



## From Symptoms to Solutions: A Deep Dive into Cervical Cancer Diagnosis and Treatment

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**Abstract** Among female cancers, cervical cancer ranks second globally. Recurrent or chemo-resistant cancers continue to claim the lives of many women, despite ongoing attempts to enhance treatment for this illness. Death may occur if the illness is not detected in its early stages; most victims are women aged 35 to 55 who are of childbearing age. Most researchers agree that high-risk HPV infections are the main cause of cervical cancer cases. In the medical field, this is generally agreed upon. Smoking, repeated sexual encounters, and long-term use of contraception are other risk factors. Current diagnostic procedures include a cytology test, sometimes known as a pap smear, followed by a colposcopy and, if necessary, a biopsy of any worrisome lesions. The current gold standard for treating metastatic cervical cancer is a combination of surgical removal, radiation therapy, immunotherapy, chemotherapy, and targeted therapy. Cervical cancer is a serious disease, and this article presents its causes, symptoms, stages, diagnostic procedures, preventative strategies, and potential treatments.

**Keywords:** Cervical cancer, cervix, HPV, risk factors, stages

### Introduction

After breast cancer, cervical cancer is the most common malignancy in females worldwide [1]. It is a major cause of illness and mortality in females [2].

**Table 1:** Cervical cancer cases in 2022

Rank (women)	Country	Number	ASR/100,000
	World	662,301	14.1
1	China	150,659	13.8
2	India	127,526	17.7
3	Indonesia	36,964	23.3
4	Brazil	18,715	12.7
5	Russian Federation	18,369	17.6
6	United States of America	13,920	6.3
7	Nigeria	13,676	26.2
8	Japan	10,958	12.5
9	Tanzania, United Republic of	10,868	64.8
10	South Africa	10,532	33.2



Worldwide, more than 300,000 women lose their lives to cervical cancer every year [4], making it a serious public health problem. Approximately 500,000 people are affected annually [3]. It is believed that a chronic infection with the human papillomavirus (HPV) is one of the primary causes of cervical cancer [5]. Carcinoma in situ or severe cervical dysplasia is the most common antecedent of invasive cervical cancers [6].

### *Cervix*

Located at the base of the uterus, the cervix is a cylindrical structure composed of stroma and epithelium [7]. The ectocervix, the part of the cervix that extends into the vagina, is lined with squamous epithelium. From the internal or at the uterine-splenic junction all the way to the external os, which exits into the vagina, the endocervical canal is lined by columnar epithelium [8]. In the transition zone, almost all cervical cancers begin in the ecto- or endocervical mucosa. The transformation zone is the area of the cervix that lies between the old and new squamocolumnar junctions [9].

### **Sign and Symptoms**

There was a lack of candor and full disclosure on cervical cancer symptoms and signs among women [10]. Finding no discomfort as an early sign or symptom of cervical cancer was reportedly "confusing" for women [11]. Although cervical cancer may be lethal, many women with the illness report feeling OK despite the lack of symptoms [12]. Early warning signs of cervical cancer include:

- Discomfort when engaging in sexual activity.
- Experiencing bleeding when having sex.
- Minimum discomfort in the back.
- Constant stinging or itching in the vaginal region.
- Odorous discharge from the vagina.
- Blood loss in the time between periods.
- Profuse menstrual bleeding [13,14].

### **Risk Factors**

Multiple variables linked to HPV exposure increase the likelihood of cervical cancer [15]. Cervical cancer is strongly associated with persistent high-risk HPV infection, according to research. Here are fourteen different types of HPV that pose a significant risk: HPV16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 68, and 73 [16]. Globally, HPV16 is the most frequent variety of human papillomavirus (HPV), but HPV18 is more common in Asia. The prevalence of HPV52 and HPV58 infections, on the other hand, is quite low [17].

### *The Risks of Contracting STDs*

The illness, which causes squamous intraepithelial lesions, is often transmitted via sexual contact. Most lesions disappear between 6- and 12-months following treatment due to immune action. However, a small number of these lesions persist and have the potential to progress to cancer [18]. Two viral oncoproteins, E6 and E7, impede the main tumor suppressor genes, retinoblastoma and P53, and so, HPV primarily causes cancer. In addition, changes in viral and host DNA methylation are associated with E6 and E7. There is a connection between changes in DNA methylation and interactions between E6 and E7 and proteins in cells, as well as changes in immunological response, cell adhesion, genetic integrity, and cellular control [19,20].

### *Vaccine-Deficit Virus on Humans*

Certain strains of human papillomavirus (HPV) pose a greater threat to women living with HIV. Results from studies examining the correlation between HIV and cervical cancer pointed to an increased likelihood of chronic invasive neoplasm (CIN) and invasive cervix carcinoma, as well as an increased prevalence of abnormal Papanicolaou (Pap) smears and persistent HPV infection with several oncogene viruses [21]. Cervical cancer is more common among HIV-positive women, and the virus is most often acquired between the ages of 13 and 18. Patients diagnosed with



cervical cancer who are HIV positive are often diagnosed at a younger age (15–49 years old) than those who are not infected [22].

