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Etiological Patterns in Incidence of Cervical Cancer

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Abstract

Background:
Cervical cancer remains one of the leading causes of cancer-related mortality among Indian women, particularly in rural populations. Although it is largely preventable through HPV vaccination and screening, multiple reproductive and sociodemographic factors contribute to its high incidence. This study aimed to identify key etiological patterns among cervical cancer patients in a tertiary care hospital.

Methodology:
A retrospective observational study was conducted over eight months at Good Samaritan Cancer & Multispecialty Hospital, Eluru. A total of 135 women with histologically confirmed cervical cancer were included. Data on age at menarche, marriage, first childbirth, parity, and cancer staging were collected via a structured questionnaire and hospital records.

Results:
Early menarche (≤14 years), early marriage (≤20 years), and high parity (>3) were common. Over 90% of cases were diagnosed at Stage II or III. Rural women represented 77% of the cases. Early reproductive exposure was significantly associated with advanced-stage cancer.

Conclusion:
Early reproductive factors and lack of timely screening are major contributors to cervical cancer incidence. Public health interventions promoting HPV vaccination, delayed marriage, and expanded screening programs are essential to reduce disease burden.

Keywords: Cervical cancer, HPV, early marriage, high parity, rural women, India, cancer staging.

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Introduction

Cervical cancer is a malignant neoplasm arising from the cells of the cervix, which is the lower part of the uterus connecting to the vagina. Globally, cervical cancer ranks as the fourth most common cancer in women, with approximately 604,000 new cases and 342,000 deaths in 2020 alone. In India, cervical cancer is the second most frequent cancer among women, accounting for a significant proportion of cancer-related morbidity and mortality. The burden is disproportionately higher in low- and middle-income countries due to lack of awareness, limited access to screening, and low uptake of preventive measures such as HPV vaccination.1,2.

The primary causative agent of cervical cancer is persistent infection with high-risk types of human papillomavirus (HPV), particularly HPV-16 and HPV-18. However, the progression from infection to cancer is influenced by several cofactors such as early age at sexual debut, multiple pregnancies, poor genital hygiene, long-term oral contraceptive use, smoking, and immune suppression. These risk factors, especially in combination with HPV infection, promote the transformation of normal cervical epithelial cells into dysplastic and ultimately malignant cells. In particular, the transformation zone of the cervix is highly susceptible to HPV-related changes.3,4

Despite being largely preventable through vaccination and early detection, cervical cancer remains a significant public health issue in India due to sociocultural barriers, poverty, low literacy rates, and limited access to healthcare infrastructure. Many women are unaware of the early signs of cervical dysplasia or the availability of screening tests such as the Pap smear or HPV DNA testing. Consequently, a large proportion of patients present with advanced-stage disease, which drastically reduces treatment success rates and survival outcomes.5,6

Over the past few decades, there has been increased emphasis on the implementation of national screening programs and vaccination strategies, but their reach remains inadequate, especially in rural and semi-urban populations. Cultural taboos, early marriage, and lack of reproductive health education contribute to the continued prevalence of high-risk behaviors and delay in health-seeking behavior among women. These factors necessitate targeted research to understand the epidemiological and etiological landscape of cervical cancer at the regional level.7,8

Methodology

Study Design:

This is a retrospective observational cohort study aimed at evaluating the etiological patterns contributing to cervical cancer.

Study Site:

The study was conducted at Good Samaritan Cancer and Multi-specialty Hospital, Vangayagudem, Andhra Pradesh.

Study Duration:

The study was carried out over a period of 8 months, from July 2023 to February 2024, which included:

- 7 months for data collection
- 1 month for data analysis

Study Population:

A total of 135 female patients with confirmed cervical cancer diagnosis were included, based on inclusion and exclusion criteria.

Source of Data and Materials

- A self-designed questionnaire was developed comprising two sections:
  - Section A: Demographic and reproductive history
  - Section B: Clinical data related to chemotherapy, radiotherapy, surgery, and early life exposure
- Patient exposure data was also retrieved from the hospital's data storage systems and patient medical records.

Inclusion Criteria:

- Female patients diagnosed with cervical cancer
- Patients who provided informed consent

Exclusion Criteria:

- Female patients with other types of cancer
- Patients not willing to participate
- Patients with unclear or incomplete medical records

Data collection:

- The target population consisted of female patients undergoing treatment through chemotherapy, radiotherapy, and/or surgical intervention.
- Data collection was performed both at the patient bedside and from hospital database records.
- Variables collected included:
  - Age at menarche, marriage, and first childbirth
  - Gravida, para, number of abortions and living children
  - Stage of cancer
  - Rural/urban residence
  - Lifestyle and screening history
- Data were documented using the custom questionnaire and compiled for statistical analysis.

Data Analysis:

- Statistical tools were used to process and analyze the collected data.
- Descriptive statistics (frequencies, percentages) were used to categorize variables.

Results

1. Distribution of Subjects Based on Age at Menarche

S. No.	Age (Years)	Number of Cases
1	10–12	62 (46%)
2	12–14	64 (47%)
3	14–16	9 (7%)

Most subjects (93%) attained menarche between 10 and 14 years, indicating a high prevalence of early onset of reproductive capability, which may be associated with prolonged hormonal exposure.

