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Treatment approaches for ovarian cancer - An overview

Mahadevan N*, Chachu Kuriakose, Chaithanya T Kumar and Sambathkumar R.

J.K.K. Nattraja College of Pharmacy, Komarapalayam, Tamilnadu, India.

***Corresponding Author:** E-Mail: nnmahadevan@rediffmail.com

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ABSTRACT

Ovarian cancer is the cancer of the ovaries, the egg-releasing and hormone-producing organs of the female reproductive tract. Cancerous ovarian cells divide and multiply in an abnormal fashion. The tumors can start from three common cell types namely, Surface Epithelium, Germ Cells and Stromal Cells. The prevalence of ovarian cancer was seen at age of 65 to 75 years and the survival rate was 45 %. Epithelial ovarian cancer (EOC) constitutes approximately 90% of cases of ovarian cancer. Current adjuvant chemotherapy includes paclitaxel and either cisplatin or carboplatin given every 3 weeks for six cycles. The combination paclitaxel and platinum chemotherapy achieves clinical response in approximately 80% of patients. However, most patients will have tumors recurrence within 3 years. The information regarding ovarian cancer and treatment approaches including Ayurvedic treatment for improving the disease condition was collected from various journals and articles. It has reported that Ayurvedic preparations are very effective as chemo-preventive and radio-preventive agents. Some of the studies proved that ayurvedic treatment had more therapeutic results as compared to chemotherapy. The comparisons of Ayurveda with modern treatment strategies were studied. The side effects were less in ayurvedic treatment and less expensive. The use of cow urine, ginger, Agaricus Blazei Murrill Mushroom, bindweed, selenium, and Astragalus showed excellent results in the improvement of disease.

Keywords: Cancer, Chemotherapy, Ayurvedic treatment**,** Bindweed, Agaricus.

1. INTRODUCTION

Ovarian cancer is a growth of abnormal malignant cells that begins in the ovaries .Cancer that spreads to the ovaries but originates at another site is not considered ovarian cancer. Ovarian tumors can be benign or malignant. Although abnormal, cells of benign tumors do not metastasize [1- 12]. Malignant cancer cells in the ovaries can metastasize in two ways: directly to other organs in the pelvis and abdomen, through the bloodstream or lymph nodes to other parts of the body. Specifically, 63% of ovarian cancer malignancies are late stage diagnoses, causing patients at this stage to experience a 5-year survival rate of only 26.9%. It is estimated that only 15% of ovarian cancer is localized to the ovary, 17% is regional, and 62% occurs as distant disease. Because of this, ovarian cancer has historically been called the "silent killer."

1.1. STAGES OF OVARIAN CANCER

There are four stages of ovarian cancer. They are stage I, II, III and IV. Treatment plan and prognosis will be determined by the stage of cancer [2].

Stage I

Growth of the cancer is limited to the ovary or ovaries in stage I. This stage is further categorised into stage IA, IB and IC [1].

Stage IA

Growth is limited to one ovary and the tumor is confined to the inside of the ovary. There is no cancer on the outer surface of the ovary. In this stage, the capsule is intact.

Stage IB

Growth is limited to both ovaries without any tumor on their outer surfaces. There are no ascites present containing malignant cells and the capsule is intact.

Stage IC

In this stage, the growth is limited to the outer surface of one or both ovaries and the capsule has ruptured along with ascites containing malignant cells or with positive peritoneal washings.

Stage II

In this stage, the growth of the cancer involves one or both ovaries with pelvic extension. It is further categorised into stage IIA, IIB and IIC.

Stage IIA

The cancer has extended and it involves the uterus or the fallopian tubes, or both.

Stage IIB - The cancer has extended to other pelvic organs.

Stage IIC

In this stage, the growth is found in one or both ovaries and has spread to uterus or fallopian tube or other tissue within the pelvis. The cancer is found at the outer surface of ovaries, the capsule is ruptured and the cancer cells are found along with fluid of peritoneal cavity.

Stage III

In stage III, the growth of the cancer involves one or both ovaries, and one or both. In this stage the cancer may be spread beyond the pelvis to the lining of the abdomen; and to lymph nodes. The tumor is limited to the true pelvis but with histologically proven malignant extension to the small bowel or omentum. It is further categorized into stage IIIA, IIIB and IIIC.