#### Oral Contraceptives

There is widespread agreement that OC pills increase cervical cancer risk. The relative risk of cervical cancer increased with the duration of OC usage, according to global collaborative epidemiological research on the disease. Reports indicate that the chance of acquiring cancer may be doubled if you use OC for five years or more [23]. Furthermore, multi-center case-control research found that women who tested positive for HPV DNA and had used OC pills for five years or longer had a cervical cancer risk that was three times higher [24]. In addition, adenocarcinoma, a kind of cervical cancer, has been linked to the use of OC pills, according to a recent meta-analysis and systematic review. The results show that using OC pills raises the risk of cervical cancer [25].

#### Partners in a Sexual Relationship

There is evidence linking sexual activity to an increased risk of cervical cancer. One research found that the risk of cervical cancer was higher in those who had sexual relations with several partners [26]. Furthermore, several studies have shown that women with a higher sex partner frequency are at a higher risk of cervical cancer and HPV infection [27,28]. Multiple sexual partners are associated with an increased risk of cervical illnesses, including cancer and non-malignant cervical disease, as shown in the meta-analysis [29]. The association remained despite controlling for human papillomavirus infection, a major determinant of cervical cancer risk. Additionally, beginning sexual activity at a young age is associated with an increased risk of cervical cancer [30].

#### Harmful Habits

Tobacco use is a well-recognized risk factor for cervical cancer [31]. A woman's cervical mucus contains nicotine metabolites, which provide credence to the idea that smoking causes cancer directly on the cervix [32].

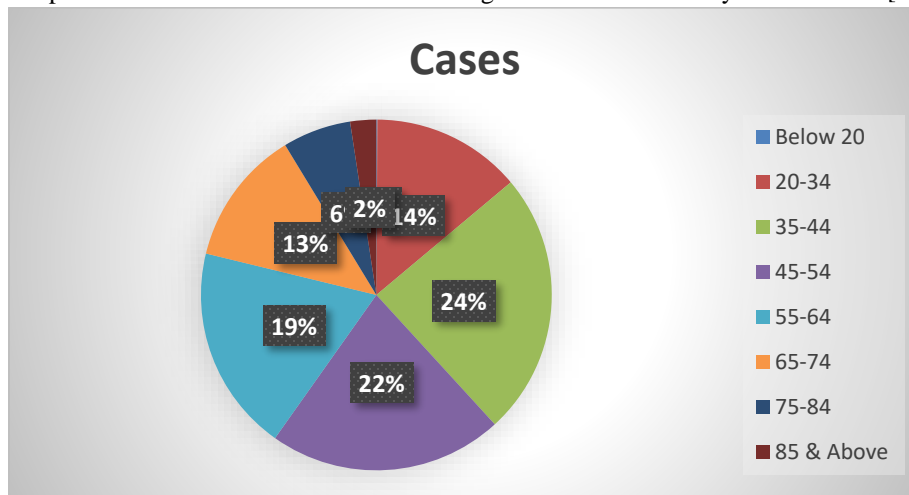


Figure 1: Cervical cancer cases according to age

#### Diagnosis

The Papanikolaou test and the HPV test are the two main diagnostic tools used for cervical cancer screening at the moment.

##### Exam by Papanikolaou

It identifies precancerous and cancerous cell lesions in their early stages, which is crucial for a successful treatment.

##### HPV Test results

It identifies HPV-related infections that might potentially be malignant [33].



While certain kinds of HPV may produce abnormalities in cervical cells after chronic infection, the vast majority of HPV infections are self-curable and do not generate precancerous cell alterations. Precancerous or high-grade lesions may develop into cervical cancer if left untreated for a long time [34].

### *The Cervical Cancer Life Cycle*

Cervical cancer staging is the most common use of the FIGO method. Cervical cancer progresses via four stages. The first four phases are often denoted by the Roman numerals I through IV. The general rule is that the danger increases as the stage number increases [35].

The FIGO system does not address Stage 0. Cervical precancerous disease known as carcinoma in situ, or Stage 0, is a serious health concern.

- Cervical cancer in its early stages often contains IA, IB, and IIA.

Cancers at stages IIB, III, and IVA are often considered locally advanced cervical cancers.

- Stage IVB is the standard for advanced cervical cancer [36].

#### *Stage IA*

Because it is located in the cervix, the tumor is only visible under a microscope. The maximum depth and width of the tumor are 5 and 7 mm, respectively.

- In Stage IA1, the tumor's depth and width are less than 3 mm and 7 mm, respectively.

Stage IA2 tumors are defined as those that are 3 mm in diameter, 5 mm deep, and 7 mm broad [37].

#### *Stage IB*

Lesion restricted to the cervix uteri, invasive cancer with a measured deepest penetration of 5 mm or more (higher than stage IA).

If the depth of stromal invasion is 5 mm or more and the largest size is less than 2 cm, the cancer is classified as Stage IB1.

