Colon Cancer: A comprehensive Review

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Abstract—Colon cancer is a type of cancer that affects the rectum or colon. The rectum and colon help the body break down meals. They store waste until it leaves the body. Through the induction of inflammation in the colon mucosa, environmental or dietary variables can promote colorectal carcinogenesis. Actually, eating a lot of red meat or alcohol can alter the composition of the gut microbiota (a condition called dysbiosis), which causes a drop in commensal bacteria that produce butyrate and an increase in dangerous bacterial strains. colon cancer also due to overweight and not exercising enough, smoking, eating a diet high in meat and fat and low in fiber, and drinking alcohol. Regular tests and a change in lifestyle can help prevent colorectal cancer. Colorectal cancer can be avoided by adopting the following lifestyle changes: Consuming a diet rich in fruits and vegetables and well-balanced, Quitting smoking, living a healthy lifestyle, lowering alcohol intake, maintaining a healthy weight, eating a diet rich in fruits and vegetables, getting regular exercise, and, if you belong to a group where immunization is recommended, being vaccinated against HPV and hepatitis B. Limiting your exposure to UV radiation and using sun protection strategies.
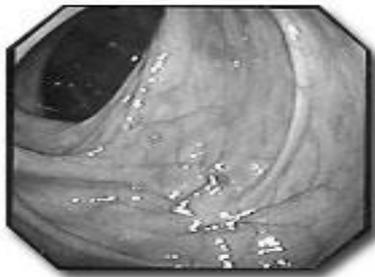
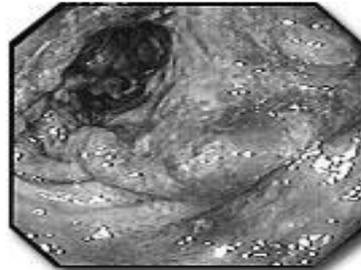*Index Terms*—Cancer, Colon cancer, CRC, Stages of colon cancer, Prevention.

I. INTRODUCTION

Colorectal cancer (CRC) ranks second in terms of mortality and is the third most common cancer globally, according to Global Cancer Statistics 2020.It is more common in regions with high human development indices and is linked to sedentary lifestyles and certain dietary practices, such as consuming a lot of alcohol and red meat. Since the early 2000s, the number of CRC cases in high-incidence areas has decreased due to screening initiatives, early detection and removal of precancerous lesions, and a change to a healthier lifestyle. Approximately 6 out of 100 individuals will eventually get colorectal cancer, which means that 1 in 17 of us will experience this disease. Furthermore, patients afflicted by this cancer now have new therapeutic options thanks to the development of targeted therapies. [1]

Colon cancer, to put it simply, is cancer of the rectum or colon. The rectum and colon support the body to break down food. They retain waste until it departs from the body. A colon cancer begins when there is a growth on the lining of rectum or colon. The growth is known as a polyp, which is pronounced Paw-lip. Certain polyps may eventually turn into cancer. Although colorectal cancer can occur anywhere in the colon or rectum, the bottom 40 centimetres of the colon and the rectum are the most frequently affected areas (approximately 60% of cases). One pertinent idea that has surfaced recently is the critical role that inflammation plays in the development, spread and metastasis of colorectal cancer. Dietary or environmental factors can cause colorectal carcinogenesis by inducing an inflammatory state in the mucosa of the colon. In fact, a high intake of red meat or alcohol can change the gut microbiota's composition (a condition known as dysbiosis), leading to a decrease in butyrate-producing commensal bacteria and an increase in harmful bacterial strains (such as pro-inflammatory opportunistic pathogens).Dysbiosis is linked to a shorter cancer-specific survival rate and, in addition to its role in the onset of colorectal cancer, may also play a role in the resistance to some chemotherapeutic agents due to its ability to modulate the immune response.Therefore, novel avenues for the prevention or treatment of colorectal cancer may be opened by probiotics, prebiotics, or antibiotics that can restore the normal equilibrium of the gut microbiota (eubiosis).[2] However, the causes of colorectal cancer vary are not completely comprehended, scientists have found certain elements that raise the chance of colorectal cancer.

Image of difference between normal colon and colon cancer

A. The following factors are linked to an increased risk of colorectal cancer:

Smoking, a diet heavy in meat and fat, low in fibre and drinking alcohol, in addition to being overweight and insufficient physical activity, Inflammatory bowel conditions (Crohn's disease, ulcerative colitis illness), Some intestinal polyps, or adenomas, A family history of intestinal polyps or colorectal cancer (adenomas).