Stage IIIA

During the staging operation, the practitioner can see cancer involving one or both of the ovaries, but the cancer is not grossly visible in the abdomen and it has not spread to lymph nodes. However, when biopsies are checked under a microscope, very small deposits of cancer are found in the abdominal peritoneal surfaces.

Stage IIIB

The tumor is in one or both ovaries, and deposits of cancer are present in the abdomen that are large enough for the surgeon to see but not exceeding 2 cm in diameter. The cancer has not spread to the lymph nodes.

Stage IIIC

The tumor is in one or both ovaries and the cancer has spread to lymph nodes. The deposits of cancer exceed 2 cm in diameter and are found in the abdomen.

Stage IV

This is the most advanced stage of ovarian cancer. Growth of the cancer involves one or both ovaries and distant metastases. Finding ovarian cancer cells in pleural fluid is also evidence of stage IV disease. Various stages of ovarian cancer are shown in figure 1.

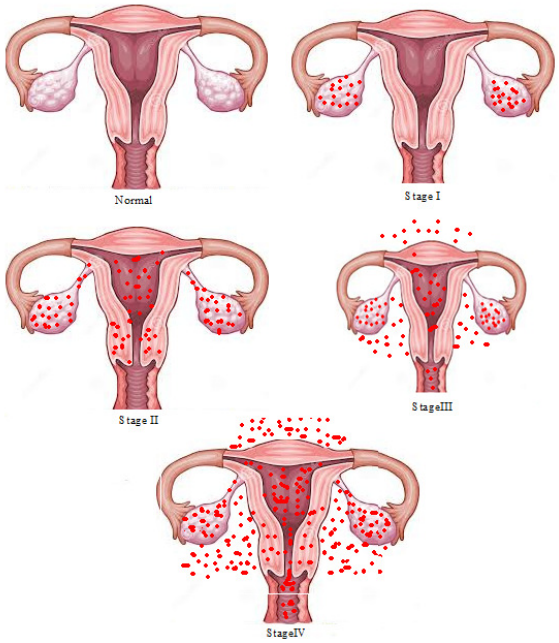

Figure - 1: Stages of ovarian cancer

1.2. TYPES OF OVARIAN CANCER

Common epithelial tumors, germ cell tumors and stromal tumors are the various types of ovarian cancer [4].

1.2.1. Common epithelial tumors

Epithelial ovarian tumors develop from the cells that cover the outer surface of the ovary and these are benign nature. This is the common type of ovarian cancer, almost 70 percent and are not diagnosed until the disease is advanced in stage [3].

Benign epithelial ovarian tumors

Most epithelial ovarian tumors are benign, don't spread, and usually don't lead to serious illness. There are several types of benign epithelial tumors including serous cystadenomas, mucinous cystadenomas, and Brenner tumors.

Tumors of low malignant potential

These are the cells which would not be clearly appearing to be cancerous under microscope. They are also known as borderline epithelial ovarian cancer. These are different from typical ovarian cancers because they don't grow into the supporting tissue of the ovary. Low malignant potential tumors tend to affect younger women than the typical ovarian cancers. These tumors grow slowly and are less life-threatening than most ovarian cancers. Low malignant

potential tumors can be fatal, but this isn't common.

Malignant epithelial ovarian tumors

When these tumors are looked at under the microscope, the cells have several features that can be used to classify epithelial ovarian carcinomas into different types. There are four subtypes namely, serous, mucinous, endometrioid, and clear cell. If the cells don't look like any of these 4 subtypes, the tumor is called undifferentiated. Undifferentiated epithelial ovarian carcinomas tend to grow and spread more quickly than the other types. Epithelial ovarian carcinomas are classified by these subtypes, but they are also given a grade and a stage.

1.2.2. Germ cell tumors

Ovarian germ cell tumors develop from the cells that produce the ova or eggs. Most germ cell tumors are benign, although some are cancerous and may be life threatening. The most common germ cell malignancies are maturing teratomas, dysgerminomas and endodermal sinus tumors. Germ cell malignancies occur most often in teenagers and women in their twenties. Now a days90 percent of patients with ovarian germ cell malignancies can be cured and their fertility preserved.

