CURRENT SCENARIO OF CANCER IN DHAKA CITY, BANGLADESH.

Submitted By

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Batch: Spring 2011

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March 28, 2015

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This dissertation is submitted to the Department of Pharmacy of BRAC University in partial fulfillment of the requirement for the degree of Bachelor of Pharmacy

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DEDICATION

Dedicated to my mother, who has sacrificed her every desire since my birth to make me a real man and who always inspires me in every steps of my life.

DECLARATION

I, Bratakatha Nath, declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

Signature……. Date: 28th March' 2015.

APPROVAL

This project entitled '**Current scenario of Cancer in Dhaka City, Bangladesh**' prepared and submitted by **Bratakatha Nath** in partial fulfillment of the requirements for the degree of Bachelor of Pharmacy has been accepted and examined.

Nishat Zareen Khair

Project supervisor

Date:

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Abstract

Bangladesh is a densely populated country with a population of almost 170 million. Along with the increasing global cancer burden, the incidence of cancer in Bangladesh is also increasing at an alarming rate. According to a survey operated by NICRH (National Institute of Cancer Research and Hospital) from 2005 to 2007, there were 24,847 cancer patients who attended in the outpatient ward; clearly the toll is rising for Bangladesh. In the current questioner based survey, 128 cancer patients were personally interviewed from two different hospitals in Dhaka named NICRH and Green Life Medical College and Hospital Pvt LTD. In this study cancer statistics was evaluated based on parameters like age, gender, location, distribution of cancer in primary sites, family history of cancer, mode of diagnosis, treatment received and medication prescribed to the patients. From the data obtained, the current trend of cancer and its correlation with various factors like genetics, exposure to environmental carcinogen and distribution of cancer with primary site of cancer was analyzed. According to the survey males are more likely to have cancer compared to females, since 62% of the patients surveyed were male and 38% was female which is almost 1.6 times less than that of males. A maximum of 21% of the patients were found to be from the age group of 51 to 60 years which indicates that still cancer is more prevalent among the senior population, however, incidence of cancer in young adults and children was also reported. 24.21% patients were found to have a history of at least one blood related member suffered from cancer. Respiratory tract and gastro intestinal tract cancer have highest incidence rate and these two together represents 36.8% of all primary sites of cancer listed in the survey. Significant correlation has been found between the primary site of cancer and family history of cancer with a p value ≤ 0.1. 33% of the total Respiratory tract cancer cases have been found to be related with family history. 54% of total surveyed patients had direct and chronic exposure to tobacco (Cigarette smoking), among which 13.28% of the patient had Respiratory tract cancer. Individuals spending major portion of their lifetime in cities may have higher chances to get cancer. The two largest cities of Bangladesh are Dhaka and Chittagong, 56 of 128 (42.18 %) patients were found to be from Dhaka division and 26 out of 128 (20.31%) patients were from Chittagong division. A variety of anticancer drugs were prescribed among which Etoposite, Cisplatin and 5-Fluoro Uracil was indicated in 51% of the cases. Therefore it can be concluded that this study presents the current scenario of cancer statistics in Dhaka city. But in order to confirm the findings of this research project further study must be conducted on a greater population.

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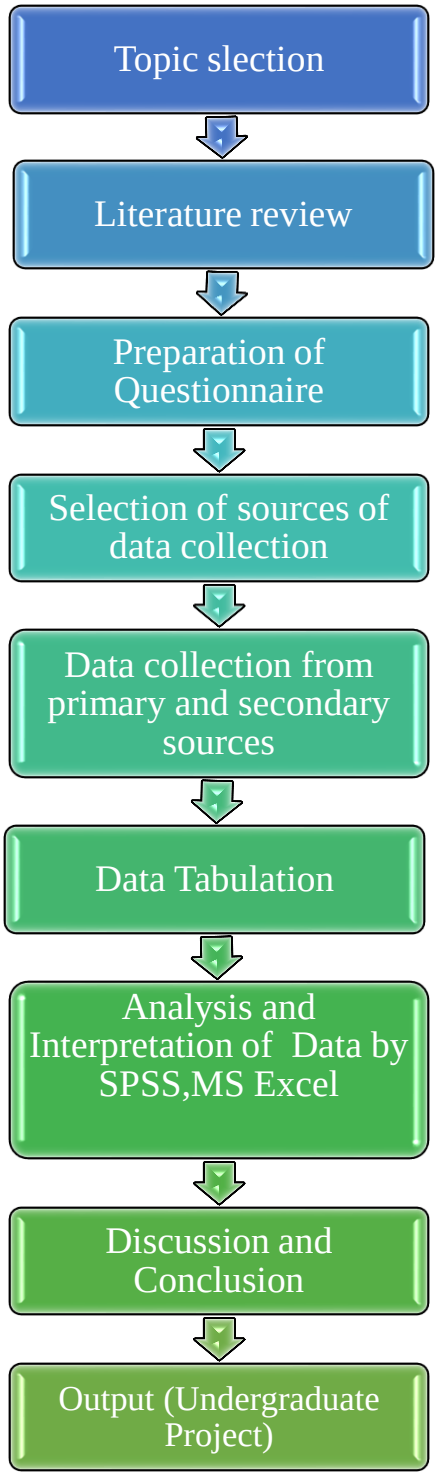
Abbreviations

