PREVALNCE OF COLORECTAL CANCER IN ERITREA AND ITS ASSOCIATION WITH LIFE STYLE AND NUTRITION

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Summary

Colorectal cancer is a cancer which includes Cancerous growths in the colon, rectum and appendix. Types of cancer in the colon and rectum: Adenocarcinoma, Carcinoid tumor stromal tumors (GISTs) and Lymphomas with adenocarcinoma being the most common. There is large geographical variation in the incidence of colorectal cancer. (1, 2, 3) Worldwide, there are 945,000 cases of colorectal cancer per year and 655,000 deaths. Colorectal cancer is more common in the developed countries than in the developing ones. (4, 5, 6) CRC is usually diagnosed by Biopsy, Blood test, imaging tests and genetic testing. (8,)The objective of the study is to investigate the prevalence of colorectal cancer in Eritrea and its variation with nutrition to increase public awareness of the disease and introduce changes in the life style of the people. In this is retrospective study data about the prevalence of colorectal cancer in Eritrea for the last ten years was retrieved from the archives of the department of Health Management Information System (HMIS), Human Resource development (HRD), Ministry of health(MOH), Asmara. The number of neoplasm cases in Eritrea shows significant increase in the last three years. Colorectal cancer accounts for about 6% only, ranking fifth among neoplasm cases in Eritrea. The highest incidence of colorectal cancer is seen in Zoba Maakel. The prevalence of colorectal cancer in Eritrea is low when compared to other countries. The number of neoplasm in Eritrea is increasing, which could be due to the changes in the life style of the population. Summarizing the epidemiological characteristics of CRC, we could state that it is a tumor showing close connection with a westernized life style, most of all with its nutritional behavior and life style.
(24, 31) Colorectal cancer in Eritrea could be prevented if more people maintained healthy life styles and satellite laboratories which could provide cost effective screening tests are established in the different zones. Moreover the ministry should work in collaboration with other organizations and institutes to prevent tragic and unnecessary suffering caused by the cancer through the implementation and introduction of advanced cancer diagnosing health centers throughout the country.

KEY WORDS: CRC: Colorectal Cancer**,** Adenocarcinoma**,** APC (Adenomatous Polyposis Coli gene)**,** CEA (Carcino Embryonic Antigen and fiber foods.

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Introduction

Colorectal cancer description and pathogenesis

Colorectal cancer or large bowel cancer includes cancerous growths in the colon, rectum and appendix. Colon cancer occurs in the large intestine. If the cancer is in the last six inches of the colon (the rectum), it is considered rectal cancer. Together, these cancers are referred to as colorectal cancers. Tumors of the colon and rectum are growths arising from the inner wall of the large intestine. Benign tumors of the large intestine are called polyps. Malignant tumors of the large intestine are called cancers. Benign polyps do not invade nearby tissue or spread to other parts of the body. Benign polyps can be easily removed during colonoscopy and are not life-threatening. (1, 2, 3)

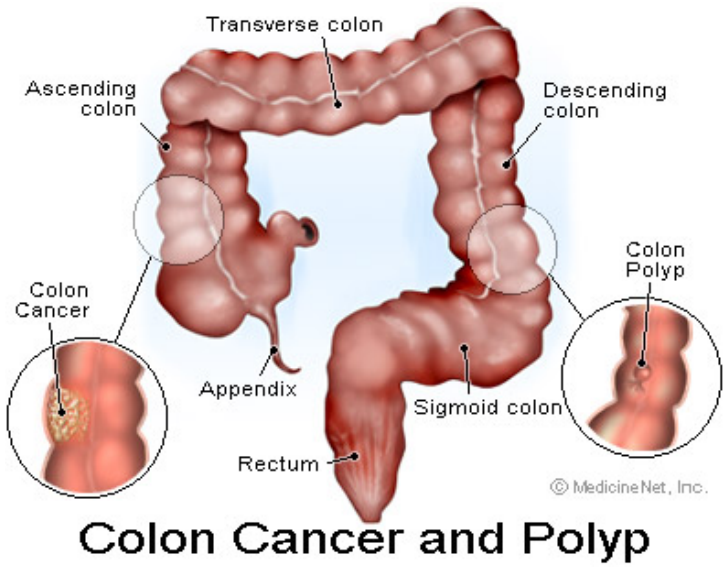

Figure 1-Colon cancer and polyp (2)

