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Extents of environmental and heritability effects on cancer: a cross-sectional study at sylhet city in bangladesh

Abstract

Background: Cancer is one of the major killer diseases throughout the world. Cancer effected people are increasing very rapidly in the developed countries as well as developing countries. Usually causes of cancer have already been known in the world, however it's still unknown epidemiologically that what's the extents of heritability and environmental effects on cancer diseases. Many studies have been performed to uncover the reasons of cancer; however, to the best of our knowledge none study has been performed to know the extents of environmental (Body Mass Index (BMI), exercise, food preferences etc.) and heritability (blood connected people who are suffering from cancer or died because of cancer) effects on cancer.

Methods: A cross-sectional study was conducted to collect the data of this study. Data were collected using a purposive sampling named 'snowball sampling' based on a semi-structured questionnaire from the cancer patients in Sylhet, Bangladesh visiting home, hospital, oncologists chambers. We have collected data total two months. Descriptive statistical tools were used for univariate analysis and Partial Least Squares Path Model (PLSPM) was used for multivariate analysis.

Results: We found total 140 patients and ratio of male and female patients are 1:1. Results show that average age of male is 54 years and female is 48 years; average BMI of male is 23.91 and female is 24.38. Most of the Male patients are affected by lung and stomach cancer followed by throat and liver. And most of the female patients are affected by breast cancer followed by stomach, ovary and liver cancer. The results of PLSPM show that extent of environmental effect (path coefficient=0.37) is more than the heritability effect (path coefficient=0.15). These revealed that higher BMI, less exercise, and taking more junk food and meat might be the more influential factors for cancer.

Conclusion: Taken together, we may conclude that the extent of environmental effect is higher than that of heritability effect. It's also clear that cancer patients are increasing in Sylhet city. Therefore, we should conscious about taking food (i. e; taking fresh vegetables, fish, etc. and should avoid fatty foods). Taking care of our body weight and doing exercise regularly.

Keywords: cancer, environmental, heritability, partial least squares path models, bangladesh

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Abbreviations: NICRH, national institute of cancer research and hospital; WHO, world health organization; BSMMU, bangabandhu sheikh mujib medical university; PLS- path model, partial least squares path model; SEM, structural equation modeling; BMI, body mass index; PLSPM, results of partial least squares path models; IARC, international agency for research on cancer

Introduction

Human health and environmental health are intimately intertwined. Despite the surge in international recognition of the link between the environment and health, the burden of disease in developing countries including cancer is increasing. Environmental threats to health are aggravated by persistent poverty and social inequity.[1] According to the World Health Organization, cancer is the leading cause of death worldwide as it accounted for 7.4 million deaths (around 13% of all deaths) in 2004. The total burden of cancer across the world is estimated to be around 22 million and approximately 10 million new cases of cancer are diagnosed every year across the world. Hence the great majority of new cases (more than 60%) are from the developing world. Cancers in all forms are causing about 12% deaths throughout the world. In developing countries cancer ranks third as a cause of death and accounts for 9.5 % (3.8 million) of all deaths.[2] Cancer is a group of diseases caused by unregulated growth and spread of neoplastic cells.[3] Other terms used for cancer are malignant tumors and neoplasms. One defining feature of cancer is the creation of abnormal cells that grow beyond their usual boundaries, and which can then invade adjoining parts of the body and spread to other organs. This process is referred to as metastasis.[4] There are particular genes known as "oncogenes" which are present in normal cells. DNA damage caused by environmental factors, such as tobacco smoke, can trigger abnormalities or mutations in these genes, resulting in increased and abnormal activity of the gene. This can then cause the gene to become cancerous. A variety of genetic syndromes illustrate how inherited diseases are component causes of cancers and how environmental exposures may produce unfortunate reactions, such as cancers, in large populations. Environmental factors by themselves are believed to explain approximately 80 percent of

all cancers, while genetic host factors alone are believed to explain only 5 percent of all cancers.[5,6] Cancer is not a modern disease, but as cancer risk increases steeply with age, it is more common nowadays due to increasing life expectancy. It has been estimated that the incidence of cancer will double between 2000 and 2020 and nearly triple by 2030.[7] Until recently, cancer has been considered a disease of westernized, industrialized countries, however, in 2008, 56% of new cases (7.1 millions) and 63% of all cancer deaths (4.8 millions) were reported by low- and middle-income countries.[8] Cancer is a multifactorial disease due to a combined effect of genetic and external factors acting concurrently and sequentially. Overwhelming evidence indicates that the predominant contributor too many types of cancer is the environment.[9]

