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Insights about cervical cancer

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Abstract: Cervical cancer ranks fourth globally among cancers that affect women, after lung, colorectal, and breast cancers. The WHO reports that there are over 4 lakh cervical cancer deaths and 6 lakh new cases annually which are highly concerning numbers. Cervical cancer is usually preventable and has significantly greater survival chances when detected early. In high-income countries with robust screening and vaccination programs, it is a rare disease. But the disease kills women in low- and middle-income countries, where there are scarcities of resources and hence it becomes a severe and irreversible illness. Treatment options include surgery, chemotherapy, and radiation therapy, either alone or in combination. This review paper discusses stages, complications, causes, and treatment plans for cervical cancer.

Keywords: Cervical cancer, Stages, Risk factors, Complications

I. INTRODUCTION

Cervical cancer (CC) is the most prevalent malignancy in women and the leading cause of death, especially in developing countries.

It generally affects the women over the age of 30.[1] This cancer is caused by the growth of the cells that start in the cervix. The cervix is the uterus's deepest section.The cervix is made up of two parts viz ectocervix and endocervix. The ectocervix is the cervix's furthest section, whereas the endocervix is its inmost.[2]

Several factors are responsible for CC viz. the number of sexual mates, early sexual exretion, compromised immune system, smoking, and HPV infection. The main leading factor of cervical cancer is Smoking when a person with HPV infection is smoking also they may tend to have futher chances of getting CC.[3]

The main cause behind CC infection is Human papillomavirus (HPV),a sexual infection. Still, a bitsy chance of women will get cervical cancer which is told by other variables.[4] This cancer does not show any symptoms at the beginning. Still, once the cells begin to develop, they may produce signs and symptoms such as vaginal bleeding following intercourse, between cycles, or during menopause.[5] Menstrual bleeding is heavier and lasts longer than usual. Thick, watery, bloody vaginal discharge with an unpleasant smell.[6] Pelvic pain or discomfort during sexual excretion.[7]

The pap-smear test (papanicolaus test) is a manual screening technique to detect pre-cancerous alterations in the cervix based on form features of cell nuclei and cytoplasm regions. [8] This test is mostly used for the early identification of cervical cancer. Pap test samples are inspected under a microscope to detect any abnormal development in the cervix. Examining cell pictures for abnormalities in the cervix provides grounds for taking immediate action to reduce cervical cancer.Pap test is used to reduce the mortality rate of cervical cancer in between 50% and 70% in developing countries. The incidence of cervical cancer can be reduced by up to 80% with routine Pap tests.[9]

However doing a pap test manually is much more time-consuming So, there are requirements for an Automated Pap test, which usually aims to segment and then classify cervical cells in the pap-smear images as either normal or abnormal. [10] This technique shows improvement in medical imaging and machine learning.

This automated tool helps to reduce the time spent and increase the accuracy of cytologists performing slide animation during the pap screening process.[11]

Trends of cervical cancer worldwide: Trends of cervical cancer cases from 2004 to till present year.

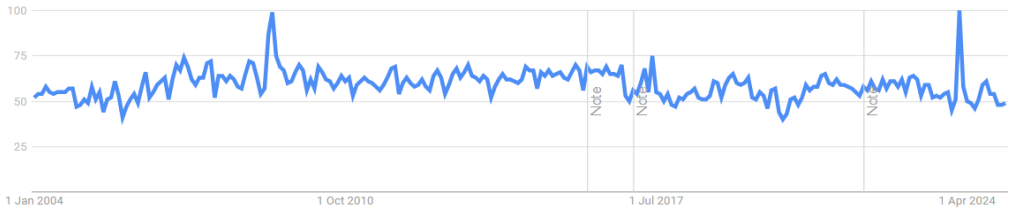

Figure1: Cases of cervical cancer from 2004 to till present [32]