Colorectal cancer is a disease originating from the epithelial cells lining the gastrointestinal tract, hereditary or somatic mutations in specific DNA sequences, among which are included DNA replication or DNA repair genes, and also the APC(Adenomatous polyposis coli gene), K-Ras, NOD2 and p53 genes, lead to unrestricted cell division. Chronic inflammation, as in inflammatory bowel disease, may predispose patients to malignancy. Genetics, experimental, and epidemiologic studies suggest that colorectal cancer (CRC) results from complex interactions between inherited susceptibility and environmental factors. It has been suggested that dietary factors may be responsible for a significant but poorly quantitated number of cancer cases (8). Efforts to identify causes and to develop effective preventive measures have led to the hypothesis that Adenomatous polyps (adenomas) are precursors for the vast majority of CRCs (7). While most of these adenomas are polypoid, flat and depressed lesions that may be more prevalent than previously recognized. Large flat and depressed lesions are more likely to be severely dysplastic. In effect, measures that reduce the incidence and prevalence of adenomas may result in a subsequent decrease in the risk of CRC. (16, 17)

Epidemiology of colorectal cancer

Globally, cancer of the colon and rectum is the third leading cause of cancer in males and the fourth leading cause of cancer in females. Cancers of the colon–rectum accounts for 945, 000 new cases (9.4% of the world total) and 655,000 deaths worldwide per year. Numbers were similar in males and females (ratio 1.05: 1). (4) The highest incidence rates are in North America, Australia/New Zealand, Western and Eastern Europe (rates in the Czech Republic (60.3 per 10^5) and Hungary (59.8 per 10^5) are among the highest worldwide)(5,6). Rates from several Japanese registries are particularly elevated, notably in Hiroshima (86.7 per 10^5), which is attributed to the nuclear bombs fired to the city emitting many carcinogens, during second world war by the U.S.A. The incidence tends to be low in Africa and Asia and intermediate in southern parts of South America (5, 6). The geographical distribution of colon and rectal cancer is similar, although the variation between countries is more striking for colon than rectal cancer. (7)

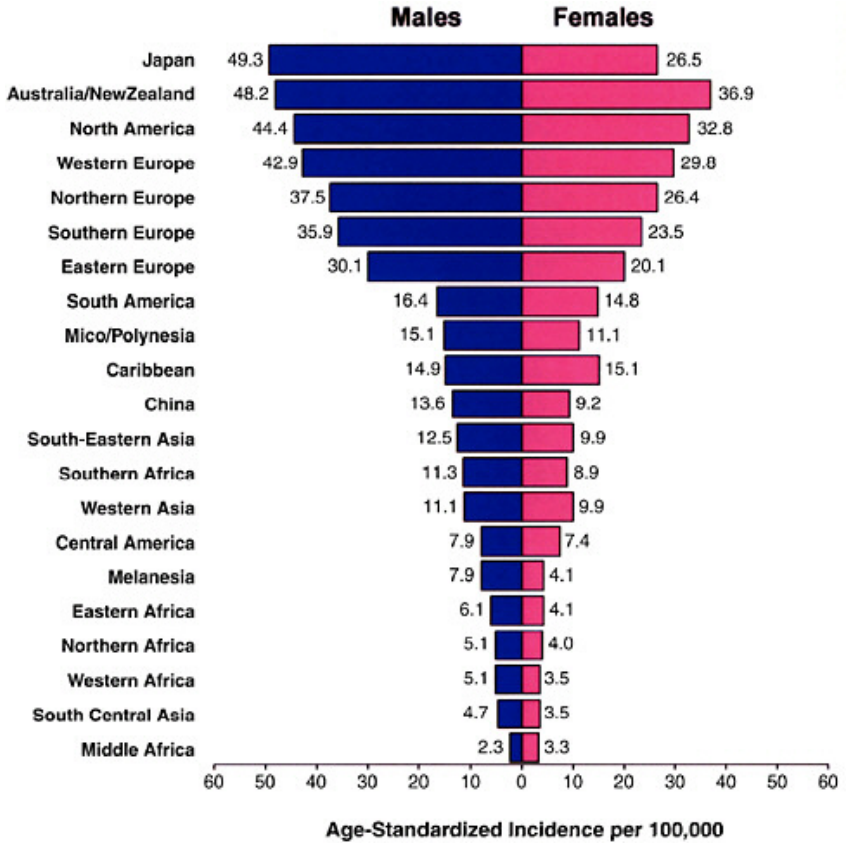

FIGURE 2- International colorectal cancer incidence rates by gender. (5, 6)

Causes and risk factors of Colorectal Cancer

There are several causes for colorectal cancer as well as factors that place certain individuals at increased risk for the disease. There are known genetic and environmental risk factors. Risk factors can be grouped in to the following:

Age: The chances of developing colorectal cancer increase markedly after age 50. More than 90% of people diagnosed with colorectal cancer are older than 50. (8)

Personal history of colorectal polyps or colorectal cancer and inflammatory bowel disease: Having a history of Adenomatous polyps (adenomas) and Inflammatory Bowel Disease (IBD) places an individual at increased risk of developing colorectal cancer. (8, 9, 10)

Family history of colorectal cancer: Most colorectal cancers occur in people without a family history of colorectal cancer. Still, up to 35 % of people who develop colorectal cancer have other family members who have been affected by this disease (7, 11, 12)

Polyps: Polyps are benign growths on the inner wall of the colon and rectum. They are fairly common in people over age 50. Some types of polyps like the familial polyposis increase a person's risk of developing colorectal cancer.

Certain types of diets: A diet that is high in red meats (beef, pork, lamb) and processed meats (hot dogs, bologna, luncheon meat) can increase colorectal cancer risk. Methods of cooking meats at very high temperatures (frying, broiling, or grilling) create chemicals that might increase cancer risk, although it's not clear how much this might contribute to an increase in colorectal cancer risk. Diets high in vegetables and fruits have been linked with decreased risk of colorectal cancer. (9)

Physical inactivity and **Obesity.** If you are not physically active or obese, you have a greater chance of developing colorectal cancer. While obesity raises the risk of colon cancer in both men and women, the link seems to be stronger in men. (7)

Smoking and Alcohol consumption: Long-term smokers are more likely than non-smokers to develop and die from colorectal cancer. While smoking is a well-known cause of lung cancer, some of the cancer-causing substances are swallowed and can cause digestive system cancers, such as colorectal cancer. (13)It is hypothesized that alcohol may act to stimulate mucosal cell proliferation, to activate intestinal pro carcinogens and possibly provide a source of unabsorbed carcinogens that can reach the distal large bowel. (4)

Signs and Symptoms

Unfortunately, most people with colorectal cancer don't experience any symptoms in the early stage of the disease. That's why screening tests, such as a colonoscopy, are so important. Most of these symptoms are more likely to be caused by conditions other than colorectal cancer, such as infection, hemorrhoids, or inflammatory bowel disease. The symptoms of colorectal cancer depend on the location of tumor in bowel and whether it has spread to elsewhere in the body (metastasis). Most of the symptoms may occur in other diseases as well, and hence none of the symptoms mentioned here is diagnostic of colorectal cancer. In general, signs and symptoms of colorectal cancer can include: Changes in bowel habits, Blood in the stool, Problems related to blood loss, abdominal discomfort, unexplained weight loss, Pain with bowel movement and feeling that your bowel doesn't empty completely.

Diagnosis of colorectal cancer

a) Screening tests

Screening tests are used to detect polyps, cancer, or other abnormalities, even if a person does not have symptoms. Colorectal cancer can take many years to develop and early detection of colorectal cancer greatly improves the chances of a cure. There are several different tests available for this purpose. These include: (16, 21)

I. **Digital rectal exam (DRE):** The doctor inserts a lubricated, gloved finger into the rectum to feel for abnormal areas. It only detects tumors large enough to be felt in the distal part of the rectum but is useful as an initial screening test.

II. **Fecal occult blood test (FOBT):** a test for blood in the stool. Two types of tests can be used for detecting occult blood in stools i.e. guaiac based (chemical test) and immunochemical. The sensitivity of immunochemical testing is superior to that of chemical testing without an unacceptable reduction in specificity. (22,23)

III. **Endoscopy:** Endoscopy includes sigmoidoscopy and colonoscopy to check for polyps and other abnormalities.(5,6)

IV. **Double contrast barium enema (DCBE**): First, an overnight preparation is taken to cleanse the colon. An enema containing barium sulfate is administered and then air is insufflated into the colon, distending it. The result is a thin layer of barium over the inner lining of the colon which is visible on X-ray films. A cancer or a precancerous polyp can be detected this way. This technique can miss the (less common) flat polyp.(7,24)

b) Diagnostic tests

Many tests are done to diagnose cancer and to determine if it has metastasized (spread). Some tests may also determine which treatments may be the most effective. For most types of cancer, a biopsy is the only way to make a definitive diagnosis of cancer.

If a biopsy is not possible other tests will help to make a diagnosis. Imaging tests may be used to find out whether the cancer has metastasized. The factors that should be considered when choosing a diagnostic test include; Age and medical condition, the type of cancer suspected, severity of symptoms, previous test results. Diagnostic tests include biopsy examination, blood tests, imaging tests and genetic testing.