Like many other countries in the world cancer in Bangladesh is one of the major killer diseases. The National Institute of Cancer Research and Hospital (NICRH), Dhaka, started a cancer registry in 2005 for the first time in Bangladesh with technical assistance from the World Health Organization (WHO).[10] Their results revealed that lung cancer was the leading cancer (17.3%), followed by cancers of breast (12.3%), lymph nodes and lymphatics (8.4%) and cervix (8.4%). In male, lung (25.5%) and in female breast (25.6%) and cervical (21.5%) cancers were predominant. Lung cancer in males and cervical & breast cancer in females constitute 38% of all cancers in Bangladesh. According to the latest WHO data published in April 2011 – oral cancer deaths in Bangladesh reached 11,562 or 1.21% of total deaths. The age adjusted Death Rate is 12.52 per 100,000 of population ranks Bangladesh 4th in the world. At present, there are 1.2 milion cancer patients in Bangladesh while approximately 2,50,000 new patients, mostly women, are added every year creating a social burden on the country. The country's women are now in danger of being affected by cervical cancer, one of the sexually transmitted diseases that claim the life of 18 women every day in the country for lack of awareness.[11-13] The National Institute of Cancer Research and Hospital and Bangabandhu Sheikh Mujib Medical University (BSMMU) cancer registry data revealed that 60% of the cancers in the male and 5% of the cancers in female are tobacco related.[14] Cancer has been appearing as important health problem in Bangladesh. Due to lack of research on environmental and heritable causes of cancer, its incidence is rising in our country day by day. It is therefore important to gather information about risk factors of cancer to address it smoothly. Various studies have been carried out in our country[10,14-21] as well as in abroad,[6,22-26] but still there is scarcity of significant study to investigate the role of heritability and environment on cancer. It is seen that most of the studies have been conducted to see the percentages of different cancers across the country and causes of cancers. However, it is important to know the extents of environmental and heritability effects on cancer. To the best of our knowledge none study has been conducted on this issue. Therefore, we are interested to conduct a study to determine the extents of environmental and heritability effects on cancer. To know the extent of environmental factors and heritability factors, a primary cross sectional data was collected based on a questionnaire in Sylhet city, Bangladesh. This study gives an idea about the status of cancer in Sylhet city and mainly which factor are more prominent in causing cancer- environment or hereditary. This study reveals that lung and stomach cancer are the leading cancer in male and breast cancer in females. Smoking, unhealthy diet, infection, smokeless tobacco, obesity, unwilling to do physical exercise and other factors found out to be main causes of various cancers. We observe that effects of environmental factors are more extent than heritability factors.

Methodology

Data

In order to conduct this cross-sectional study a primary data were collected based on semi-structured questionnaire from the patients in Sylhet city, Bangladesh during July-August, 2015. We used a non-parametric sampling known as snowball sampling because this type of sampling technique works like chain referral. After observing the initial patient we asked for assistance from the patient to identify people with a similar case. We then observed the nominated patients and continue in the same way until the obtaining sufficient number of patients. We visited several hospitals and clinics where cancer patients were taking chemo-therapy. We also visited several chambers of oncologists where cancer patients were coming for advice about cancer treatment. As the cancer patients are not so available so we stopped the data collection after obtaining our relevant information from 140 samples. The research study was carried out by maintaining the national laws and regulations of the country and the hospital. We followed some inclusion criteria of the patients, these are: all age ranges, both Male and female, patients willing to sign informed consent formand patients who are taking treatment. We also confirm that the study was reviewed and approved by the review board of University Research Center, Shahjalal University of Science and Technology, Sylhet, Bangladesh before the study began. Patients, height and weight were measured using valid equipment and others information were obtained by asking them as well as their relatives following a questionnaire. Then the questionnaire as well as the research protocol was send to the hospital and clinic authorities and were getting permission for data collection. Doctor, nurses and other medical stuffs gave permission to collect data from the cancer patients. Patients gave their information freely and they were well informed about the collection procedure. Variables used in this study are: demographic information was collected based on age, gender, height, weight (before cancer) and weight (after cancer). Weight of before cancer was collected observing their medical file. Some other cancer related variables are: type of cancer, stage of cancer etc. For Heritability information- we asked the patients about their parents or blood connected people are suffering from cancer or not. For environmental information- we collected patients' preferences on different kinds of food by Likert scale, previous or currently suffered by other diseases. To know the extent of heritability and environmental effects on cancer we used partial least squares path model. Following shows the description of PLS-path model.