B. Colorectal cancer can cause the following symptoms:

Changes in stools, alternating between constipation and diarrhoea, "pencil stool" or persistent urges to pass stool without passing any blood in the stool or on it (never put this all on haemorrhoids, Abdominal cramps that occur frequently.Prolonged bloating, unpleasant odour and loud bowel sounds stools,Abdominal masses that can be felt, Rectal bleeding or blood in the stool, Pain during bowel movements ,Continual urges to defecate . [3]

C. Stages of colon cancer:

Stage I: In its early stages, colorectal cancer has entered the intestinal wall but has not yet progressed into the surrounding lymph nodes or beyond the muscular skin.

Stage II: Although it has not yet reached any neighboring lymph nodes, the cancer has spread farther into the gut wall. There are three types of stage II colon cancer:

Stage IIA: Although the cancer has not yet reached the outer layer, it has pierced the majority of your colon wall.

Stage IIB: Your colon's outer layer or wall has been breached by the malignancy. Stage IIC: Cancer has spread to an adjacent organ.

Stage III: At this stage, colon cancer has spread to your lymph nodes. Stage III colon cancer is separated into three substages, same like Stage II

Stage IIIA: Cancer that started in the first or second layers of your colon wall may have spread to one to four lymph nodes.

Stage IIIB: The cancer affects additional layers of your colon wall, but only one to three lymph nodes are impacted. Colon cancer that has progressed to four or more lymph nodes but affects fewer layers of the colon wall is also referred to as stage IIIB.

Stage IIIC: Cancer has spread to the outermost layer of your colon and four or more lymph nodes. malignancy that has spread to a neighboring organ

Stage IV: The cancer has progressed to other parts of your body, including the ovaries, liver, or lungs:

Stage IVA: This stage indicates that the cancer has progressed to a single organ or lymph nodes that are more distant from your colon.

Stage IVB: More lymph nodes and more than one distant organ have been affected by the cancer.

Stage IVC: Abdominal tissue, lymph nodes, and distant organs are affected by cancer.

II. DIAGNOSIS

Early detection of colon cancer maximizes treatment efficacy. The majority of people ought to begin receiving screened at age of 50 for colon cancer. Individuals who have a lineage of Colon cancer or polyps may require getting screened prior to reaching 50. Colorectal cancer has a very good prognosis and can be cured if detected early. [4]

A. Methods to verify colorectal cancer diagnosis:
- Colonoscopy (using a flexible instrument to examine the entire colon).
- Sigmoidoscopy (lower colon examination and rectum with a flexible tool).
- Rectoscopy (rectum examination for up to 15–20 cm with a stiff tool).
- Digital colonoscopy.
- Barium enema, a radiological examination of the colon. [5]

III. PREVENTION

Colorectal cancer can be avoided with a change in lifestyle and routine screenings, Making the following lifestyle adjustments can help prevent colorectal cancer, Eating a balanced diet high in fruits and vegetables, Giving up tobacco use, leading an active life, Reducing the amount of alcohol consumed, keeping a healthy weight, maintaining a nutritious diet that includes fruits and vegetables, engaging in regular physical activity, receiving a vaccination against hepatitis B and HPV if you are in a group for which immunization is advised. utilising sun protection techniques and/or limiting your exposure to UV radiation (which is mostly caused by the sun and artificial tanning devices), making sure radiation is used in healthcare safely and appropriately (for diagnostic and therapeutic purposes) reducing ionising radiation exposure at work; and lowering exposure to uranium's natural decay and subsequent indoor and outdoor air pollution. [6]

A. Risk factors
The evidence linking colorectal cancer to red meat, processed meat, significant alcohol consumption (more than 30 g ethanol per day) in men and possibly women, body and abdominal fat, factors contributing

to greater adult attained height, or their effects. Limited evidence suggests that foods containing iron, cheese, foods containing animal fats, and foods containing sugars are causes of colorectal cancer.

B. non-dietary factors
Aspirin, long-term use of non-steroidal anti-inflammatory drugs (NSAIDs), smoking, and certain conditions like certain colorectal diseases, family history, and the metabolic syndrome have all been identified as non-dietary risk factors for colon cancer.