ABBREVIATED FORM	FULL FORM
NICRH	National institute of cancer research and Hospital
WHO	World Health Organization
DNA	Deoxyribonucleic acid
IARC	International Agency for Research on Cancer
SPSS	Statistical Package for Social Science
HIV	Human Immunodeficiency Virus
MS Excel	Microsoft Excel
et al.	And others
e.g	Example
i.e	That is
PPM	Parts per million
PM	Particulate Matter

PROJECT DESIGN



Chapter One: Introduction

1.1 Cancer, a global burden

Cancer is responsible for killing more people globally then tuberculosis, HIV and malaria. Back in 1990s, almost 25% of global cancer was diagnosed in low income and lower middle income countries. But the scenario has changed in 2010, as this percentage increased to share 55% of global cancer burden from these countries. According to a study, by the year 2030, more than 30 million people may die from cancer every year and from this almost 9 million deaths will be shared by the developing countries.[1]More than six cancer deaths out of ten are from less developed countries[17]. Pisani et al. have projected a 30% increase in the number of cancer deaths in developed countries, and more than twice this amount (71%), in developing countries, between 1990 and 2010, due to demographic changes alone. Rising incidence will only add to this burden[33].From the other study, the rate of cancer in the developing countries will increase from 650000 to 2.2 million per year.[2]Only China and India which is together habitating 37% of world population, reported 3 million cases of newly diagnosed cancer in 2012[3].Factors that contribute to regional differences in the types or burden of cancer include regional variations in the prevalence of major risk factors, availability and use of medical practices such as cancer screening, availability and quality of treatment, and age structure. The most common cancers prevailing in these regions are lung cancer, oral cancer, cervical cancer and breast cancer. Breast cancer and cervical cancer are the top two cancers occurring in female and lung cancer followed by oral cancer acquire the top two position for occurrence in male population.[1]The most common types of cancer are lung cancer (1.18 million deaths), stomach cancer (700000 deaths), and liver cancer (598000 deaths)[24] in 2012. For both cases of male and female the cancer incidence rate in developing countries is half of those observed in developed countries although overall cancer mortality are quiet similar.[4] If we look at Bangladesh, cancer is one of the major cause of morbidity and mortality among the non-communicable disease. Each year about 200000 people develop cancer and 150000 die of the disease. Cancer is the sixth cause of morbidity in Bangladesh and 60% of the patients diagnosed with cancer die within 5 years of diagnosis. At least one third of the cancers can be treated by the existing knowledge and support in our country[5].

A cancer incidence rate is the number of new cancers of a specific site/type occurring in a specified population during a year, usually expressed as the number of cancers per 100,000 population at risk, that is, Incidence rate = (New cancers / Population) × 100,000[35].

The numerator of the incidence rate is the number of new cancers; the denominator is the size of the population. The number of new cancers may include multiple primary cancers occurring in one patient. The primary site reported is the site of origin and not the metastatic site. In general, the incidence rate would not include recurrences. The population used depends on the rate to be calculated. For cancer sites that occur in only one sex, the sex-specific population (e.g., cervical cancer for females) is used[35].

Cancer incidence is a worldwide problem, since there are still differences between regions. Figure 1.1 shows the difference in the incidence of cancer between the developed countries and the rest of the world. According to a study conducted by GLOBOCAN, more than half of all cancer cases in 2012 occurred in low resource countries and researchers estimate that these proportions will increase further by 2025. Sometimes comparisons of cancer incidence statistics are actually difficult, due to the lack of national cancer registries in many resource-poor settings, particularly in Africa. In general, GLOBOCAN statistics show that the cancer incidence rate is almost 25 percent higher in men than in women, with rates of 205 and 165 per 100,000, respectively. Male incidence rates vary almost five-fold across the different regions of the world, with rates ranging from 79 per 100,000 in Western Africa to 365 per 100,000 in Australia/New Zealand[48].