Partial least squares path model (PLS-path model)

The Partial least Square Path Modeling (PLSPM) method to Structural Equation Modeling (SEM) allows estimating complex cause effect relationship with latent variables. It is a component based estimation approach that differs from covariance based structural equation model.[27,28] Recently, PLS path modelling has been used by a growing number of researchers from various disciplines. PLS methodology has also achieved popularity in empirical research. PLS is a more appropriate when sample sizes are small, when assumptions of multivariate normality and interval scaled cannot be made, and when the researcher is primarily concerned with prediction of the dependent variable.[29] The PLS parameter estimates properly reveal the strength and direction (i.e., positive vs. negative) of the relationship among variables compared to correlation coefficient. The PLS technique is justified where theory is insufficiently grounded, and

the variables or measures do not conform to a rigorously specified measurement model, or fit a certain distribution.[30,31] The following figure shows the primary structure of our path model to determine the effects of heritability and environmental on cancer. Every node indicate dimension of path model and each node is a function of a set of factors/variables that are associated with the respective dimension. The dimension 'heritability' may contain cancer disease of individuals' inheritance (paternal side or maternal side), the dimension 'Environmental' may contain Body Mass Index (BMI), Food habit, Physical exercise etc. and 'Cancer' may contain different kinds of cancer exist or not of each individual. We are interested is to determine the value of the parameters 'a' and 'b' to estimate the extent of heritability and environmental effects on cancer and 'c' to find out the effect of environment on heritability. Latent variable Environment (X) has 10 manifest variables (x_s) namely body mass index before cancer, exercise, rice, vegetables, fish, beverages, meat, junk food, betel nut and fruits. Latent variable Heritability (Y) has 8 manifest variables (y_s): father, mother, brother, sister, grandmother, grandfather, cousin paternal and cousin maternal. Latent variable Cancer (Z) has 13 manifest variables (z_s): other, breast, brain, lung, liver, blood, stomach, colon, throat, ovary, male reproductive organ, skin and mouth. The levels of each manifest variable in heritability and cancer are 'Yes' and 'No'.

The mathematical form of outer model is

$$X = a_{11}x_{11} + a_{12}x_{12} + \ldots + a_{110}x_{110}$$

$$Y = c_{11}y_{11} + c_{12}y_{12} + \ldots + c_{18}y_{18}$$

$$Z = b_{11}z_{11} + b_{12}z_{12} + \ldots + b_{113}z_{113}$$

In outer model Principal Component Analysis is used and considered first Principal Component in each group and they are noted as x, y and z. These components were used as variables in inner model to run our PLS-path model.

Inner model

Environment has direct effect on cancer and indirect effect on hereditary. Hereditary has direct effect on cancer.

The mathematical form of inner model:

$$z = ax + by + \varepsilon_1$$

$$y = cx + \varepsilon_2$$

Here,

x = PC1 of Environment group

y = PC1 of Heritability group

z = PC1 of Cancer group

a, b and c are the path model coefficients and refers to error term.

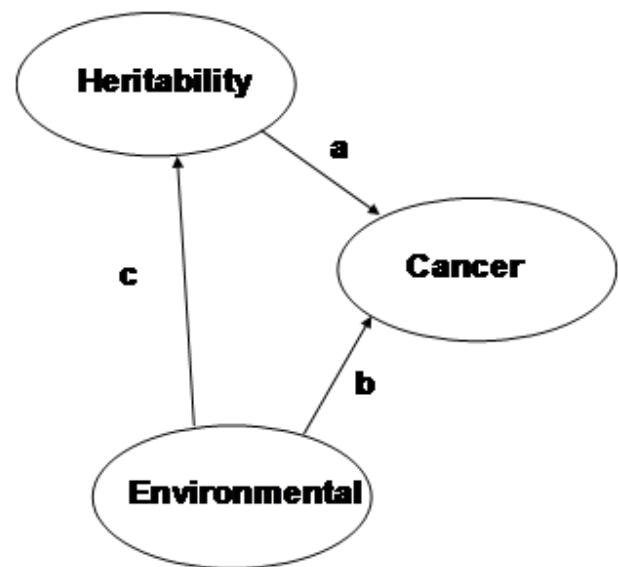Descriptive analyses were done by MS excel and SPSS. For solving path model the 'plspm' package in R program was used.

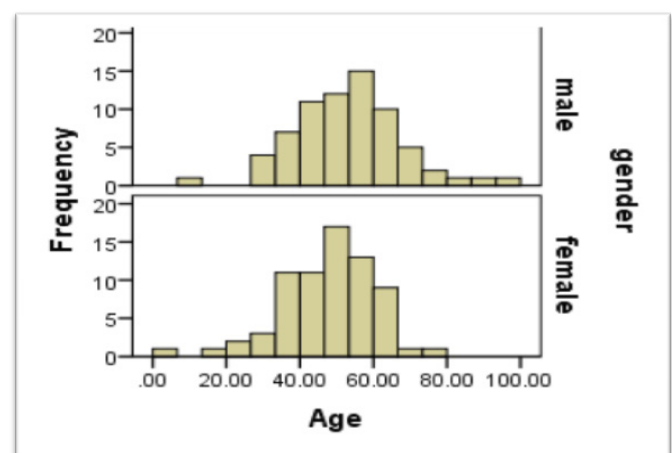**Figure 1** Path diagram of heritability and environmental effect on cancer.