C. Genetic Factors
Either polyposis or nonpolyposis syndromes have been linked to a genetic predisposition to colon cancer. Familiar adenomatous polyposis (FAP), also known as adenomatous polyposis coli (APC) gene, is the primary poly-posis syndrome and is linked to FAP gene mutation or loss. [7]

D. Patient-related factors
The response of a tumour to treatment cannot be predicted only by age. Although females have longer median survival times than males, gender has an impact on the overall prognosis of this disease; however, this criterion does not predict treatment responsiveness. The patient's performance status has a significant impact on the course of treatment

E. Disease-related factors
The likelihood of responding and surviving is correlated with the severity of the illness. The number of metastatic sites, the number of lesions within each metastatic site, the percentage of liver involvement, and, indirectly, the baseline LDH and WBC values can all be used to determine the extent of the disease. [8]

F. Biological markers
A great deal of effort has been spent in search of serological markers that would allow the early detection and diagnosis of colorectal cancer. A variety of proteins, glycoproteins and cellular and humoral substances have been studied as potential tumour markers, but none has been found to be specific for colorectal cancer. The most widely studied marker, CEA, may be useful in the preoperative staging and postoperative follow-up of patients with large bowel cancer v but has a low predictive value for diagnosis in asymptomatic patient. [9]

G. Treatment of Colon Cancer

Stage "0" of colon cancer- Here it appears as polyps. And polypectomy can be performed.

Stage "1" colon cancer -Colon cancer layers of colon wall hre. But they have not spread out of the wall. Here treatment is Partial colectomy.

Stage "2" of colon cancer- Stage where cancers have grown through wall of colon to nearby tissues but have not yet spreded to lymph nodes. Can treat by surgery along with lymph nodes.

Sometimes adjuvant chemotherapy is recommended if

- Cancer looks very abnormal
- Has grown to lymph and blood vessels
- Cancer have blocked colon
- Perforation in colon wall

Sometimes radiation therapy is given to kill remaining cancer cells if present.

Stage "3" of colon cancer- Here cancer have grown to nearby lymph nodes. Surgery and chemotherapy is recommended.

Stage "4" of colon cancer- Have spread to other organs from colon. Sometimes to liver, lungs, or distant lymph. Here chemotherapy before and after surgery is recommended.

The main drugs used in the adjuvant treatment of colon cancer are a combination of the following:

• 5-fluorouracil (5FU), which is often given with the vitamin folinic acid (leucovorin)

• capecitabine

• oxaliplatin

• irinotecan

• raltitrexed

• mitomycin C.

The most commonly-used chemotherapy drugs for advanced bowel cancer are:

- Bevacizumab
- Used to treat many types of cancers and a specific eye disease. Blocks
- endothelial cell proliferation and new vessel formation by inhibition of
- VEGF interaction on surface of endothelial cells.
- Irinotecan Hydrochloride
- Inhibit DNA replication and transcription
- Capecitabine:
- It is a prodrug of 5-FU absorbed from intestine.
- Cetuximab:
- Thymidine synthase inhibitor hence by inhibitng thymidine monophosphate, which is the active

form of thymidine required for de novo synthesis of DNA.

- Ramucirumab
- It is directed against the Vascular Endothelial Growth Factor Receptor
- 2 (VEGFR2) as an antagonist for blocking the growth factor binding on
- Receptor
- Oxaliplatin
- Formation of Platinum DNA adducts for blocking DNA replication and
- are cytotoxic than cisplatin

- Cetuximab
- Expression of (EGFR) being reported in cancer of colon rectum head
- and neck, cetuximab bind specifically on EGFR on both normal and
- tumour cells.
- 5-FU
- Thymidine synthase inhibitor hence by inhibitng thymidine monophosphate, which is the active form of thymidine which is a nucleoside required for DNA replication.
- Leucovorin Calcium
- As an adjuvant to get rid of the blood cell disorders due to cytotoxic
- drugs

- Trifluridine
- Nucleic acid synthase inhibitor

- Panitumumab
- Binding to EGFR and thereyby inhibits binding of all ligands in EGF [10]

IV. DISCUSSION

Colon cancer is one kind of cancer that develops in the colon or rectum. The rectum and the colon are essential for human beings in digesting food and aiding in the removal of wastes. They collect waste until it is either removed from the body. Environmental or dietary factors might stimulate colorectal carcinogenesis by initiating inflammation in the colon mucosa. Consuming large amounts of alcohol or red meat can change the gut microbiota's composition (a condition known as dysbiosis), which

results in an increase in harmful bacterial strains and a decrease in friendly bacteria that produce Colorectal cancer is one of the types of cancers that may be prevented, but this is only possible if regular testing is conducted along with lifestyle changes. In any event, the prognosis would depend on the diagnosis at the time; better results are usually obtained at earlier stages of development. These activities are in addition to screening recommendations based on personal risk factors and emphasize lifestyle changes like the consumption of a healthy diet, exercising frequently, and quitting smoking. It will result in earlier detections and more successful treatments and thereby show a significant impact on survival rates and quality of life. butyrate. Colon cancer is also brought on by being overweight, not exercising enough, smoking, eating a diet heavy in fat and meat and poor in fiber, and consuming alcohol.

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