I) **Biopsy:** A biopsy is the removal of a small amount of tissue for examination under a microscope. Other tests can suggest that cancer is present, but only a biopsy can make a definite diagnosis of colorectal cancer. The sample removed from the biopsy is analyzed by a pathologist.

A biopsy may be performed during a colonoscopy, or it may be done on any tissue that is removed during surgery. Sometimes, a CT scan or ultrasound is used to perform a needle biopsy.

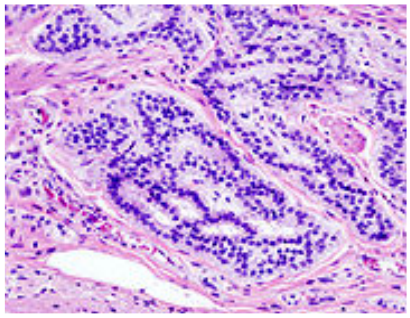

FIGURE 11-Histopathologic image of colonic Carcinoid stained by hematoxylin and eosin.(5,6)

The pathology of the tumor is usually reported from the analysis of tissue taken from a biopsy or surgery. A pathology report will usually contain a description of cell type and grade. The most common colon cancer cell type is adenocarcinoma which accounts for 95% of cases. Other, rarer types include lymphoma and squamous cell carcinoma. (7)

II) Blood tests: Because colorectal cancer often bleeds into the large intestine or rectum, people with the disease may become anemic. A test of the number of red cells in the blood, which is part of a complete blood count (CBC), can indicate that bleeding may be occurring. Another blood test detects the levels of a protein called carcinoembryonic antigen (CEA). High levels of CEA may indicate that a cancer has spread to other parts of the body. CEA is not an absolute test for colorectal cancer because it is elevated in only about 60% of people with colorectal cancer that has spread to other organs from the colon. In addition, other conditions may cause a rise in CEA. CEA tests are most often used to monitor patients already treated for colorectal cancer.

III) Imaging tests: Imaging tests performed before treatment look for cancer that may have spread outside of the colon and rectum.

a. **CT scan:** A Computed Tomography (CT) scan creates a three-dimensional picture of the inside of the body with an x-ray machine. A computer then combines these images into a detailed, cross-sectional view that shows any abnormalities or tumors. Sometimes, a contrast medium (a special dye) is injected into a patient's vein to provide better detail. In a person with colon cancer, a CT scan can check for the spread of cancer in the lungs, liver, and other organs.
b. **Ultrasound:** Ultrasound is a procedure that uses sound waves to produce images of the body to tell if cancer has spread to the liver or other organs. Endorectal ultrasound is commonly used to determine the depth of penetration of rectal cancer, and can be used to help plan treatment; however, this test cannot accurately detect metastatic lymph nodes (cancer that has spread to nearby lymph nodes) or metastatic disease beyond the pelvis.
c. **Chest x-ray:** An x-ray is a picture of the inside of the body. For instance, a chest x-ray can help doctors determine if the cancer has spread to the lungs.
d. **Positron emission tomography (PET) scan.** A PET scan is a way to create pictures of organs and tissues inside the body. A small amount of a radioactive substance is injected in to a patient's body and absorbed by the organs or tissues being studied. This substance gives off energy that is detected by a scanner, which produces the images.

IV) Genetic counseling and genetic testing:
This test is usually done in the developed countries for families who may have a hereditary form of colon cancer, such as hereditary nonpolyposis colorectal cancer (HNPCC) or familial Adenomatous polyposis (FAP). Stool DNA testing is an emerging technology in screening for colorectal cancer. Pre-malignant adenomas and cancers shed DNA markers from their cells which are not degraded during the digestive process and remain stable in the stool. Capture, followed by PCR amplifies the DNA to detectable levels for assay. Clinical studies have shown a cancer detection sensitivity of 71%-91%.Genetic testing has limitations and psychological implications: Some of which are testing may cause depression, anxiety, family tension, confidentiality concerns, testing may provide a false sense of security, may provide unclear results and it is costy. (25, 26, 27)

