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Correlation between different cancers with age, sex, physiological, clinical and nutritional status in Bangladeshi adults

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Abstract

Cancer is one of the leading causes of death all over the world including Bangladesh. Cancer incidence is dependent on different factors like age, sex, physiology, many other diseases and nutritional status. In this study, total 105 cancer patients aged between 20 and 79 were diagnosed; among them 41 patients were male and 64 were female. All of them were diagnosed with either primary or secondary cancer. Histology and use of radioactive molecules confirmed the presence and type of cancer in the patients. Among them those who were diagnosed with coexistence of diabetes or hypertension were more affected with cancer. We also observed that cancer risk was associated with smoking and nutritional status in Bangladeshi patients. These findings indicate that these are correlated with cancers in the Bangladeshi adults. More study will be required to repeat the findings and establish the trend regarding correlation found.

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Introduction

Cancer is the second leading cause of death worldwide and accounts for more deaths than HIV/AIDS, tuberculosis and malaria combined. Cancer patients in the developing countries, like Bangladesh, are far more likely to die of their disease than those in wealthy countries. Half of the estimated 10 million new cancer cases occur in developing countries every year and that number has been predicted to rise to 70% by 2020. Cancer is dependent on age, with the increase of age incidence of cancer may be increased (Hasty, 2002).Cancer incidence differs with different sex. Breast cancer is more than 100 times more common in women than breast cancer in men (Giordano, 2004; World Cancer Report, 2008; National Cancer Institute, 2011). Blood glucose level may be a great regulator of different types of cancer such as high blood glucose level in adult women can develop colorectal cancer (Kabat, 2011). It's possible that elevated glucose levels are linked to increased blood levels of growth factors and inflammatory factors that spur the growth of intestinal polyps, some of which later develop cancer. So the patients those have diabetes may develop cancer at any stage in their life. Most of the people of the developing countries like Bangladesh are depressed about their economical conditions. These depressions are associated with pancreatic cancer (Carney, 2003). There are so many common clinical symptoms among the cancer patients such as weight loss, severe pain at the whole body, nausea, anorexia, and dementia in few cases. Feeling of pain arises due to the anaerobic glycolysis of the cancer patients that can cause the accumulation of lactic acid in the whole body. Nutritional status is also correlated with the cancer development. Diet is an important factor in case of cancer. It has been estimated that 35 percent of cancer deaths may be related to dietary factors (Doll and Peto, 1981). Nutritional deficiency is very common in Bangladesh. Besides, there are so many obese people. Obesity is one of the major causes of many kind of human cancer. An overweight and obese person as well as diabetes person (type II) generally has high level of insulin in their body.

Insulin has the capability to inhibit sex hormone binding globins (SHBGs), thus availability of estrogen may be increased which may cause breast cancer in female because estrogens are needed for the growth of the malignant cells of the breast cancer patients (Fig. 1).
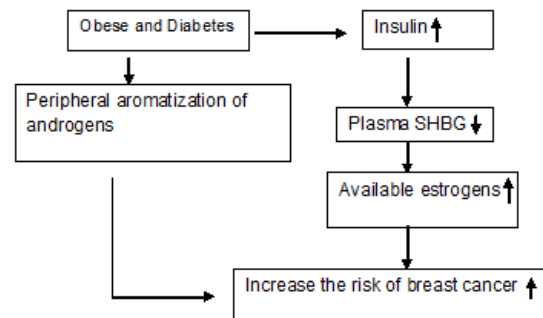

Fig. 1. Correlation of Cancer with obesity and diabetes.

Deficiencies of vitamin (such as vitamin A, vitamin B2, vitamin C, vitamin E) are responsible for esophageal cancer (Yang, 1984). Poor diet is a common scenario in our population which can develop cancer in the head and neck (Bassett, 1983). From all of these we conducted our study to see how much these factors are correlated with cancer and how they regulate the status of the patients. There is no such study that has been carried out till now in Bangladesh. There are more than 100 different types of cancer present in the world but most of them are correlated with the factors mentioned in our study as well.