Figure 2 Distribution of patients according to their age.

Results

Descriptive measures of some demographic variables

To know the status of cancer in Sylhet city, as univariate approach at first we calculated some descriptive measure of demographic variables of age and BMI (kg/m²) of male and female separately of total 140 cancer patients. We found that ratio of male and female is 1:1, average age of male is 54 years with standard deviation is 14.8 and average female age is 48 years with standard deviation 13. It indicates that females are suffered by cancer comparatively lower age than male. It is also seen that from age 40 to 60 females are higher than male and some patients were found over age 80 in male (Figure 2). We collected patients, height, weight (after cancer that is weight at the time of data collection) and weight (before cancer- that is initial weight at the time of diagnosed and it was collected by observing their medical file). Afterwards, we calculated BMI (before cancer) and BMI (after cancer) using the formula of BMI = height / weight2. We also grouped BMI based on different health statuses (underweight below 18.5, Normal from 18.5 to 24.9, Overweight from 25.0 to 29.9 and

Obesity 30 and above). The following Table 1 shows the descriptive measures of each BMI group of before cancer and after cancer of male and female. We found more overweight and obese patients in female patients than male. From Table 1, on average BMI before and after cancer for female patients were more than that of male, i.e. female patients were more obese than male. None individual was found in obese group of male in after cancer. The results also indicate that after cancer females' weights were increased than that of male. It was also shown in Figure 3 (A and B). It was also seen that BMI after cancer, overweight and obesity decreased for male and female increased. Overall we observe that BMI after cancer is decreased.
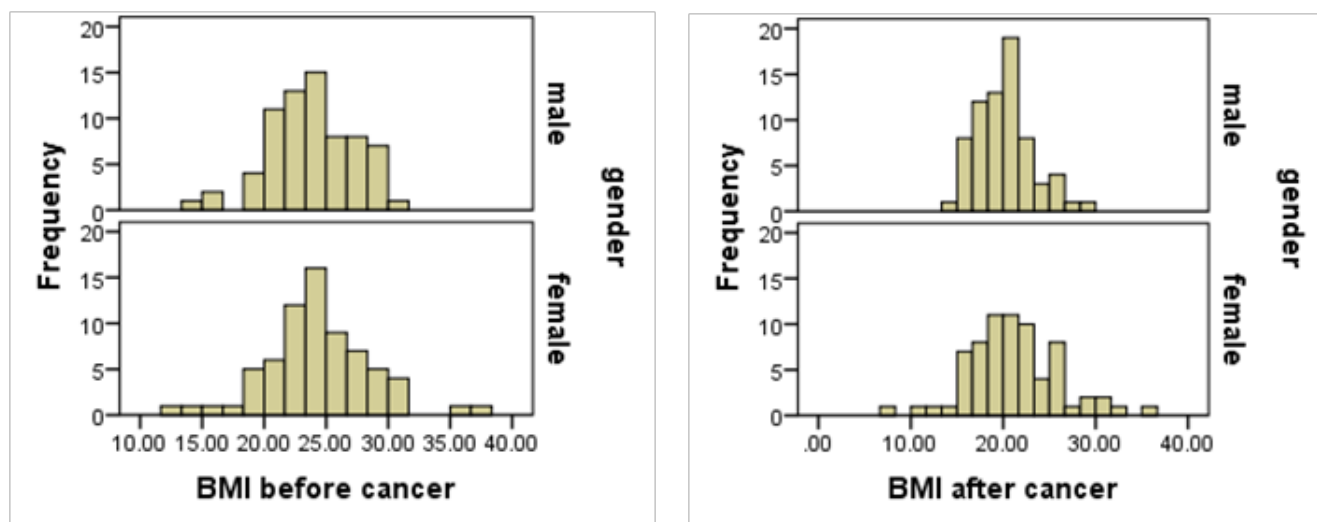