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II. STAGES

By diagnosis the cancer at various stages we are able to find out how far it will spread in the body. When choosing the best course of treatment, cancer staging is an important consideration.The stages are numbered from 0 to IV, with numerous subcategories within each numerical level. [12]
Overall, the five stages of cervical cancer include:

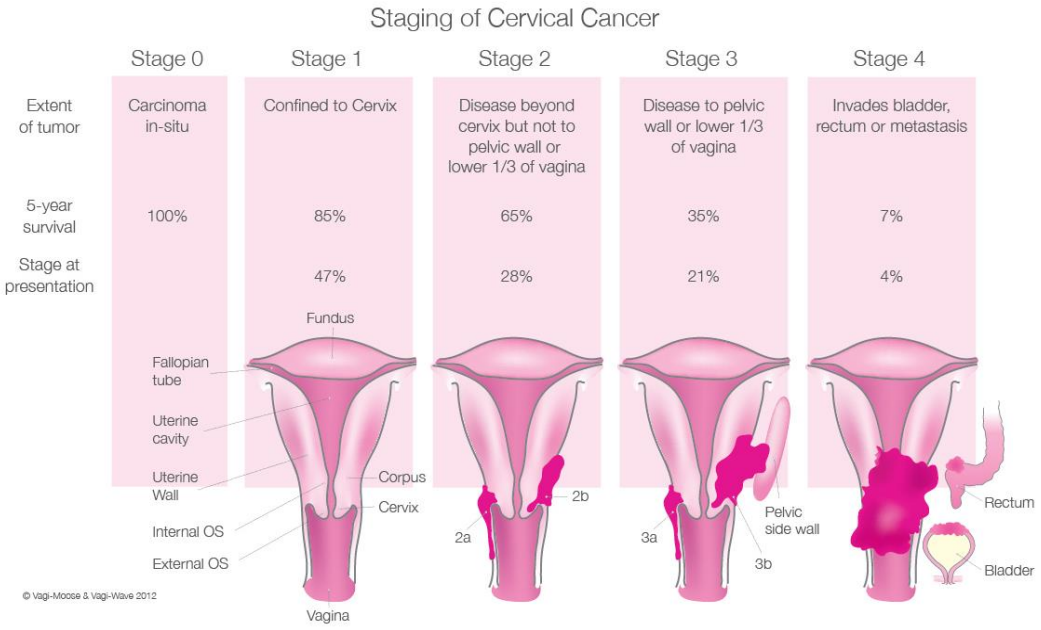

Figure2. Stages of cervical cancer [33]

2.1 Stage I

Stage I cervical cancer affects only the cervix. Tumors are categorized as IA or IB based on their size and depth of invasion.
Stage IA is determined by the depth of tumour infiltration.
Stage IA1: Cervical tissues contain a minor quantity of cancer, visible only under a microscope. The depth of tumor invasion is 3 millimeters or less then 3mm.
Stage IA2: Cervical tissues have a very small quantity of cancer that can only be spotted under a microscope. The depth at which the tumor has invaded is more than three millimeters but less than five.[13]
Stage IB is classified according to the size of the tumor and the depth of malignant invasion. *Stage IB1*: refers to tumors that are 2 cm or less and have a deepest point of invasion of more than 5 mm.
Stage IB2: The tumor's size lies between 2cm to 4cm.
Stage IB3: The tumor is larger than 4 cm. [14]

2.2 Stage II: The top two-thirds of the vagina or adjacent tissue may be affected by stage II cervical cancer. The extent to which the cancer has spread determines the stage II classification.
Stage IIA refers to cancer that has spread from the cervix to the upper two-thirds of the vagina but not to the surrounding tissue.
*Stage IIA1:*The tumor is 4cm .
Stage IIA2: The tumor is greater than 4 cm.
Stage IIB: Cancer has spread from the cervix to the tissues surrounding the uterus. [5]

2.3 Stage III: In stage III, The lower section of the vagina, the pelvic wall, the kidneys, and the lymph nodes have all been affected by stage III cervical cancer.
Stage III is separated according to how far the cancer has spread.
Stage IIIA: The lower portion of the vagina has been affected by cancer, while the pelvic wall has not.
Stage IIIB: Cancer has spread to the pelvic wall and/or the tumor has grown large enough to clog one or both ureters, causing one or both kidneys to get larger or stop working.