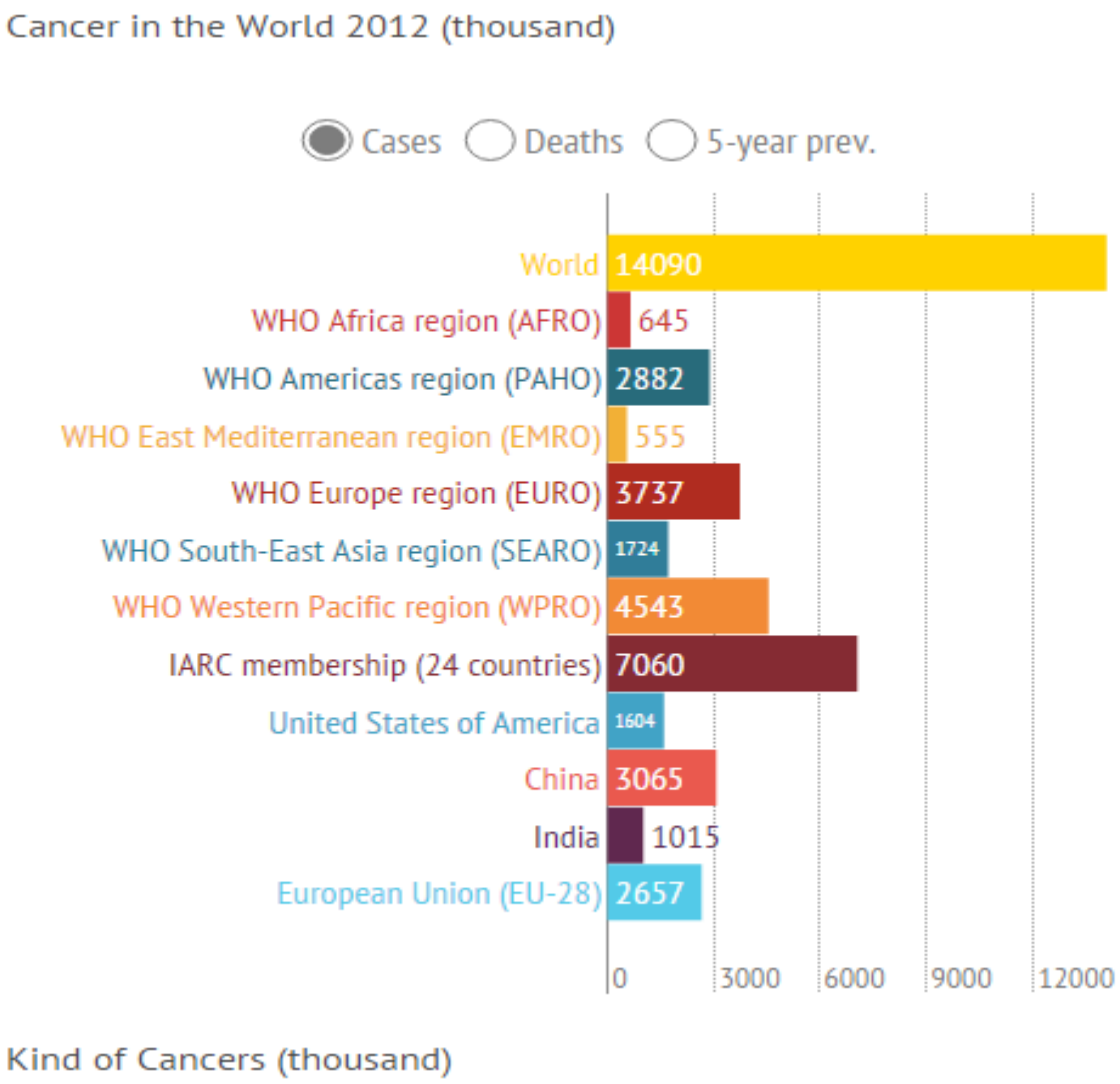


Figure: 1.1: Cancer cases worldwide in 2012. (Source: GLOBOCAN 2012)

If we look into the figure 1.1 above we can see the no of cancer detected worldwide in 2012.Here in this figure, America, Europe and IARC member countries and Western Pacific region have shown majority of patients detected with cancer. But, the number is also not less in South-East Asian region. In South East Asia the Number is 1724000 and our neighbor country India alone had 1015000 detected cancer cases in 2012.