Materials and methods

Study design

This is an unmasked study to see the correlation of many different important factors with cancer incidence and recurrence. This study was based on Bangladeshi adults that interpret the cancer status in many developing countries of the world like Bangladesh.

Study subjects, sites and sample collection

The data of cancer patients were collected from BSMMU and six other different hospitals. The study included total 105 cancer patients of either sex from Bangladeshi population. Among them 41 were male

and 64 were female. All of them had either primary or secondary cancer. We selected the patients from different parts of Bangladesh as to find an overview and overall scenario about the correlation of cancer with the presumed regulatory factors. Patients were randomized using a computer generated random number table prepared by an independent person not involved in the study. Only the adult patients were involved in the study and biopsy sample were collected from them those who had already developed cancer. Samples were collected by endoscopic method by expert physicians. After collecting all the samples and history from the patients, PET-scan was carried out to see the incidence and type of malignancy.

Histopathology of the cancer patients

Histopathology report contains information about the size, shape, and appearance of a specimen as it looks to the naked eye. This information is known as the gross description. This report helps determine treatment options. In our work, part of the tumor was removed using a needle and examined under microscope for biopsy. Tissues collected during a biopsy were preserved in 10% buffered formalin, after that the tissues were cut into short sections. Then the tissues were processed with the help of tissue processing machine and were embedded with paraffin. The paraffin wax embedded tissues were then sliced into thin sections which were stained using hematoxylin and eosin (H & E) dyes and placed on the glass slide for microscopic observation. These slides were observed under the microscope using Leica Qwin software system.

Positron Emission Tomography (PET) scan to observe the cancer status

PET scan was used to detect cancer and find out the cancer's stage (a way of describing a cancer, such as where it is located, whether or where it has spread, and whether it is affecting the functions of other organs in the body). For the test, a small amount of a radioactive substance was injected into a patient's body through the intravenous injection. This substance is absorbed mainly by organs and tissues those use much energy. Because cancer tends to use energy actively, it absorbs more of the radioactive substance. A scanner then detects this substance to produce images of radio-labeled organs and tissues inside the body. The radioactive substance usually remains in the body for a short time (for 30 to 90 minutes).

Blood sugar and blood pressure measurement

After collecting blood by piercing the skin of finger with a sterile needle, blood sugar was measured by disposable strips which interface with a digital meter. Blood pressure was measured by sphygmomanometric method. All these data were stored and compared to measure the correlation with different cancer.

Nutritional status determined by using body mass index (BMI) calculation

Nutritional status may be an effector of certain types of cancers. So BMI of all of the cancer patients included in our study was determined using the standard equation:

$$BMI = \frac{Body\ Weight}{(Height)^2}$$

Here, body weight is expressed, height is expressed in meter, BMI was expressed as kg/m². Most of the study patients had cancer induced malnutrition. Fifteen subjects were selected. Among them 9 were affected with cervical cancer and 6 had esophageal cancer. 5 cervical cancer patients and 3 esophageal cancer patients were provided with well nutritious foods and the other 4 cervical cancer and 3 esophageal cancer patients were treated as control.

Results and discussion

Baseline demography

Among one hundred and five patients, forty one male and sixty four female patients with a mean age of 37.5 years and average body weight of 49.4 kg were enrolled in the study (Table 1). All patients that were selected in the study developed different types of cancer. The cancer sites and types were different from patient to patient.

Table 1. Demographic data of different cancer patients at the time of admission.

Features	Total study patients (N= 105)	
	Data	P value
Age at enrollment, yrs	37.5 ± 18.80	0.43
Sex, Male: Female	41:64	0.33
Body weight, kg	49.40 ± 6.25	0.10
Duration of symptoms, months	5.42 ± 1.40	0.09
Fever, n (%)	90 (85.71%)	0.03
Pain, n (%)	98 (93.33%)	0.01

Table 2. Age dependency pattern of many types of cancer.