Figure 3

    a. BMI before cancer for male and female.
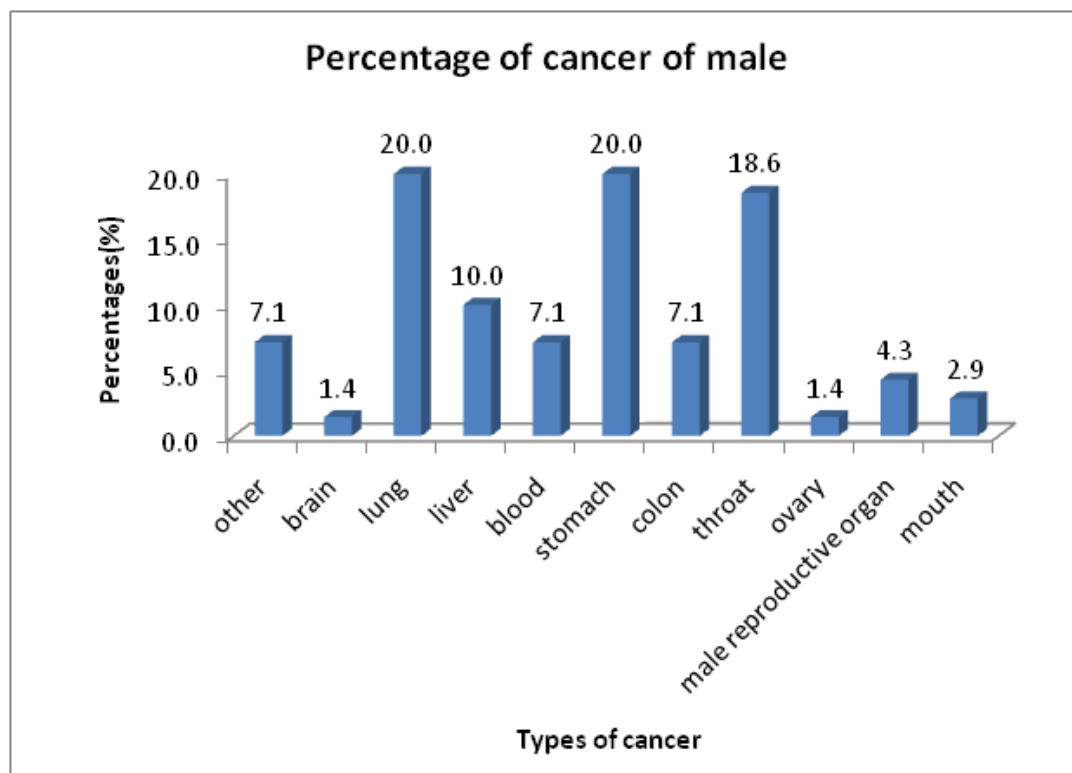
    b. BMI after cancer for male and female.

Figure 4 Distribution of male patients according to types of cancer.

Distribution of patients according to types of cancer

We plotted bar diagrams of male and female patients separately to know the percentage of patients who are suffering by different cancer diseases. In comparison with male and female , lung (20%) and stomach (20%) cancer were top in the rank for male followed by throat (18.6%), liver (10%), colon (7.1%) etc. (Figure 4) whereas for female it was breast cancer (34.3%) followed by stomach (14.3%) ,throat (12.9%), ovary (11.4%) etc. (Figure 5).
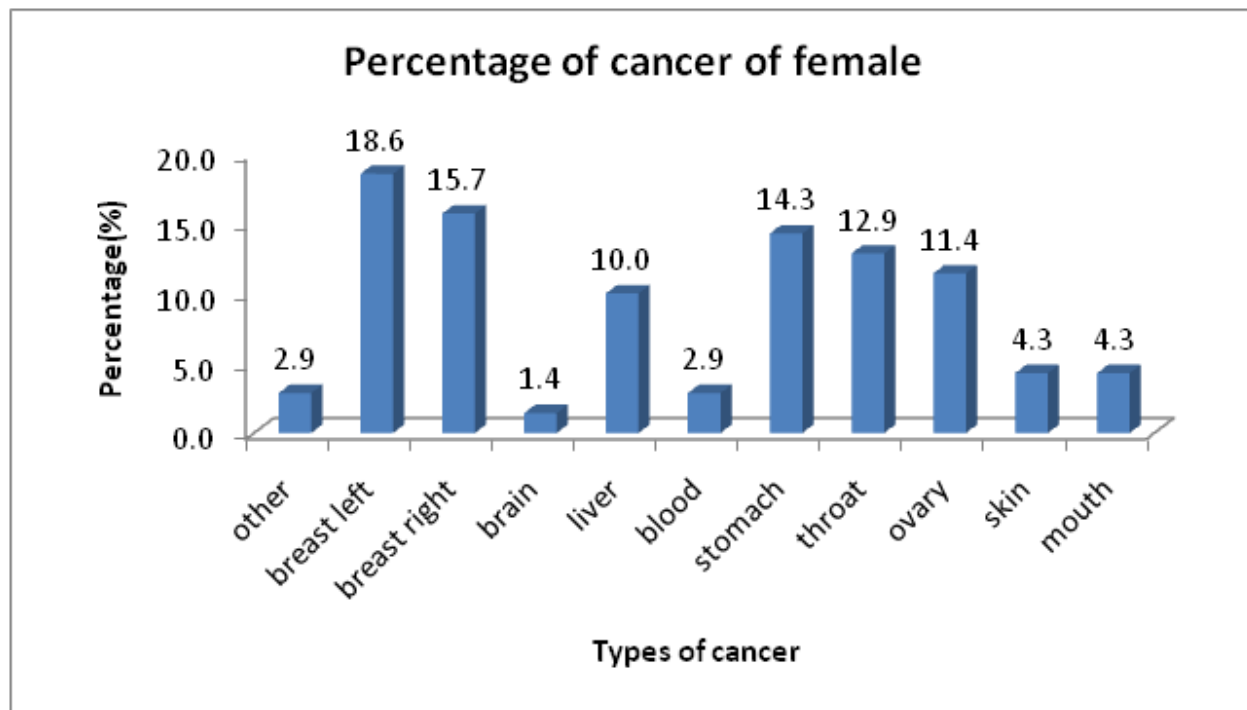