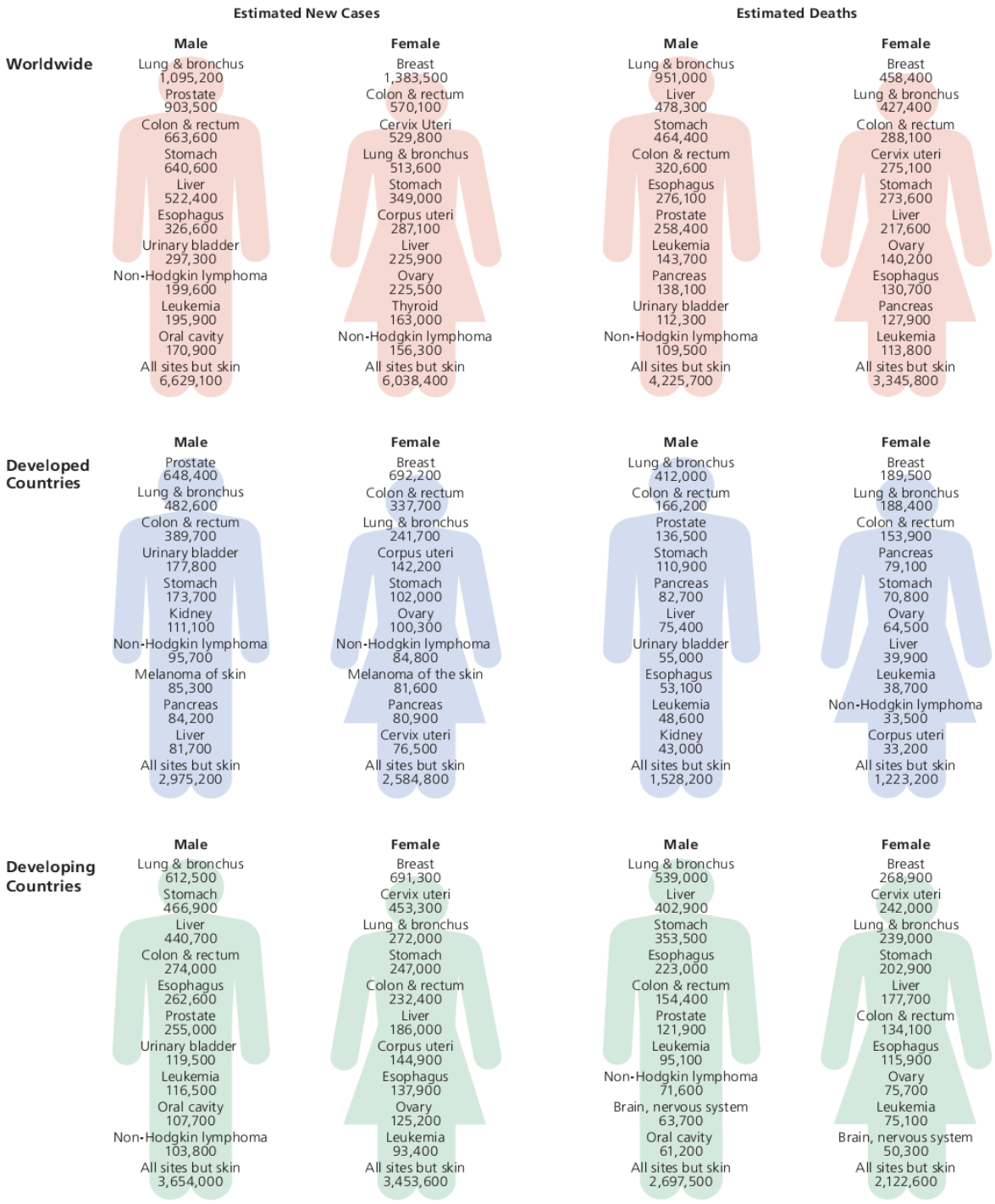


Figure 1.2: Estimated new cancer cases and deaths Worldwide,developed and developing countries among male and female in 2008.(Source: GLOBOCAN 2008).

If we look into figure 1.2 we can see the incidence of different types of cancer worldwide, in developed and developing countries among male and female population. Here, Lung cancer is highest among men while Breast cancer in most common among women worldwide. But in developed countries the result alters a bit for male; here prostate cancer precedes than lung cancer while breast cancer is in the first position complying with the world statistics. Moving to the statistics of developing countries, again lung cancer has the highest occurrence among men and breast cancer among female. However, following the lung cancer in male and breast cancer in female, stomach cancer for male and cervix and uteri cancer for female holds the next position respectively. Now, if we look at global cancer statistics of the year 2012, quiet similar picture can be seen in terms of type of cancer incidence worldwide as shown in figure 1.3.