Age range	Occurrence of cancer n (%)
< 25	9.0 (8.57%)
25-30	43.0 (40.95%)
50-75	52.0 (49.52%)
> 75	1.0 (0.95%)

Table 3. Observation of the correlation between the nutritional statuses with the cancer.

Parameters	Malnourished	Well nourished
Cachexia	Yes	No
Anorexia	Yes	No
Nausea	Yes	No
Anemia	Yes	No
Feeling well	No	Yes
Energetic	No	Yes

Cancer and age

It was found that cancer incidence was greater in the aged patients. Many of our study patients developed cancer after the age of 50 years. Twenty four patients had family history of cancer but most of them developed cancer at the middle or last stage of their life. In our study patients we found that more percentage of cancer patients was in the age range of 50 to 75 years (Table 2). Although cancer may develop at any time of the person's life but cancer incidence was more in this age range.

Cancer and difference of sex

Cancer pattern differs in male from female. In our study 60.95% female and 39.05% male were included. Some types of cancers have been found to have more incidences in male whereas some other cancers in female. Such as breast cancer incidence was more in female (ten times) than male. On the other hand colorectal cancer occurrence was more in male. In this study among the 64 females, there were 22 patients affected with left or right breast cancer and the rest were affected with other types of cancers. About 30 percent female were affected with breast cancer. On the other hand, only two of the male were affected with breast cancer and their age was over 60 years.

Table 4. Correlation of hypertension and diabetes with the recurrence of cancer.

	HTN Present	HTN Absent	Diabetes Present	Diabetes Absent
% of patients	45	55	36	64
Recurrence of cancer (n%)	92	57	66	80

Smoking and cancer

To observe the correlation of cancer with smoking, study patients were divided into different groups. One who smokes from past till now, the present smoker only and past smoker but presently nonsmoker. In this study it was found that 82% patients were smoker, 10% were non smoker and the rest took different tobacco. The cancer status of adult smokers were severe than the nonsmokers of same age and same physical condition. So there is a strong correlation between smoking and incidence of cancer (Fig. 2).

Correlation between nutritional status and cancer

In addition to the cancer induced malnutrition, most Bangladeshi people are basically malnourished. Most cancer patients suffer from cachexia, muscle wasting, nausea, anorexia, anemia and decreased quality of life. In this study 15 subjects were randomly selected, among them 9 were affected with stage III cervical cancer and 6 subjects had esophageal cancer. 5

cervical and 3 esophageal cancer patients were provided diet consisting of all nutritional elements properly and the other 4 cervical cancer and 3 esophageal cancer patients were observed as control. It was found that after receiving chemotherapies the condition of the patients provided with well nourished food were improved from the coexisting problems of cancer compared to the controls (Table 3).
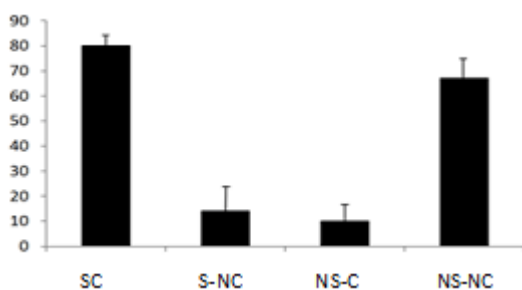

Fig. 2. Smoking and cancer correlation. Here, SC= Smoker and developed cancer, S-NC= Smoker but did not develop cancer, NS-C= Non-smoker and developed cancer, NS-NC= Non-smoker and did not develop cancer

Correlation of hypertension (HTN) and diabetes (DM) with cancer
In this study, it was found that HTN has correlation with cancer. Most of the hypertensive patients who had cancer recurrently got cancer after receiving the recommended therapies.

In case of diabetes, blood sugar is elevated. Type II diabetes has association with pancreatic cancer, non-Hodgkin's lymphoma, colorectal, prostate, endometrial, liver, breast, and renal cell cancers. Diabetes interferes the cancer by reducing the healing of infections. In our study patients we found 45% hypertensive patients and 36% of diabetes patients and recurrence of cancer among them was 92% and 66% respectively (Table 4).