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Stage IIIC: Depending on whether the cancer has gone to the lymph nodes, it is categorized as either IIIC1 or IIIC2. 0[7]

2.4 Stage IV: Cervical cancer in Stage IV has spread to the bladder, rectum, or other body parts.
Stage IV is separated into two parts: IVA and IVB, according to where the cancer has spread.
Stage IVA: The bladder and rectum are among the adjacent pelvic organs where cancer has spread.
Stage IVB: Indicates that cancer has progressed to other regions of the body, including the liver, lungs, bones, and distant lymph nodes.
When cancer cells spread via the lymphatic or circulatory systems to create tumors in other body parts, metastatic cancer results.The metastatic tumor is the same type of malignancy as the primary tumour.[15]

2.5 Stage V (Recurrent stage): Recurrent cervical cancer is cancer that has reappeared following treatment. In addition to reoccurring in the cervix, cancer can spread to other parts of the body. Tests will be performed to establish where the cancer has returned in your body, whether it has spread, and how far. Treatment options for recurrent cervical cancer vary based on its spread.

III. COMPLICATIONS

The main issues experienced by cervical cancer are pain, vaginal bleeding, uterovaginal, rectovaginal, ureterovaginal fistulas, uremia, malnutrition, anemia, and mental depression. Proper medical intervention can treat the complications of cervical cancer.[16]

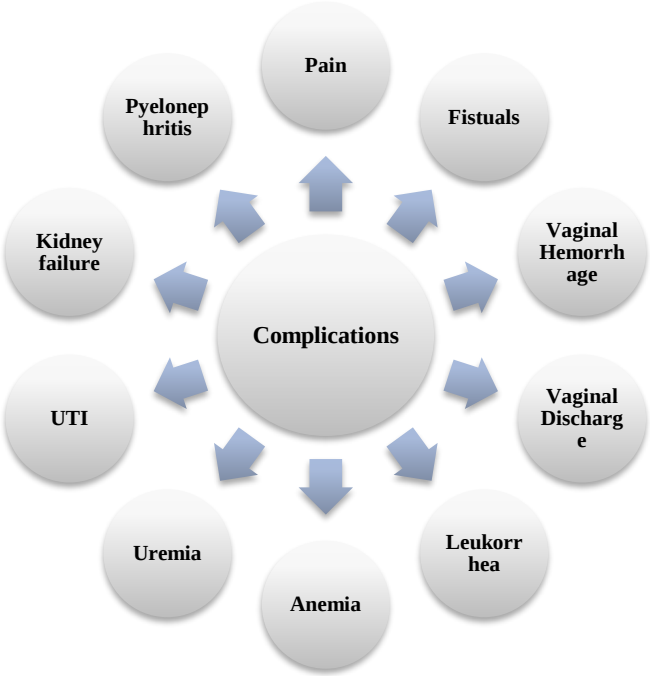

Figure3: Complications of cervical cancer

The following are the complications of cervical cancer.
3.1 Pain - When metastatic cervical cancer spreads to the bone, intense pain occurs in the body, muscles, or nerves. Nerves, veins, and lymphatics can be squeezed and destroyed by pain associated with cervical cancer. It can also cause infection, inflammation, and obstruction of the organ. [17]
3.2 Fistulas- are abnormal connections between two empty organs. In cases of advanced cervical cancer, a fistula may form between the urine bladder and the vagina. This can also lead to vaginal secretion leaking.[18]
3.3 Vaginal Hemorrhage –It is the main cause of CC. It could happen only on rare occasions. [19]
3.4 Vaginal Discharge - White, malodorous discharge from the vagina is another source of discomfort and neglect by friends and family members.[20]
3.5 Leukorrhea- is a disorder in which the vagina produces thick white and malodorous discharge. The patient is bothered by the terrible odor.
3.6 Anemia- is a condition in which there is insufficient blood to meet the tissue's oxygen requirements. Profuse vaginal bleeding causes severe anemia, which might lead to death.[21]

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3.7 Uremia- is a disorder in which the blood contains high quantities of urea. If not properly managed, then it may lead to death.