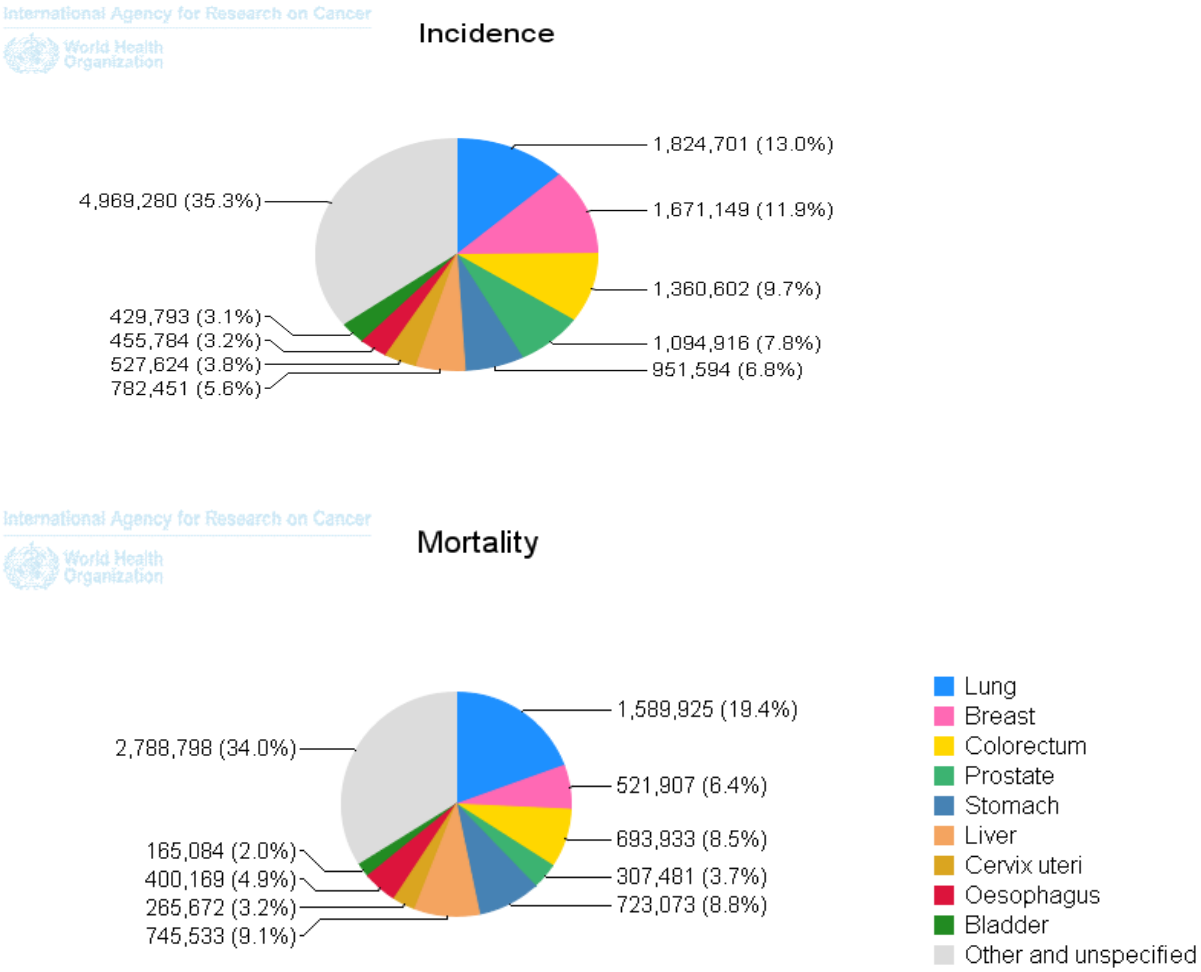


Figure 1.3: Cancer Incidence and mortality worldwide in 2012.(Source: GLOBOCAN 2012)

In figure 1.3, we can see that Lung cancer has 1,824,701 incidence cases (13%) and breast cancer has 1,671,149 (11.9%) worldwide, both of which are highest among male and female respectively like the statistics of 2008.

1.2 What is cancer?

Cancer is the general name for a collection of more than 100 diseases. Albeit there are numerous sorts of malignancy, all malignancies begin on the grounds that irregular cells develop abnormally. Untreated tumors can bring about serious ailment and death[36]. Tumor can begin any part in the human body, which is comprised of trillions of cells. Regularly, human cells develop and multiply to shape new cells as the body needs them. At the point when cells develop old they die via apoptosis and new cells take their place[37].

At the point when tumor grows, this efficient procedure terminates. As cells turn out to be more irregular, old or damaged cells survive when they should die, and new cells structure when they are not required. These additional cells can separate without ceasing and may frame developments called tumors. Numerous malignancies create strong tumors, which are masses of tissue. Malignancies of the blood, for example, leukemia, by and large don't form strong tumors. Destructive tumors are threatening, which implies they can spread into, or attack, close-by tissues. Moreover, as these tumors develop, some disease cells can sever and go to removed places in the body through the blood or the lymph system and frame new tumors at far away from the first tumor[37].