- Stage IB2: Invasive carcinoma measuring 2 cm or less and less than or equal to 4 cm in length
- Stage IB3: Invasive carcinoma measuring 4 cm or more in length [38]

#### *Stage IIA*

Stage IIA1 - invasive carcinoma with a maximum size of less than 4 cm Stage IIA2 - invasive carcinoma with a greatest dimension of 4 cm or more [39]

#### *Stage IIB*

When the pelvis is involved, but not to the level of the parametria [40]

Stage IIIA carcinoma only affects the lower third of the vagina and does not extend to the pelvic wall. Stage IIIB carcinoma extends to the pelvic wall and causes hydronephrosis or a non-functioning kidney, along with pelvic and/or paraaortic lymph nodes. It is not known whether this is caused by another factor.[41] The

Depending on the tumor size and extent, there are three stages of lymph node metastasis: o Stage IIIC1, which only involves pelvic lymph nodes; o Stage IIIC2, which involves para-aortic lymph nodes; and o with r (imaging) and p (pathology) notations to indicate the method of lymph node identification [42].

#### *Stage IV*

Cancer has spread beyond the pelvis or has invaded (confirmed by biopsy) the bladder or rectum mucosa (cases with bullous oedema cannot be assigned to stage IV).

- Stage IVA - metastasis to neighboring organs
- Stage IVB - metastasis to faraway organs [43]

Prevention: Regular cervical cancer screenings are among the most important things women can do for their health [44].

### *The process of immunization*

Beyond cervical cancer, HPV is a major culprit in the development of a number of other cancers. Getting a shot against HPV is a fantastic way to stay healthy. In 2006, the HPV vaccination was licensed by the U.S. Food and Drug Administration. Since then, there have been improvements that have led to a vaccine that protects against nine different strains of the virus [45].



### *Diet*

Stick to a cancer-fighting diet. Avoid diets heavy in sugar, salt, and lipids (trans and saturated) and eat enough of antioxidant-rich foods to help prevent cancer [46].

### *Strength training*

Maintain a regular workout routine. Research shows that a reduced risk of cervical cancer is associated with exercising for at least 30 minutes each week [47].

### *Relationship with a Sexual Partner*

Restrict the number of sexual partners you have. Even if you only have sex with one person, being monogamous reduces your chance of getting cervical cancer-causing HPV virus [48].

### *Medical Care*

Treatment for cervical cancer involves a multidisciplinary team that includes gynaecologic oncologists. The stage of the illness, your age, general health, and future fertility plans are some of the variables that impact cervical cancer therapy.

Cervical cancer treatments include targeted therapies, immunotherapy, surgery, chemotherapy, and radiation [49].

### *Immunotherapy*

Immunotherapy is a medical approach that uses medicine to assist the body recognize and destroy cancer cells. In order to evade the immune system's detection, cancer cells masquerade as healthy cells. By directing immune system cells to these signals, immunotherapy may stop cancer cells from fooling the body into thinking they are healthy [50].

### *Personalized Treatment*

The goal of targeted drug treatment is to eradicate cancer cells while avoiding harming healthy cells. It kills cancer cells by targeting proteins that control their proliferation and spread. The more researchers learn about cancer cells, the better tailored medications that can disrupt these proteins will be [51].

### *Medical Procedure*

Several surgical procedures are available for the treatment of cervical cancer. When cancer is still in its early stages, your doctor may decide to remove only the affected areas. Some of the most common surgical treatments for cervical cancer include:

- Laser surgery, which involves focusing a laser beam on the cancer cells and destroying them.
- Freezing and destroying cancer cells is the goal of cryosurgery.
- A hysterectomy is a surgical procedure that removes the cervix and uterus.

The cervix and upper vagina are removed during a trachelectomy, but the uterus is left intact.

Similar to a hysterectomy, a pelvic exenteration may also include the bladder, vagina, rectum, and even part of the colon, depending on the stage of the malignancy [52].

## **Cancer treatment**

Chemotherapy is the administration of drugs to the patient in the form of injections or pills in order to eradicate cancer cells. Once it enters your bloodstream, it begins to kill cells all throughout your body. Chemotherapy often requires the use of a combination of drugs. Chemotherapy is often administered in cycles. How often and for how long you get chemotherapy depends on the medicine used and the specific site of your cancer [53].

Cervical cancer treatment using radiation beams to kill cancer cells. Radiation treatment is available in two different forms:

- EBRT, or external beam radiation treatment, directs high-powered rays from a machine located outside the patient's body to specific cancerous areas.
- Radiation is delivered either directly to the tumor or to areas around it in brachytherapy [54].

## **Conclusion**

Cervical cancer, the second most common cancer among women worldwide, is caused almost entirely by human papillomavirus (HPV). It is necessary to aware the people about the cervical cancer, it's prevention and early screening by traditional and innovative patient education methods. HPV vaccination is involved in the primary prevention of



cervical cancer to prevent cervical cancer. The estimated effectiveness of HPV vaccination is 90%. To achieve the best cure with the fewest consequences, treatment selections should be tailored to the patient and based on a variety of factors, including the patient's age, medical condition, tumor-related factors, and treatment preferences.

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