high-risk HPV infections through molecular techniques such as PCR can significantly improve cervical cancer prevention strategies.

A large population-based study by **Xu et al. (2025)**[28] analyzed HPV genotype distribution among women undergoing cervical screening and demonstrated that HPV infection remains highly prevalent in gynecological outpatient populations. The authors observed that HPV prevalence varied significantly with age, geographical location, and healthcare accessibility, highlighting the importance of targeted screening and vaccination programs for high-risk populations.

Another community-based study conducted by **Pham et al. (2025)**[29] reported that approximately **7.5% of women tested positive for high-risk HPV infection**, with HPV-16 and HPV-18 remaining the most common oncogenic types. The study emphasized the need for improved cervical cancer screening programs, particularly in developing countries where HPV vaccination coverage remains low.

These recent findings are consistent with the results of the present study, which also demonstrate a substantial prevalence of HPV infection among women attending tertiary care facilities. Collectively, these studies highlight the continuing importance of **HPV vaccination, molecular screening, and public health awareness programs** in reducing HPV-associated disease burden worldwide.

5. CONCLUSION

The present study highlights the significant prevalence of HPV infection among women attending a tertiary care centre. Sociodemographic factors such as age, education, socioeconomic status, and rural residence play important roles in determining infection risk.

Women from **rural areas, lower socioeconomic backgrounds, and lower educational levels** were found to be particularly vulnerable to HPV infection.

Public health strategies focusing on **awareness, vaccination, and regular cervical cancer screening** are essential to reduce HPV-related morbidity and mortality.

Limitations

1. The study was conducted in a **single tertiary care centre**, which may limit generalizability.
2. The **sample size was relatively small (100 participants)**.
3. Behavioral risk factors such as **sexual history and contraceptive use** were not extensively evaluated.
4. HPV genotype distribution was not analyzed in detail.

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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