Dissimilar to dangerous tumors, benign tumors don't spread into, or attack, close-by tissues. Benign tumors can sometimes be massive .At the point when removed; they ordinarily don't develop back, while dangerous tumors more often have this problem. Dissimilar to most benign tumors somewhere else in the body, brain tumors can be life threatening[37].

1.3. Mechanism of cancer generation

Cancer results from a series of molecular events that fundamentally alter the normal properties of cells. In cancer cells the normal control systems that prevent cell overgrowth is disabled and the

invasion of other tissues occur. These altered cells divide and grow in the presence of signals that normally inhibit cell growth; therefore, they no longer require special signals to induce cell growth and division. As these cells grow they develop new characteristics, including changes in cell structure, decreased cell adhesion, and production of new enzymes. These heritable changes allow the cell and its progeny to divide and grow, even in the presence of normal cells that typically inhibit the growth of nearby cells. Such changes allow the cancer cells to spread and invade other tissues. The abnormalities in cancer cells usually result from mutations in protein-encoding genes that regulate cell division, over time more genes become mutated. This is often because the genes that make the proteins that normally repair DNA damage are themselves not functioning normally because they are also mutated. Consequently, mutations begin to increase in the cell, causing further abnormalities in that cell and the daughter cells. Some of these mutated cells die, but other alterations may give the abnormal cell a selective advantage that allows them to multiply much more rapidly than the normal cells. This enhanced growth describes most cancer cells, which have gained functions repressed in the normal, healthy cells. Cancer cells in malignant tumors can often metastasize, sending cancer cells to distant sites in the body where new malignant tumors may form[6].The hallmarks of cancer comprise six biological capabilities acquired during the multistep development of human tumors as shown in figure 1.4. The hallmarks constitute an organizing principle for rationalizing the complexities of neoplastic disease. They include sustaining proliferative signaling, evading growth suppressors, resisting cell death, enabling replicative immortality, inducing angiogenesis, and activating invasion and metastasis[7].According to Farber the inhibition of proliferation in normal cells surrounding the tumor is one of the key factors of cancer development. In such an environment, malignant cells may arise and be able to proliferate selectively, relative to the surrounding cells[32].

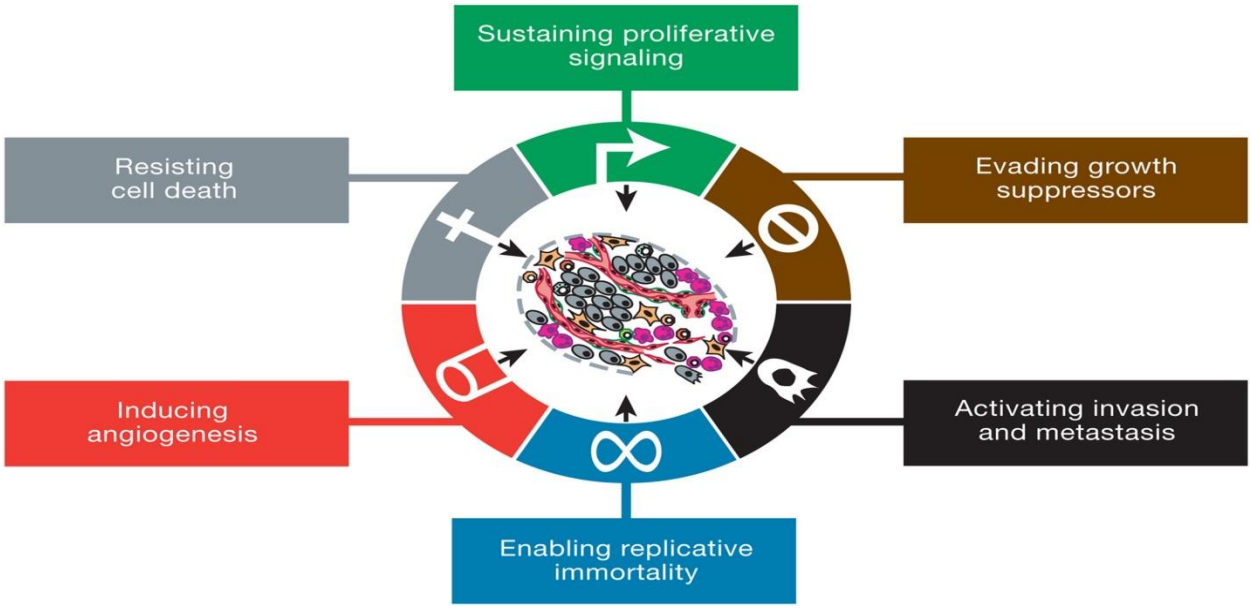


Figure: 1.4: Hallmarks of cancer.