1.2.3. Stromal tumors

Ovarian stromal tumors are a rare class of tumors that develop from connective tissue cells that hold the ovary together and those that produce the female hormones, estrogen and progesterone. The most common types are granulosa-theca tumors and Sertoli-Leydig cell tumors. These tumors are quite rare and are usually considered low-grade cancers, with approximately 70 percent presenting as Stage I disease.

The most common symptom of these tumors is abnormal vaginal bleeding. This happens because many of these tumors produce estrogen. These hormones can cause vaginal bleeding to start again after menopause. In young girls, these tumors can also cause menstrual periods and breast development to occur before puberty.

1.2.4. Primary peritoneal carcinoma

The removal of one's ovaries eliminates the risk for ovarian cancer, but not the risk for a less common cancer called Primary Peritoneal Carcinoma. It develops in cells from the peritoneum. It is similar in symptoms, spread and treatment.

1.3. RISK FACTORS

The followings are the risk factors of ovarian cancer [13].

1.3.1. Age

Ovarian cancer occurs at all age forms from infancy onwards. Due to increase in age and presence of gene mutations shows evidence for the occurrence f ovarian cancer. The majority of epithelial ovarian cancer arises in postmenopausal patients. There is a more chance for ovarian cancer development in elderly as compared to the young. It is mostly seen at the age of 65 years or above.

1.3.2. Family history

Women who have a first-degree relative diagnosed with ovarian cancer have a 3 to 4 fold increased risk of developing the disease compared with women with no family history. Hereditary epithelial ovarian cancer occurs at young age (approximately 10 yrs) as compared to non hereditary ovarian cancer.

1.3.3. Reproductive factors

Parity is one of the risk factor for ovarian cancer. The risk for epithelial ovarian cancer is more for women who have no children and those with early menarche or late menopause. Women who have been pregnant have 50% decrease in risk factor for developing ovarian cancer. Similarly multiple pregnancies may show protective evidence. The use of oral contraceptives may also show a decrease in risk.

1.3.4. Ovulation

There are two theories regarding the relationship between ovulation and risk of development of ovarian cancer. The incessant ovulation theory suggests that the repeated ovarian trauma caused by the follicular rupture and subsequent epithelial repair results in genetic alteration within the surface epithelium. The Gonadotropin theory proposes that the persistent stimulation of ovaries by gonadotropin coupled with local effects of endogenous hormones increase surface epithelial proliferation and subsequent mitotic activity. Thus ovulary suppression may show a decrease in ovarian cancer.

1.3.5. Genetic factors

Ovarian cancer is characterized by the TP53 mutation in almost all tumors [14-18]. There are also evidence regarding the increased risk of ovarian cancer due to mutation in gene like NF1, BRCA1, BRCA 2, RB1 and CDK 12.

1.3.6. Lactose consumption and use of talcum powder

Use of lactose and talcum powder in vulva and perineum are associated with the increase in epithelial ovarian cancer [5].

1.3.7. Height

Ovarian cancer risk is 7-10% higher per 5cm increment in height

1.3.8. Body mass index

There is a probable link between body mass index and ovarian cancer. There is about 75% increase in risk of ovarian cancer in premenopausal women who are obese (BMI of 30 or above) compared to healthy women (BMI of 18.5 to 23).

1.3.9. Diet

Intake of non-starchy vegetables may decrease ovarian cancer risk. However, there are no significant associations between fruit or vegetable intake and ovarian cancer risk. But the intake of food high in acryl amide, a carcinogenic compound found in cooked or burned, carbohydrates rich food shows an increase in ovarian cancer.

1.3.10. Hormone replacement therapy

Postmenopausal hormone replacement therapies are associated with a small increase in ovarian cancer occurrence. But there are evidence that the risk increases with the continuation of hormone replacement therapy and reduces with the discontinuation of therapy [6].

1.3.11. Familial breast ovarian cancer syndrome

This involves the germ line mutation of BRCA1 an BRCA2 cancer genes. This shows an increased risk of ovarian cancer.