Diagnosis of colorectal cancer in Eritrea

In Eritrea there are no any screening tests available as such in the developed countries. Hence it makes it so difficult to diagnose colorectal cancer at earlier stages. This results in late diagnosis of colorectal cancer with low survival rates of the diagnosed individuals. When someone is suspected of colorectal cancer he/she is ordered to make an x-ray. Then according to the x-ray results colonoscopy is done and a biopsy sample is sent to the histopathology department in the national health laboratory to be examined by a pathologist, as for all other biopsy samples the diagnosis is made microscopically by examining eosin- hematoxylin stained slides. Adenocarcinoma is the most type of colorectal cancer encountered.(24)The histopathology department practices both internal and external quality controls as the following:

a) Internal quality control

In the histopathology department the most important parts of the procedures controlled internally are staining, quality of the staining reagents and alcohol. These are all controlled by the pathologist suggestion while examining the slides under the microscope. In case of any poor quality of the slides, the pathologist is unable to examine them clearly and in such cases the procedures and ingredients involved in the procedure are examined and investigated.

b) External quality control

In external quality control tissue blocks are send monthly to the Christian hospital in U.S.A .after that the quality of the tissue blocks are examined and suggestions are send back. in addition in case the pathologist gets any difficulty of examining the slides, the tissue blocks and slides are sent to Christian hospital and results are send back and are confirmed with that of the pathologist .If the results are matched with that of the histopathology laboratory, NHL both the results are given to the patient. In case of any differences, results of the Christian hospital are given to the patients and then they examine the reason for the differences and learn from it.

Background

Colorectal cancer accounts for 945,000 new cases annually (9.4% of the world total). Numbers were similar in males and females (ratio 1.05: 1). There is at least a 25-fold variation in occurrence worldwide. Colorectal cancer is the third most commonly diagnosed cancer and the second leading cause of cancer death in the developed countries while in the developing countries of Africa and Asia it has not reached to such level. In the developed countries, the incidence of colorectal cancer is increasing, while the mortality rate is decreasing. The increase

in the incidence can be attributed to the developments in colorectal cancer screening techniques, while the decrease in mortality is mainly due to the advancements in treatment options and early detection promoting recovery from the disease.

Colorectal cancer survival is closely related to the clinical and pathological stage of the disease at diagnosis. Approximately 65 percent of patients present with advanced disease. Five-year survival for cancer limited to the bowel wall at the time of diagnosis approaches 90 percent. Survival at 5 years is 35 to 60 percent when lymph nodes are involved and less than 10 percent with metastatic disease.

There are many risk factors for colorectal cancer, some of which are not amenable to change. These include older age, male sex, inflammatory bowel disease, certain hereditary conditions, and a family history of colorectal cancer or Adenomatous polyps. Individuals with no predisposing factors are considered to be at average risk

Problem statement

It is required to do research on colorectal cancer prevalence in Eritrea and variation with nutrition as there is no statistically based study done before. Besides there is no screening method done on colorectal cancer in Eritrea. This can have an effect in increasing the prevalence and decreasing the survival rate of the diagnosed individuals.

Significance of the study

- To investigate the status of colorectal cancer in Eritrea.
- This retrospective study could be used as a reference for further study.
- It may also provide a help in understanding the risk factors for the disease.

Objective

The main objective of this study:

- To investigate the prevalence of colorectal cancer in Eritrea and to compare it with that of the developing and developed countries.
- To associate any differences with different risk factors like environmental and life style related factors based on literature.
- To rank the prevalence of colorectal cancer in Eritrea among other types of cancer.
- In addition by suggesting the different risk behaviors to increase public awareness of the risk factors and introduce changes in the life style of the people.

Materials and Methods

This is a retrospective study. The prevalence of colorectal cancer in Eritrea for the past ten years was retrieved from the archives of the department of Health Management Information System (HMIS), Human Resource development (HRD), Ministry of health, Asmara. During this study information was collected from different books and articles. Information was obtained from the internet sources and consulting different health professionals including laboratory technicians, pathologists and gastroenterologists. A compelling search through available literature on the etiology, epidemiology and comparative anthropology of CRC was done.

Results

Neoplasm in Eritrea

According to the present study the number of neoplasm cases in Eritrea shows significant increase in the last three years that may be attributed to the changing of the life styles of the people in the cities. However, the proportion to other morbidity cases remained almost constant. Neoplasm of the female reproductive organ mainly breast followed by skin cancer are the leading causes of neoplasm in 2007 it accounted to about 3% of the total deaths in hospitals and health centers. Since neoplasm is a terminal illness, it is possible that most of the people die at home .As a result only few deaths were reported in the hospitals and health centers. As seen in the chart below colorectal cancer accounts for about 6% only, ranking fifth among neoplasm cases in Eritrea .Cases from the other zones are very few while most of the cases of neoplasm in general and CRC in particular were reported from Maakel zone and National Referral Hospitals (NRH) that may be due to the availability of diagnostic facilities. (29)