2. Distribution Based on Age at Marriage

S. No.	Age at Marriage (Years)	Number of Cases
1	10–15	35 (26%)
2	15–20	47 (35%)
3	20–25	39 (29%)
4	25–30	14 (10%)

More than 60% of women were married before the age of 20, reflecting early sexual debut, a known risk factor for cervical cancer.

3. Age at First Childbirth

S. No.	Age at First Childbirth (Years)	Number of Cases
1	15–20	48 (35%)
2	20–25	67 (50%)
3	25–30	12 (9%)
4	30–35	8 (6%)

Most women (85%) gave birth before the age of 25. Early childbearing contributes to cervical trauma and susceptibility to HPV infection.

4. Number of Pregnancies (Gravida)

S. No.	Number of Pregnancies	Number of Cases
1	1–2	38 (28%)
2	2–4	47 (35%)
3	4–6	32 (24%)
4	6–8	18 (13%)

High parity was evident in this population, with 37% having more than 4 pregnancies. Multiparity is a well-established risk factor for cervical cancer due to hormonal and physical cervical changes.

5. Age-Wise Distribution of Cervical Cancer Diagnosis

S. No.	Age Group (Years)	Number of Cases
1	15–25	0
2	25–35	3 (2%)
3	35–45	40 (30%)
4	45–55	44 (33%)
5	55–65	28 (21%)
6	65–75	17 (12%)
7	75–85	3 (2%)

Description:

Peak incidence occurred between 35–55 years of age (63%), aligning with global trends of cervical cancer presentation.

6. Cancer Stage at Diagnosis

S. No.	Cancer Stage	Number of Cases
1	Stage I	1 (1%)
2	Stage II	89 (66%)
3	Stage III	34 (25%)
4	Stage IV	11 (8%)

The majority of subjects (91%) were diagnosed at Stage II or III, indicating a delay in early detection and inadequate screening measures.

7. Rural vs Urban Distribution by Age Group

Age Group (Years)	Rural Cases	Urban Cases
20–30	1	1
30–40	11	3
40–50	26	12
50–60	35	8
60–70	21	4
70–80	9	4

Rural patients (77%) outnumbered urban cases significantly. Limited awareness and screening access in rural areas may explain this disparity.

8. Parity Distribution Across Rural & Urban Populations

Parity	Rural Cases	Urban Cases
1	11	8
2	13	6
3	21	3
4	16	7
5	14	3
6	13	2
7	8	1
8	7	2

Rural women demonstrated significantly higher parity, reinforcing the association between multiparity and cervical cancer risk.

9. Relationship Between Age at Marriage and Parity

Age at Marriage (Years)	Primiparity	Secondary Parity	Multiparity
11–15	6	6	21
16–20	5	4	33
21–25	3	6	29
26–30	4	3	15

Younger age at marriage correlated with increased multiparity. Early reproductive behavior contributed substantially to increased risk exposure

Discussion

The present study explores the etiological patterns in the incidence of cervical cancer among women attending a tertiary care cancer hospital. The results highlight that early age at menarche, early marriage, and early childbirth are predominant factors among diagnosed patients. These findings are consistent with global literature suggesting that prolonged reproductive exposure and early initiation of sexual activity are critical contributors to the development of cervical cancer. Women exposed to early hormonal

changes and cervical trauma become more susceptible to persistent high-risk HPV infection, which is widely recognized as the primary causative agent in cervical carcinogenesis.

High parity was another major risk factor observed in this study, with a significant number of women having more than three pregnancies. Repeated pregnancies are known to cause long-term physiological changes in the cervix, including hormonal fluctuations and chronic mechanical stress, thereby enhancing the risk of oncogenic transformation in HPV-infected cells. Additionally, multiparity may reflect limited contraceptive use and inadequate reproductive health education, especially in resource-limited settings, contributing indirectly to the cervical cancer burden.

The study also revealed that the majority of cases were diagnosed at an advanced stage (Stage II or III), indicating a critical gap in early screening and timely diagnosis. This delay can be attributed to poor awareness, lack of regular cervical screening programs, and sociocultural barriers that discourage women from seeking gynecological care. The rural predominance of cases further underscores disparities in healthcare access, emphasizing the need for community-based screening, mobile diagnostic units, and targeted education campaigns to bridge the urban-rural divide.

Overall, the findings reinforce the importance of preventive strategies, including HPV vaccination, delayed age of marriage, promotion of family planning, and integration of regular Pap smear or HPV-DNA screening in primary healthcare. Public health policies should prioritize awareness generation, especially among rural populations, and ensure accessibility to preventive and diagnostic services. With early intervention and improved coverage of screening and vaccination programs, the incidence of cervical cancer can be significantly reduced in the Indian population.

Conclusion

This study shows that cervical cancer in our cohort is driven chiefly by early reproductive exposure (menarche ≤ 14 years, marriage ≤ 20 years) and high parity, with 91 % of cases presenting at Stage II–III and 77 % arising in rural women . These findings confirm that delayed screening, limited awareness, and unequal access to preventive services remain decisive barriers to early detection. Strengthening school-based HPV vaccination, enforcing policies that discourage early marriage, expanding community-level screening, and improving contraceptive counselling are essential steps to curb the disease burden. Although limited by its retrospective single-centre design, the study provides actionable evidence for targeted public-health interventions and underscores the urgency of larger, multicentric research to refine region-specific prevention strategies.

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