1.3.12. Endometriosis

Women who have developed endometriosis have 30% increase in risk of ovarian cancer. It is a condition in which the endometrial cells are found growing outside the uterus [7].

1.3.13. Ovarian cyst

Presence of ovarian cyst shows an increase in risk of ovarian cancer.

1.4. SYMPTOMS OF OVARIAN CANCER

Ovarian cancer may cause one or more of these signs and symptoms

- Vaginal bleeding or discharge
- Pain in the pelvic or abdominal area
- Back pain.
- Bloating
- Constipation or diarrhea.
- Abdominal pressure, fullness, swelling or bloating
- Pelvic discomfort or pain
- Persistent indigestion, gas or nausea
- Changes in bladder habits, including a frequent need to urinate
- Loss of appetite or quickly feeling full
- Increased abdominal girth or clothes fitting tighter around your waist
- A persistent lack of energy

1.5. DIAGNOSIS

According to NICE guidance on recognition and treatment of ovarian cancer the diagnostic methods are the following [11].

1.5.1. Blood test (CA125)

CA 125 is a protein that is a so-called tumor marker or biomarker, which is a substance that is found in greater concentration in tumor cells than in other cells of the body. In particular, CA 125 is present in greater concentration in ovarian cancer cells than in other cells. A very high level of CA125 in the blood may be suspected for ovarian cancer [8,9].

The National Institute for Health and Care Excellence (NICE) has produced guidance that advises to test for CA125 if you frequently experience:

- Bloating
- Feeling full quickly
- Loss of appetite
- Pelvic or abdominal pain
- Needing to urinate urgently or frequently

The CA125 test is particularly important for patient over 50 yrs or has these symptoms more than 12 times each month. The normal values for CA 125 may vary slightly among individual laboratories. In most laboratories, the normal value is less than 35 U /ml.

1.5.2. Biopsy

It is the test to determine the growth of cancer at particular region by removal of sample of the growth from the suspicious area and examine it under a microscope. This procedure is called a biopsy [10].

In rare cases, a suspected ovarian cancer may be biopsied during a laparoscopy procedure or with a needle placed directly into the tumor through the skin of the abdomen. Usually the needle will be guided by either ultrasound or CT scan. This is only used in patients who cannot

have surgery because of advanced cancer or some other serious medical condition, because there is concern that a biopsy could spread the cancer.

1.5.3. Laparoscopy

In this test it uses a thin, lighted tube through which the ovaries are observed other pelvic organs and tissues in the area. The tube is inserted through a small incision in the lower abdomen and sends the images of the pelvis or abdomen to a video monitor.

1.5.4. Colonoscopy

A colonoscopy is a way to examine the inside of the large intestine (colon). After the large intestine has been cleaned with laxatives, the physician inserts a fiberoptic tube into the rectum and passes it through the entire colon. The images are sent to a video monitor. This help on determining abnormalities. Colonoscopy can be uncomfortable, so the patient is sedated before the procedure. This procedure is more commonly used to look for colorectal cancer.

1.5.5. Ultrasound

Ultrasoundis the use of sound waves to create an image on a video screen. Sound waves are released from a small probe placed in the woman's vagina or on the surface of her abdomen. The sound waves create echoes as they enter the ovaries and other organs. The same probe detects the echoes that bounce back, and a computer translates the pattern of echoes into a picture.

This is often the first test done if a problem with the ovaries is suspected. Ultrasound can be useful finding an ovarian tumor and seeing if it is a solid mass or a fluid-filled cyst. It can also be used to better look at the ovary to see how big it is and how it looks inside .These factors help the doctor decide which masses or cysts are more worrisome.

1.5.6. Barium enema x-ray

This is a test to see if the cancer has invaded the colon or rectum. After taking laxatives the day before, the radiology technician puts barium sulfate, a chalky substance, into the rectum and colon. Because barium is impermeable to x-rays, it outlines the colon and rectum on x-rays of the abdomen. This test is rarely used now in women with ovarian cancer. Colonoscopy may be done instead.