Histological outcomes
From histological observation we found that cancer rapidly spread and cause severe erosions. With the recommended therapies we found partial recovery but cancer may persist and cause recurrent attack to the cancer patients. In the patients who had HTN,

diabetes or nutritional deficiencies and old age, their hematoxylin and eosin (H & E) staining slides showed more severe infections and erosions. The slides showing that there were so many cells due to the presence of cancer. We found that many RBCs were present in the tissue slides that indicated the erosion during the cancer in the patient's tissue. Receiving the treatment the number of cell may reduce but still there can be the presence cancerous cells. Cancer, basically, is the uncontrolled growth of cells. Again, there are different types of cancers. The pathology of cancer patients is different. It is said that cancer status is different as two people is unlike in the world. We found that cancer is highly correlated with age, sex, physiological, clinical and nutritional status of a person. With the increase of age occurrence rate of cancer is being high. It may be because of the vulnerability of the cells to be mutated and exposure to radiation and toxicity. We found that between the age of 50 to 75 years cancer risk and occurrence rate is very high. Cancer is also sex dependent as we found that between the age of 40 years and 75 years, cancer occurrence in female is high. However, in this period male subjects are less vulnerable than female. But after the age of 60 years male are more vulnerable than female (National Cancer Intelligence Network; White, 2011). On the other hand after the age of 84 years cancer incidence is lessen for either sex. Around a quarter (25%) of cases diagnosed in elderly men are prostate cancers. Some evidence suggests that prostate cancer in men aged over 70 years is more aggressive, is often diagnosed at a more advanced stage, and has a larger tumor volume compared to men aged 69 and under (Delongchamps, 2009; Sun *et al.,* 2009).

Cancerous patients with the coexisting diabetes are more vulnerable. Because the growth of many cancers is dependent on the availability of estrogen and the insulin (which is increased in diabetic person and has the ability to increase the level of estrogen), so the diabetic person has high incidence of cancer.
High blood pressure also has a correlation with cancer. Because of the inadequate blood supply for the elevation of the interstitial fluid pressure during

hypertension (HTN), inadequate delivery of drugs to solid tumors takes place. With the recommended therapies cancer can't be cured because of persistent infection and other coexisting problems such as diabetes or hypertension.

Smoking is another causal agent of cancer. As early as the 18th century many believed that tobacco could only cause cancer of lips, throat and tongue and at present it is also clear that tobacco can increase the hazard of lung cancer (Proctor, 2004).

Nutrition plays major (but not always their role is fully understood) roles in many aspects of cancer development and treatment (Reeves, 2007). Malnourished and undernourished people are highly suffered with the cancer related consequences than the well nourished people with the same cancer. Malnutrition is a common problem in cancer patients that has been recognized as an important component of adverse outcomes, including increased morbidity and mortality and decreased quality of life. Weight loss has been identified as an indicator of poor prognosis in cancer patients (McMahon, 1998).Good nutrition practices can help cancer patients maintain weight and the body's nutrition stores and improved quality of life (Brown, 2003).Poor nutrition practices, which can lead to malnutrition, can contribute to the incidence and severity of treatment side effects and increase the risk of infection, thereby reducing chances for survival (Vigano, 1994). Overweight and obesity increase the risk of developing several cancers. Once cancer develops, individuals may be at increased risk of recurrence and poorer survival if they are overweight or obese. A statistically significant association between overweight or obesity and breast cancer recurrence or survival has been observed in the majority of population-based case series (McTiernan, 2005). In this study we found that 50% of our female patients were overweight to obese (average BMI 29.12) and about 30% of female subjects were underweight (average BMI 17.85). In case of male subject 46% were underweight (average

BMI 18.51) and 36% were overweight (average BMI 27.86).

From these observations we can say that cancer incidence was correlated with both malnutrition and overweight. From this study we can clearly understand the correlation of different factors (age, sex, physiological, clinical and nutritional status) with different types of cancer in Bangladeshi population. However, larger population size and longer time period of study is needed to ascertain these correlations.

Acknowledgement

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