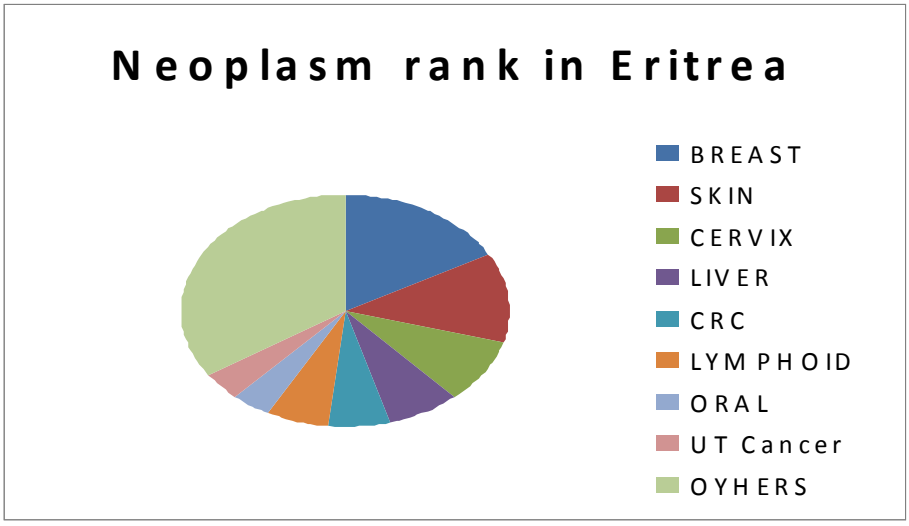

Figure 12- Neoplasms in Eritrea

As in the figure above breast cancer is the leading cancer in Eritrea followed by skin, cervix and liver cancers respectively. Colorectal cancer is the fifth cause of neoplasm in Eritrea. Oral cancer and the remaining types of neoplasm are the least ones.

Cololorectal cancer in Eritrea

In the HMIS the prevalence of colon and rectal cancer was recorded separately. The prevalence of colon and rectal cancer for the last ten years starting from 1998 up to 2008 was found to be as in the following table.

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
colon cancer	33	38	71	29	19	33	37	49	35	38	36
Anorectal cancer	19	29	60	32	21	15	16	37	26	54	80
Total	52	67	131	61	40	48	53	86	61	92	116

Table 1. Colorectal cancer Prevalence in Eritrea in 1998-2008

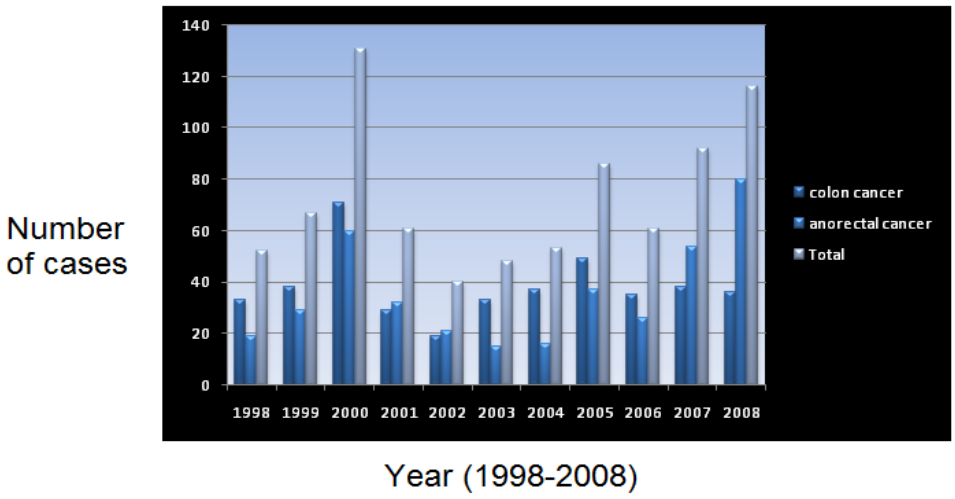

Figure 13-Graph of colorectal cancer incidence in Eritrea 1998-2008

The graph above shows general data on the cases seen during the period of 1998-2008. The data above was recorded in the HMIS separately in accordance to the location of the cancer and generally in total. According to figure 13, the first three years show a leap in the number of cases. The cases in colon cancer show an elevation against the cases in anorectal cancer. However, the fourth year shows only a great fall in the number of cases and a reversal of positions between colon cancer cases and anorectal cancer cases. This trend continues to the next year, 2002, the lowest level in this graph for colon cancer cases and the total number of cases.