1.4 Types of cancer

There are more than 100 types of cancer. Types of cancer are usually named for the organs or tissues where the cancers form. For example, lung cancer starts in cells of the lung, and brain cancer starts in cells of the brain. Cancers also may be described by the type of cell that formed them, such as an epithelial cell or a squamous cell[48].

1.4.1 Carcinoma

Carcinomas are the most common type of cancer. They are formed by epithelial cells, which are the cells that cover the inside and outside surfaces of the body. There are many types of epithelial cells, which often have a column-like shape when viewed under a microscope. Carcinomas that begin in different epithelial cell types have specific names:

Adenocarcinoma is a cancer that forms in epithelial cells that produce fluids or mucus. Tissues with this type of epithelial cell are sometimes called glandular tissues. Most cancers of the breast, colon, and prostate are adenocarcinomas.

Basal cell carcinoma is a cancer that begins in the lower or basal (base) layer of the epidermis, which is a person's outer layer of skin.

Squamous cell carcinoma is a cancer that forms in squamous cells, which are epithelial cells that lie just beneath the outer surface of the skin. Squamous cells also line many other organs, including the stomach, intestines, lungs, bladder, and kidneys. Squamous cells look flat, like fish scales, when viewed under a microscope. Squamous cell carcinomas are sometimes called epidermoid carcinomas.

Transitional cell carcinoma is a cancer that forms in a type of epithelial tissue called transitional epithelium, or urothelium. This tissue, which is made up of many layers of epithelial cells that can get bigger and smaller, is found in the linings of the bladder, ureters, and part of the kidneys (renal pelvis), and a few other organs. Some cancers of the bladder, ureters, and kidneys are transitional cell carcinomas[48].

1.4.2 Sarcoma

Sarcomas are cancers that form in bone and soft tissues, including muscle, fat, blood vessels,lymph vessels, and fibrous tissue (such as tendons and ligaments).

Osteosarcoma is the most common cancer of bone. The most common types of soft tissue sarcoma are leiomyosarcoma, Kaposi sarcoma, malignant fibrous histiocytoma, liposarcoma, anddermatofibrosarcoma protuberans[48].

1.4.3 Leukemia

Cancers that begin in the blood-forming tissue of the bone marrow are called leukemias. These cancers do not form solid tumors. Instead, large numbers of abnormal white blood cells (leukemia cells and leukemic blast cells) build up in the blood and bone marrow, crowding out normal blood cells. The low level of normal blood cells can make it harder for the body to get oxygen to its tissues, control bleeding, or fight infections.

There are four common types of leukemia, which are grouped based on how quickly the disease progress and on the type of blood cell the cancer starts in (lymphoblastic or myeloid)[48].

1.4.4 Lymphoma

Lymphoma is cancer that begins in lymphocytes (T cells or B cells). These are disease-fighting white blood cells that are part of the immune system. In lymphoma, abnormal lymphocytes build up in lymph nodes and lymph vessels, as well as in other organs of the body.

There are two main types of lymphoma:

Hodgkin lymphoma – People with this disease have abnormal lymphocytes that are called Reed-Sternberg cells. These cells usually form from B cells.

Non-Hodgkin lymphoma – This is a large group of cancers that start in lymphocytes. The cancers can grow quickly or slowly and can form from B cells or T cells[48].

1.4.5 Multiple Myeloma

Multiple myeloma is cancer that begins in plasma cells which is another type of immune cell. The abnormal plasma cells, called myeloma cells, build up in the bone marrow and form tumors in bones all through the body. Multiple myeloma is also called plasma cell myeloma and Kahler disease[48].

1.4.6 Melanoma

Melanoma is cancer that begins in cells that become melanocytes, which are specialized cells that make melanin (the pigment that gives skin its color). Most melanomas form on the skin, but melanomas can also form in other pigmented tissues, such as the eye[48].

1.4.7 Brain and Spinal Cord Tumors

There are different types of brain and spinal cord tumors. These tumors are named based on the type of cell in which they formed and where the tumor first formed in the central nervous system. For example, an astrocytic tumor begins in star-shaped brain cells called astrocytes, which help keep nerve cells healthy. Brain tumors can be benign (not cancer) or malignant (cancer) [48].