3.8 Pyelonephritis -is the inflammation of the nephron in the kidney, which causes a rapid kidney infection. It is uncommon, although it persists in people with urinary tract blockage.

3.9 Urinary Tract Infection (UTI)- A condition in which the patient feels discomfort and a burning feeling while urinating as a result of an infection in the tract, allowing urine to pass more easily.[7]

3.10 Kidney Failure - Kidney dysfunction and failure are possible complications of advanced cervical cancer. In addition, the patient may have blood in the urine, weakness, exhaustion, swollen ankles, and shortness of breath.

IV. CAUSES AND RISK FACTORS

While HPV is the most important risk factor for cervical cancer, it is far from the only one. Other variables can affect your risk. [22]

Figure4: Causes and Risk Factors

4.1 Sexual Conduct and Cervical Cancer -Multiple sexual partners or starting sexual activity early in life raise the risk of cervical cancer. This is because it increases the possibility of developing HPV. In addition, women whose partners have had several partners are at a higher risk of having HPV.[23]

4.2 Smoking- Smoking has been linked to squamous cell cervical cancer. Tobacco byproducts have been identified in the cervical mucus of smokers. Researchers believe that by consuming these substances the DNA will get affected and may lead to the development of CC.[24]

4.3 Immune System Deficiency - The immune system is critical for killing cancer cells and inhibiting their growth and spread. Women with compromised immune systems, such as those with HIV, are more likely to acquire cervical cancer because they have a lower ability to fight off HPV.[25]

4.4 Multiple pregnancies. - Multiple pregnancies are a risk factor for cervical cancer. According to studies, hormonal changes during pregnancy may increase the cervix's susceptibility to HPV or enhance the growth of aberrant cells into malignant cells. [26]

4.5 Other Factors - Long-term usage of oral contraceptives (birth control tablets) has been associated with an increased risk of cervical cancer. However, the risk is expected to decrease with time once the contraceptives are removed. Those who have had a full-term pregnancy before the age of 17 are also somewhat more likely to get cervical cancer compared to those who give birth later in life.[27]

V. TREATMENT

Treatment options for cervical cancer is determined by various factors, such as cancer's stage, any other health issues you may have, and your preferences. Surgery, radiation, chemotherapy, or any combination of these. [12]

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Figure5. Treatment options for cervical cancer [34]

5.1 Surgery: An operation in which doctors cut out the cancer.[28]
5.2 Chemotherapy: The use of certain medications to reduce or eradicate cancer is known as chemotherapy.The drugs can be tablets, injections, or a combination of the two.[29]
5.3 Radiation therapy: The use of high-energy rays, like X-rays, to eradicate cancer is known as radiation treatment.[7]
5.4 Immunotherapy: Uses your body's immune system to aid in the fight against cancer cells or to manage adverse effects from previous cancer treatments.[30]
5.5 Targeted therapy: Medication is used to inhibit cancer cells from developing and spreading. The drugs can take the form of pills or be administered through your veins. Before receiving targeted therapy, you will be tested to determine whether it is appropriate for your cancer type.[31]

VI. CONCLUSION

Cervical cancer is recognized as a major cause of death among women. HPV-positive cervical cancer continues to be a significant global health burden. Many risk factors are responsible for CC but a person that tends to smoke and also has an HPV infection has more chances of getting CC. This can doesn't show any signs and symptoms at the early stage. This is an unusual sign and should be diagnosed. An automated Pap-smear test is used to check whether the person is having cancer or not. There are multiple treatments available for CC.

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