In the following years, beginning from 2003 to 2008, the cases increase as colon cancer cases manifestates over anorectal cancer cases, which stabilizes at its lowest level during 2003-2004. A fluctuation is seen in 2005 as the total number of cases jumps and then give a short decline in 2006. Both types show similar outlook. Colon cancer cases stabilize in the final two years, as anorectal cancer cases show a gradual increase, increasing the total number of cases.

Zonal prevalence of colorectal cancer in Eritrea in 2008

Zones	Anseba	Debub	maakel	Gash-Barka	Semenawi-keih-bahri	Debubawi-keih bahri	National referral	Total
Colon cancer	1	4	14	----	----	----	15	34
Ano-rectal	5	1	56	1	2	----	13	78
Total	6	5	70	1	2	----	28	112

Table 2 Zonal prevalence of colon and rectal cancers in Eritrea in 2008

As in table 2 the prevalence of colorectal cancer in Eritrean zones is high in maakel zone and lowest in Debubawi keih bahri when compared with the other zones. This difference of colorectal prevalence can be attributed to the availability of advanced diagnostic centers and health services in Maakel zone when compared to other zones. (29)

Discussion

The number of neoplasm cases in Eritrea is generally increasing. The neoplasm of the reproductive organs in Eritrea is dominating the other types of neoplasm. The neoplasms of the reproductive organs have greater chance to be detected than the others. This could be due to the fact that the female reproductive organs can be detected early as the individuals refer to health centers for other purposes like the prenatal care, leading to increased number of cases to be seen than the other types of cancer. As seen in table 1, the prevalence of colorectal cancer in Eritrea is low. But these results are not representative of the actual prevalence of colorectal cancer in Eritrea. The results are only a hospital based data, and there is no any screening test for high risk individuals practiced in our country. The cases are only patients who referred the hospitals for seeking treatment. The diagnosed individuals usually die within a few months; there is low survival rate of the individuals. Most of the cases are reported from Maakel zone and national referral hospital (NRH).The cases reported from the other zones are too low when compared with those reported from Maakel zone. These low cases can be related to the lack of advanced diagnostic health facilities, lack of awareness of the inhabitants and strong cultural and traditional influence of the inhabitants of the zones .the people usually does not prefer to attend

health centers instead they attend traditional health practitioners. During such times the cancer metastize and cause damage to other organs including liver and the individuals die without being diagnosed. This usually happens in the inhabitants of the developing countries especially in the rural areas. Hence these factors can also contribute to the decreased number of cases. Therefore further study is needed to investigate the real and actual state of the disease in our country.

The prevalence of colorectal cancer in Eritrea is low when compared to other developed countries like north America with incidence rates of 37.1 per 100,000 , north European countries 30.3 , south eastern Asia 11.6, sub Saharan countries 8.2, Uganda 4.7, Nigeria 3.4 and Eritrea <1. From this we can also notice that there is large geographical variation in the incidence of colorectal cancer. It is low in the developing countries like Africa and Asia and high in the developed countries. (4, 8)These differences may reflect the influence of culture and socioeconomic differences in dietary habits, obesity, physical activity, genetic background and gene-environment interactions. Genetic factors are known to be important in determining propensity to develop cancer but there is strong evidence that the worldwide variation in cancer incidence is mainly due to our lifestyle and environmental factors such as the food we eat .There are strong international correlations between risk of large bowel cancers and percapita consumption patterns of meat, fat (specifically animal fat) and fiber. That the risk of colon cancer is quite labile to environmental change is evident from the study of migrants, when populations moved from low- to high-risk areas; the incidence of colorectal cancer increases rapidly within the first generation; implying that dietary and other environmental factors constitute a major component of risk.

The prevalence of colorectal cancer in Eritrea as in the above results is almost the same as the other African countries and even lesser than some others. This could be due to the same environmental and dietary exposure of the population in these countries. However there is much variation when compared to the developed countries like the United States. In a bid to find reasons and explanation for this observed rarity of colorectal cancer in Eritrea in comparison to the developed countries, this review will concentrate in the following factors:

Diet is one factor that has been extensively researched in the epidemiology of colorectal carcinoma. In Eritrea the popular dietary habits includes vegetables, fruits and cereals. However, westernized diets include grilled meats like steaks, deep-fried chicken and burger-meats which are served in ever-growing and popular western fast-food establishments. Eritreans had little meat in their diet and instead eat a lot of fiber from fruits, grains and vegetables. Eritrean diet includes, insoluble fiber (typified by wheat bran and cellulose) and soluble fiber (usually dried beans. The mechanism by which fiber may fight disease is thought to have three components. Fiber increases stool weight, binding to bile acids decreases transit time, and stimulates the growth of healthy bacteria. The net effect dilutes harmful substances (carcinogens) and minimizes their contact with the intestinal lining. Fiber may act as a substrate for bacterial fermentation with a resultant increase in bacterial mass and the production of short chain fatty acids, typified by butyrate. Butyrate has been shown to have anticarcinogenic effects in vitro and is regarded as important fuel for the colonic epithelium. (4, 14, 18, 30, 31)