Figure 5 Distribution of female patients according to types of cancer.

Table 1 Descriptive statistics of the different groups of BMI (kg/m^2)

Gender	BMI Group	BMI (Before Cancer)			BMI (After Cancer)		
		Mean	Std. Deviation	N	Mean	Std. Deviation	N
Male	Underweight	15.6192	0.98611	3	17.0092	1.08993	23
	Normal	22.427	1.74864	43	20.8856	1.41103	41
	Overweight	27.4409	1.58105	23	26.4385	1.16624	6
	Obese	31.25		1			0
	Total	23.9087	3.46154	70	20.0879	2.9455	70
Female	Underweight	16.3205	2.56758	6	15.8789	2.64289	21
	Normal	22.7909	1.64897	37	21.4981	1.70398	34
	Overweight	27.2724	1.24273	21	26.7841	1.28695	11
	Obese	32.1311	2.98301	6	32.4447	2.24528	4
	Total	24.3813	4.21446	70	21.2685	4.98295	70
Total	Underweight	16.0867	2.11811	9	16.4698	2.04517	44
	Normal	22.5953	1.70237	80	21.1633	1.57011	75
	Overweight	27.3605	1.4158	44	26.6621	1.22031	17
	Obese	32.0053	2.74339	7	32.4447	2.24528	4
	Total	24.145	3.84984	140	20.6782	4.12108	140

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Descriptive analysis of some other categorical variables

We also found that 84% male patients did not exercise before cancer where 16% did exercise and 91.4% female patients did not exercise before cancer where 8.6% did exercise. These suggest that lack of physical exercise may cause cancer. Results showed that only 17.9% patients had cancer in their family history and 82.1% had no cancer in their family history. Therefore, heritability might not play important role to be a risk factor for cancer.

Results of Partial Least Squares Path Models (PLSPM)

To know the extent of environmental effect and heritability effect on cancer, we considered multivariate analysis. To do that, we grouped the manifest variables in environmental, heritability and cancer dimensions. The results of PLS-path model were depicted in the Figure 6. We observed that a total effect of environmental on cancer was 0.37, among these direct effect was around 0.33 and indirect effect was around 0.04. Indirect effect means cancer is not only affected by environment but also affected by heritability via environment. The effect of environmental on heritability was 0.23 and the effect of heritability on cancer was found 0.15. These indicate that environmental factors are more influential on cancer than the heritability factors. Observing the loadings of each dimension, we found that for Environmental dimension BMI that is obesity plays an important role on cancer followed by beverages and other carbohydrate and fat related foods; for heritability dimension mother's and sister's cancer might play role on individual's cancer; and for cancer dimension, we found breast cancer was top in the rank for female followed by stomach, ovary etc. and for male it was stomach and lung cancer. We also found that goodness of fit our path model is very good for the outer model (0.74) good for the inner model (0.49). That is overall the model is fitted well. Outer model shows the association between manifest variable and latent variable of each dimension, that is the outputs are the loadings. Inner model shows the results of path coefficients considering first principal component of each dimension. Because of less sample size p-values were not possible to calculate by bootstrap method. Therefore, we should consider more sample size in further research.
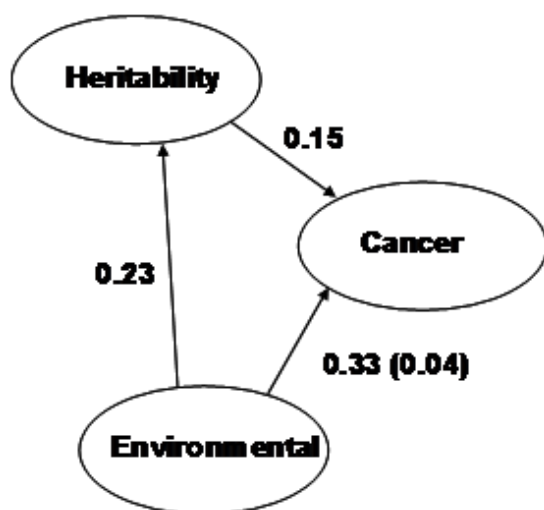

Figure 6 Path diagram of PLS-path model.