1.5.7. Positron emission tomography (PET) scan

In this test, radioactive glucose is given to look for the cancer. Because cancers use glucose (sugar) at a higher rate than normal tissues, the radioactivity will tend to concentrate in the cancer. A scanner can spot the radioactive deposits. This test can be helpful in spotting small collections of cancer cells. In some instances this test has proved useful in finding ovarian cancer that has spread. It is even more valuable when combined with a CT scan.

1.6. TREATMENT FOR OVARIAN CANCER

1.6.1. Hormone therapy

Hormone therapy is the use of hormones or hormone-blocking drugs to fight cancer [14-17]. This includes Luteinizing-hormone-releasing hormone (LHRH) agonists and aromatase inhibitors.

1.6.2. Targeted therapy

Targeted therapy is a newer type of cancer treatment that uses drugs or other substances to identify and attack cancer cells while doing little damage to normal cells. Bevacizumab helps block the signal that cancer cells send out to cause new blood vessels to form to nourish new tumors. In studies, bevacizumab has been shown to shrink or slow the growth of advanced ovarian cancers.

1.6.3. Radiation therapy

Radiation therapy uses high energy x-rays or particles to kill cancer cells. These x-rays may be given in a procedure that is much like having a regular (diagnostic) x-ray.

1.6.4. Brachytherapy

Radiation therapy also may be given as an implant of radioactive materials, called brachytherapy, placed near the cancer. This is rarely done for ovarian cancer.

1.6.5. Surgery

For epithelial ovarian cancer, surgery has 2 main goal- Staging and debulking. The first goal is to stage the cancer. Usually this means removing the uterus (hysterectomy), along with both ovaries and fallopian tubes (bilateral salpingo-oophorectomy or BSO). In addition, the omentum is also removed (omentectomy). Debulking epithelial ovarian cancer is the removal of tumor as much as possible. Cancers that aredebulked properly are called optimally debulked. For other types of ovarian cancer (germ cell tumors and stromal tumors), the main goal of surgery is to remove the cancer.

1.6.6. Chemotherapy

Chemotherapy is the use of drugs to treat cancer. Most often, chemo is a systemic treatment. Most of the time, systemic chemo uses drugs that are injected into a vein (IV) or given by mouth or sometimes by intraperitoneally.

Chemotherapy recommendations based on stage is as follows:

Stage I

Chemotherapy is usually given after surgery.

- Paclitaxel 175 mg/m^2 IV over 3h **plus** carboplatin AUC 6 IV over 30min on day 1; every 21d for 3-6 cycles**or**
- Docetaxel 75 mg/m^2 IV over 1h **plus** carboplatin AUC 5 IV over 1h on day 1; every 21d for 3-6 cycles**or**
- Carboplatin AUC 5 IV over 1h on day 1; every 21-28d for 6 cycles[**or**
- Carboplatin 350 mg/m^2 IV over 1h on day 1; every 21-28d for ≥ 4 cycles

Stages II

All patients with stage II or higher cancer should be considered for front-line chemotherapy

- Paclitaxel 175 mg/m^2 IV over 3h plus carboplatin AUC 7.5 IV over 30min on day 1; every 21d for 3-6 cyclesor
- Docetaxel 75 mg/m^2 1h IV infusion plus carboplatin AUC 5 IV over 1h on day 1; every 21d for 3-6 cycles or
- Carboplatin AUC 5 IV over 1h on day 1; every 21-28d for 6 cyclesor
- Carboplatin 350 mg/m^2 IV over 1h on day 1; every 21-28d for ≥ 4 cycles

Stage III

Patients with optimally debulked (≤ 1 cm) stage III ovarian cancer after front-line surgery should be offered intraperitoneal (IP) chemotherapy.It includes:

- Paclitaxel 135 mg/m^2 IV over 24h on day 1 plus cisplatin 100 mg/m^2 IP on day 2 (may reduce dose to 75 mg/m^2) plus paclitaxel 60 mg/m^2 IP on day 8 for ≥ 6 cycles, provided that the disease is responsive
- Clinicians may reduce the cisplatin dose to 75 mg/m^2 IP on day 2, and some give paclitaxel 135 mg/m^2 IV over 3h followed by cisplatin 75 mg/m^2 IP, both on day 1 and on an outpatient basis
- Normal range of carboplatin AUC for treatment of ovarian carcinoma ranges from 5 to 7.5; patients who have received extensive prior chemotherapy or radiation should start with an AUC < 5