Eritrean diet also contains less type of processed fatty meat when compared to the developed countries. Western diets contain large amount of fatty acids which are major sources of bile acids. An increased bile acid concentration in the intestinal tract accompanies a high-fat diet because bile acids are released from the gallbladder after fat ingestion. The concentration of bile acids in the colon is heavily influenced by the amount and type of fat in the diet. The potential mechanism of action of bile salts in colorectal carcinogenesis has been suggested that it is mediated by diacylglycerol. The conversion of dietary phospholipids to diacylglycerol by intestinal bacteria is enhanced by a high-fat diet. It is proposed that diacylglycerol enters the cell directly, stimulating protein kinase C, which is involved in intracellular signal transduction. (4, 15, 20, 28, 32, 33).The carbohydrate-based diet of Eritreans has been shown to be protective against the development of colon cancer. The human colonic bacteria ferment starch and non-starch polysaccharides to short-chain fatty acids, mainly acetate, propionate and butyrate. More over Eritrean foods are hot and spicy. These types of foods contain diferuloylmethane and it targets multiple signaling pathways that may protect the colon by decreasing the activity of beta-glucuronidase and mucinase. Other anticancer properties of these foods include inhibition of llipooxygenase activity, specific inhibition of cyclooxygenase 2 expression and the promotion/progression stages of carcinogenesis. Garlic and onions which are included in our every day diet contain diallyl sulphide, which were found to suppress cell division in human colon tumor cells. Red pepper which is used widely in developing countries including Eritrean cooking also has been shown to protect against colorectal carcinoma. The main ingredient of red chili pepper is capsaicin and this is known to cause death of colon cancer cells. (13, 19)

Body weight/size and physical activity could be discussed as a second factor which could contribute to the decreased incidence of colorectal cancer in Eritrea and other developing countries in comparison to the developed ones. (34)Sunlight and vitamin D also has contribution to this decreased incidence in African countries in general and our country in particular. Africa is blessed with sunlight all year round. Sunlight is important in the peripheral manufacture of vitamin D in the human body. Vitamin D and calcium have been shown to be protective against colorectal cancer. Thus geographical serendipity also plays a part in the provision of factors that keep the incidence of colorectal cancer low in Africans. (33, 34)

Conclusion

Carcinoma of the colon and rectum is about the 2nd commonest cancer in the developed (western) world. However, in developing countries in general and Eritrea in particular has not yet reached such magnitude. This suggests that there may be factors either genetic or environmental which may be responsible for this. The paper acknowledges the reduced incidence of colorectal cancer in developing countries and endeavors to highlight the various factors that produce this observation. The rarity of Adenomatous polyposis syndromes in the developing countries in general and Eritrea in particular contributes to the reduced incidence of colorectal cancer. Cancer prevention and cancer-protective factors are deemed to lie in the starchy, high-fiber, spicy, peppery foodstuff and low animal proteins, which many Eritreans consume. Exposure to sunlight and physical activity are also suggested to be protective against colorectal cancer.

Summarizing the epidemiological characteristics of colorectal carcinoma, we could state that it is a tumor showing close connection with a westernized life-style, most of all with its nutritional behavior, which is a serious health problem in developed countries. The nutritional

recommendations usable in prevention have actually been known for a long time. Despite this fact, no success has been met in making the desired nutritional behaviors acceptable over a wide area. This does not reach the desired level even in countries where health interventions produce highly positive results.

To conclude the number of neoplasm in Eritrea is increasing significantly, which could be due to the changing of the life style of the population. More over the prevalence of colorectal cancer in Maakel zone is relatively high when compared to other zones. The explanation why the incidence of colorectal cancer in Africans as a whole and in Eritrea specifically remains low is rooted in ,the rarity of Adenomatous polyposis syndromes, the protective effects of our starch-based, vegetable-based, fruit-based and spicy, peppery diet and our geographical location which ensures sunshine all year round. The data we have used for Eritrean prevalence is only a hospital based data it does not include any screening results. More over there is lack of awareness of the rural inhabitants leading to a decreased attendance of the inhabitants to the health care centers. Hence the data is less representative of the actual prevalence in our country.

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