Discussion

Cancer kills more people globally then tuberculosis, HIV, and malaria combined. In the 1960s, almost 25% of global cancer burden was diagnosed in low-income and lower middle income countries. In 2010, nearly 55% of the global cancer burden was found in these countries. By 2030, over 13 million people will die from cancer every year. Almost 9 million (about 70%) of these deaths will be in developing countries.[32] The top five malignancies are lung, breast, cervix uteri, lip and oral cavity, and esophagus, considering both sexes. Lung cancer tops the list in the case of men and breast cancer tops the list in the case of women.[32] Frequency of different types of cancer occurring in Bangladeshi population is not similar with that of other population groups worldwide. Ethnicity, genetic predisposition, life style, socio-economic condition, environmental pollution and many other risk factors interplay for the different distribution which is also evident in a number of other study findings. In this study, environmental and heritable factors are considered as primary contributor to the development of cancer. Primary cross sectional data were collected based on a semi-structured questionnaire from Sylhet city, Bangladesh. Total 140 patients were interviewed in two months of data collection where male and female ratio was 1:1. A similar study was done at the National Institute of cancer research and hospital (NICHR) in 2006.[33,34] In this study, data was first analyzed in univariate approach and then multivariate approach (using partial least square path model).It has been observed that the highest number (54.23%) of patients were in 41-60 years age group, followed by 33.38% in 21-40 years age group.[22] In this study, average age for male is 54 years and average age of female is 48 years, which indicates that females are affected by cancer comparatively lower age than male. Another study was done in National Institute of Cancer Research of Bangladesh, where 3.9% patients were of paediatric age group (0-15yrs) and 19.1% in older age group that is majority lied within the middle age group and the common cancers were cancers of lung, lymphatic organs, larynx, oral cavity and skin in adult males and breast, cervix, lung, oral cavity, lymphatic organs, ovary in females.[15] Bangladesh Cancer Registry Report showed that maximum number of the cancer patients were in age group between 30-65 years, which is around 66% NICR.[35] In a recent study[13] on cancer scenario update of Bangladesh, cancer of lung and mouth-oropharynx rank as the top two prevalent cancers in males. Other common cancers in males are oesophageal cancer, stomach cancer, lymphomas, and multiple myeloma. In women, carcinoma cervix and breast cancer are the most prevalent followed by mouth-oropharynx, lung and oesophageal cancer. A similar study on 232 cancer patients attending Dhaka Medical College Hospital in 2010 showed the most common malignancies were cancers of respiratory tract, female genital organs, head-neck and breast. In India, the most common cancers are of lungs, breast, colon, rectum, stomach, oral cavity and liver.[36] Most prevalent cancers in Pakistan are lung, oral cavity, larynx, urinary bladder in male and breast, oral cavity, ovary, cervix, oesophagus in female.[37] In the present study, it was found that among male, the highest no of cancer is in lung (20%), and stomach (20%) followed by throat (18.6%), liver (10%), colon (7.5%) and blood (7.1%). Among female, the highest number is in breast (34.3%), followed by stomach (14.3%), throat (12.9%), ovary (11.4%) etc. Studies revealed that lung cancer is the leading cancer in male in our country.[38] This study also conforms to this claim. The underlying main cause of lung cancer is tobacco. Present study also found that cancer patients who used to take Betel leaf and Tobacco smoking frequently, mostly suffering from lung