If patient cannot tolerate IP delivery, revert to 1 of the 2 drug regimens listed below:

- Paclitaxel 175 mg/m^2 IV over 3h **plus** carboplatin AUC 7.5 IV over 1h on day 1; every 21d for 6 cycles**or**
- Docetaxel 75 mg/m^2 IV over 1h **plus** carboplatin AUC 5 IV over 1h on day 1; every 21d for 6 cycles

Stage IV

Treatment recommendations are similar to those for stage III.[15]

Patients should be considered for front-line chemotherapy and should strongly consider participation in clinical trials if the option is available.

- Paclitaxel 175 mg/m^2 IV over 3h **plus** carboplatin AUC 7.5 IV over 1h on day 1; every 21d for 6 cycles **or**
- Docetaxel 75 mg/m^2 IV over 1h **plus** carboplatin AUC 5 IV over 1h on day 1; every 21d for 6 cycles

1.6.7. Recent Ayurvedic Approaches for the Treatment of Ovarian Cancer

The importance of ayurvedic treatment over allopathic treatment [19].

- It helps in restricting the growth of cancer.
- Regular treatment helps in reducing the disease.
- Patients survive from unbearable pain.
- It helps in improving the quality of life.

1.6.8. Cow urine therapy

Cow urine can increase the life expectancy in ovarian cancer patients to 4-6 years. Cow urine enhances the anti-microbial effects of antibiotic and antifungal agents used in the therapy. A fraction of cow urine is as a bio-enhancer of anti-infective, anti-cancer agents and nutrient. Therapeutic qualities of cow urine are anti-tumour qualities, reduce inflammation, analgesic and reduce the body temperature [20]. The antimicrobial property of cow urine can kill the drug resistance bacteria and viruses which reduce the incidence of cancer. Also the bioenhancing property can increase the efficacy of chemotherapeutic drugs.

1.6.9. Ginger

Ginger (Zingiber officinale Rosc) is a natural dietary component. It has antioxidant and ant carcinogenic properties. It kills cancer cells. It also prevents from building up resistance to cancer treatment [21]. Ginger is used as an effective remedy for nausea and inflammation. Application of ginger powder solution and water to ovarian

cancer cells leads to cell death. It also modulates secretion of angiogenic factors in ovarian cancer cells.6-shogaol is the most active compound of ginger that kills ovarian cancer cells. Inclusion of ginger in diet may prevent ovarian cancer.

1.6.10. Agaricus blazei murrill mushroom

It is a well known cancer fighting mushroom. It stimulates the immune system and promotes natural mechanisms to battle infectious disease and cancers. It stimulates lymphocyte T-cell and Helper T-cell production [22]. The mushroom contains polysaccharide which stimulates production of interferon and interleukin that indirectly function to destroy and prevent the proliferation of cancer cells.

1.6.11. Bindweed

Bindweed is used as natural anti-angiogenic treatment in ovarian cancer. It is about 100 times more effective than shark cartilage at inhibiting angiogenesis. Bindweed is a potent angiogenesis inhibitor for ovarian cancer. It is modestly efficient at improving the immune function. It can also be used as an immune stimulant, that is, a nontoxic purified extract of the bacterial cell wall of Gram-positive bacteria and beta 1, 3-glucan, the results were even more remarkable.

1.6.12. Selenium

Selenium is a powerful cancer fighter. The usual recommended dose is 200 to 400 mcg daily.It protects against the development of several cancers and a powerful cancer fighter. Selenium or sodium selenite interferes with cell growth and proliferation, and to induce cell death. Selenium have growth-inhibiting effect in ovarian cancer cells[23] .Although selenium has growth-inhibiting effect in ovarian carcinoma cells in vitro, there is no additive effect on treatment with combination of paclitaxel and selenium.

1.6.13. Turmeric/Curcumin

Curcumin alone had a cytotoxic effect in cisplatin-resistant cells at 25 μM. It seems to be very effective against ovarian cancer. Among many anti-cancer benefits, it mainly activates the gene p53 and thereby prevents inflammation. It has the ability to induce cell death in ovarian cancer cells, and enhance apoptosis induced by tumor necrosis factor-related apoptosis inducing Apo2 ligand. Curcumin and Apo2L/TRAIL together can activate both the extrinsic and intrinsic pathways of apoptosis, they may circumvent chemoresistance to conventional chemotherapeutic agents [23-26].

1.6.14. Vitamin K

Vitamin K can stop and shrink tumor growths in many forms of cancer, including ovarian cancer. Vitamin K causes ovarian cancer cells to self destruct when used in a combination with high dosages of Vitamin C. The usual recommended dose amounts for adult women are 35 mg or more along with 3000 mg or more of vitamin C in divided doses.

1.6.15. Quercetin

Quercetin is an effective anti-cancer agent which stops chemical signals that give ovarian cancer cells a growth advantage over healthy cells. The general recommended dose is 125-250 mg. Low quercetin doses has a substance which increases sensitivity of ovarian cancer cells to cisplatin and paclitaxel [27,28] .

The value of quercetin includes its wide accessibility efficacy and a broad range of activity but also its low toxicity as compared to other examined compounds. It increases chemo sensitivity of ovarian cancer cells. Quercetin is a hydrophobic agent, the encapsulation of quercetin into a biodegradable monomethoxy poly(ethylene glycol)-poly(ε-caprolactone) micelles are effective for the treatment of ovarian cancer .

1.6.16. Astragalus

Atragalus increases the production of immune-system chemical interleukin-2 (IL -2), that fights cancer and the human papilloma virus (HPV) and activates gene pS3. The usual recommended dose is 500- 1000 mg 3 times daily.

1.6.17. Espinheirasanta

It inhibits tumors, kills cancer & leukemia cells, cleanses blood, aids digestion, increases urination, reduces acid, prevents ulcers, kills germs, relieves pain, detoxifies, promotes menstruation, and is mildly laxative. It slows down the growth of ovarian tumors. As a decoction the usual amount taken is 1 cup, 2 to 3 times daily.

1.6.18. Milk thistle

Milk thistle extracts inhibit growth of ovarian cancer cells and prevent angiogenesis. The usual recommended dose is from 400 to 1000 mg per day.

1.6.19. Green tea catechin extracts

Green tea deactivates plasmin, which promotes tumors spread. The usual recommended dose is 250-500 mg daily. In epithelial ovarian cancer cell lines, greentea and greentea components down regulates the expression of proteins involved in inflammation, cell signalization, cell motility and angiogenesis. Greentea and greentea components induce

apoptosis and could potentiate the effects of cisplatin, a chemotherapeutic agent [29,30].

1.6.20. Caretenoids

Carotenoids are a large group of fat soluble pigments widely distributed in plants and animals, expecially in orange, red, yellow and green plants and fruits. These act as chemo preventive agents, irrespective of whether they are finally transformed into vitamin A, and may represent a potentially powerful alternative to present chemotherapeutic approaches to the treatment of ovarian cancer [31].

1.6.21. Ginkgo Biloba

Ginkgo biloba is a chemo preventive agent which has an inhibitory effect appeared to be cell cycle blockage at G0/G1 to S phase. It may reduce the risk for nonmucinous ovarian cancer. It is an effective agent to reduce BRCA1-associated ovarian cancer risk. These pathways include cell proliferation, tumor suppression, and DNA damage repair [32,33].

2. CONCLUSION

As per the information collected from various sources, we have found that the ayurvedic treatment has several advantages and fewer side effects over allopathic treatment in some cases. Hence, Researchers should not ignore the Ayurvedic treatment for ovarian cancer. A detailed study of Ayurvedic and modern treatments for ovarian cancer may be useful for the patients with advanced ovarian cancer. Future research needs to focus on the role of cytoreductive surgery, consolidation chemotherapy, development of new chemotherapeutic agents, chemo resistance modulators, as well as new approaches including the Ayurvedic treatment of women with ovarian cancer.

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