and stomach cancer. In Indian subcontinent, carcinomas of breast and cervix are the commonest malignancies in female. In a survey, it was found that most women are affected by three types of cancer in this subcontinent which are breast cancer (23.62%), cervical cancer (17.71%) and ovarian cancer (13.65%).[20] According to World Health Organization (WHO) 2012 reports, breast cancer is the leading cause of death in women, accounting 23% of all cancer deaths. In Asia, one in every three women faces the risk of breast cancer in their lifetime as per reports of WHO 2012. Among different types of cancers, breast cancer is a heterogeneous and hormone dependent cancer, representing about 2.9%of total female cancers and it is the second most common type diagnosed in women of developing countries.[8] From the present study, we also found that breast cancer is in the leading position among female patients. Infection, tumor and more fatty related food may cause this kind of cancer .The International Agency for Research on Cancer (IARC) has concluded that there is sufficient evidence of a cancer-preventive effect of avoidance of weight gain for cancers of the colon, breast (in postmenopausal women), endometrium, kidney (renal-cell carcinoma), and esophagus (adenocarcinoma).[39] Present study revealed that average BMI for female patients were more than that of male i.e. female patients were more obese than male. Findings also show that after cancer, females weights were increased than that of male. Overweight and obese patients decrease after cancer in male but increase in female. Overall, BMI after cancer decreased. Many cancer patients are overweight or obese and do not engage in regular physical activity. This study also found that 84% male patients did not exercise before cancer where this percentage for female is 91.4%, this suggest that lack of physical exercise may be a cause of cancer .The study observes that only 18% of all cancer cases are due to genetic defects and the remaining 82% are due to environment and lifestyle. In our present study, only 18% blood connected cancer patients were affected by cancer. In multivariate approach, our PLS-path model also showed that heritability effect is less than environmental effect on cancer. Indicates environmental factors (overweight and obesity, less exercise, taking more junk and fat related food) are more responsible than heritability factors (blood connected people who are suffering from cancer or died because of cancer). Path model also confirms that environmental factors are more susceptible on causing cancer. The PLS-path model found that total effect of environment on cancer is 0.37 and the effect of heritability on cancer is 0.15. Environmental dimension BMI that is- obesity plays an important role on cancer followed by beverages and other carbohydrates and fat related foods. For heritability dimension, mother's and sister's cancer might play role on individual cancer.

Conclusion

This study gives an idea about the status of cancer in Sylhet city, Bangladesh and mainly which factor causes of cancer environmental or hereditary. The study revealed that large numbers of patients have been suffering from lung, stomach, breast cancer followed by throat cancer, lung, liver, ovary, blood, colon, mouth, male reproductive organ, skin, brain and other cancer etc. Among these most of the males patients have been suffering from lung and stomach, and females from breast and stomach cancer. From this study, we observed that patients those smoked and taking betel nuts have been suffering from lung and stomach cancer respectively. The worldwide burden of cancer could be prevented in a significant proportion through the application of existing cancer control knowledge, and by implementing programs for tobacco control, and early detection and treatment, as well as public

health campaigns promoting physical activity and healthier dietary preferences and lifestyles.[40] We observed only 18% of all cancer cases are due to genetic defects and the remaining 82% are due to environment and lifestyle provides major opportunities for preventing cancer. Our path model also confirms that environmental factors are more responsible on cancer. Because tobacco, diet, infection, obesity, and other factors contribute to the incidence of all cancer, so now it is clear that how we can prevent cancer. Patients diagnosed with lung cancer are cigarette smokers. Similarly, smokeless tobacco is responsible for 400,000 cases (4% of all cancers) of oral cancer worldwide.[41] Thus avoidance of tobacco products and minimization of alcohol consumption would likely have a major effect on cancer incidence. Also Physical inactivity has been linked with increased risk of cancer of the stomach, breast, throat, lung, liver, ovary, blood, mouth, male reproductive organ, colon etc. Taken together we may conclude that day by day cancer patients are increasing in Sylhet city. We also conclude that the extent of environmental effect is more than the heritability effect. As recommendations we could say at early stage treatment of cancer is one of the best ways to stop spread of cancer. So it is essential to diagnosed as soon as possible. To do that people should know about the symptoms of different cancers. From the survey, we found that most people have no idea about cancer and its risk factors. It needs to increase public awareness regarding this matter and government needs to come forward. They can publish the causes and prevention procedures of different cancers in local and national newspapers, advertising in several radios and TV channels. Now-a-days any one can do this job by advertising it in online social media, however many people in our country are out of online facilities. Cancer treatment is very expensive in almost everywhere in the world. Almost all of the patients said that they have already expended 200,000-300,000 taka for their cancer treatment and now they are in big trouble for their livelihood and management of money for their treatment. Government should give more subsidies into the health sectors so that poor and middle class people get free treatment and buy medicine at low cost. In Bangladesh numbers of specialized hospitals for cancer treatment are not so available. Government should established specialized cancer hospitals at district level as well as should develop cancer treatment facilities in medical based hospitals. The government of Bangladesh needs to rethink its present health care provisions and work with NGOs. The cost is a major factor for many developing nations; research has shown an effective awareness program may reduce the incidence of developing some cancers. There are some limitations of this research that we were unable to collect more sample size because of short time. Also our sampling was purposive sampling. So, further studies can be conducted considering more sample size and following random sampling techniques.

Author's contribution

MOU Conceived the idea for the study, designed the research, analysis and interpretation of data, drafted the manuscript, revised it critically for important intellectual content, and final approval of the version to be submitted, AK: Collected the data, helped to analyze the data, drafted the manuscript and final approval of the version to be submitted, NS: drafted and revised the manuscript and final approval of the version to be submitted, MB: helped to write the manuscript and final approval of the version to be submitted, MJHJ: draft the manuscript, helped to revise and finalizing the manuscript and final approval of the version to be submitted.

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Conflict of interest

None.

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