1.5 Cancer Staging:

Staging describes the extent or spread of the disease at the time of diagnosis. It is essential in determining the choice of therapy and in assessing prognosis. Stage is based on the primary tumor's size and location and whether it has spread to other areas of the body. A number of different staging systems are used to classify tumors. The TNM staging system assesses tumors in three ways: size and extent of the primary tumor (T), absence or presence of regional lymph node involvement (N), and absence or presence of distant metastases (M).Once the T, N, and M are determined, a stage of I, II, III, or IV is assigned, with stage I being early stage and stage IV being advanced. Summary staging (in situ, local, regional, and distant) is the most simplistic way to categorize how far a cancer has spread from its point of origin. It is useful for historical descriptive and statistical analysis of tumor registry data. If cancer cells are present only in the layer of cells where they originated and have not penetrated the basement membrane of the tissue, the stage is in situ; otherwise, it is invasive. Stage is categorized as local if cancer cells are confined to the organ of origin, regional if the cells have spread beyond their original (primary) site to nearby lymph nodes or tissues, and distant if they have spread from the primary site to distant organs or distant lymph nodes. However, as the molecular properties of cancer have become better understood, prognostic models have been developed for some cancer sites that incorporate biological markers and genetic features in addition to summary stage and tumor characteristics[51].

1.6 Factors contributing to cancer

Cancer develops over several years and has many causes. Several factors both inside and outside the body contribute to the development of cancer. As we are surrounded by the environment, it may pose as a risk factor while some elements of environment appear to be carcinogen or mediator for the generation of cancer. Exposure to a wide variety of natural and man-made substances in the environment accounts for large number of cancer. Some of such factors inside (Genetics, age)and outside the body are given below.

1.6.1 Age:

Considering the characteristics of various cancers, it has been found that most of them arise in late life.It has been noticed for many years that cancer is more common among the old than among the young thus it is a disease of old age. Most researchers who studied relationships between age and cancer risk paid attention mainly to the increase in cancer risk with age[8].The most common cancers in older people are skin, lung, colorectal, breast (in women), and prostate (in men). Although cancer was previously more common in old or middle old aged population, currently the incidence of cancer among relatively young adults and children has increased. Adolescents and young adults aged 15 to 39 years are much more likely to be diagnosed with cancer than children under the age of 15 years. The most common types of cancer seen in adolescents and young adults are lymphoma, leukemia, germ cell tumors (including testicular cancer), melanoma, central nervous system tumors, sarcomas, and breast, cervical, liver, thyroid, and colorectal cancers[9]. The vast majority of cancers occur in older adults. Many cancers in adults are linked to lifestyle-related risk factors (such as smoking, being overweight or obese, or lack of physical activity) or to other environmental factors. A small portion is strongly influenced by changes in a person's DNA (gene mutations) that they inherit from their parents[10].

Cancers that start in childhood (before age 15) are much less common. The types of cancers that develop in children are often different from the types that develop in adults. Childhood cancers are often the result of DNA changes in cells that take place very early in life, sometimes even

before birth. Unlike many cancers in adults, childhood cancers are not strongly linked to lifestyle or environmental risk factors[10].

1.6.2 Genetics

Recently, the role of genetic factor in the development of cancer is widely recognized. Genetic factors affect the tendency to develop cancer. Predisposing mutations often influence DNA repair, cell-cycle regulation and cell-death pathways. Individuals differ in their inherited tendency to develop cancer. Mutations can cause a cell to make (or not make) proteins that affect how it grows and divides into new cells. Certain mutations can cause cells to grow out of control, which can lead to cancer. Major single-gene defects that cause early cancer onset have been known for many years from their inheritance patterns, and inherited defects that have weaker effects on predisposition were also suspected to exist. Recent progress in cancer genetics has identified specific loci that are involved in cancer progression, many of which have key roles in DNA repair, cell-cycle control and cell-death pathways. Those loci, which are often mutated somatically during cancer progression, sometimes also contain inherited mutations. Recent genetic studies and quantitative population-genetic analysis provide a framework for understanding the frequency of inherited mutations and the consequences of these mutations for increased predisposition to cancer[12]. Mendelian inheritance cause strong genetic predisposition to nearly every type of cancer. Natural selection keeps these mutations rare because they cause severe disease early in life. Firstly, conclusions about polygenic inheritance come mainly from statistical studies of differences in the risk of developing cancer between twins, family members and unrelated individuals. The direct study of predisposing allelic variation is only just beginning, and the most promising line of investigation concerns variants that affect DNA repair. Secondly, families that show a high level of polygenic pre-disposition to breast cancer have a high level of constant risk of developing cancer later in life, which does not increase with age. In contrast, most individuals have a relatively low risk that does increase with age[12]. One of the ways scientists know that genes play an important role in the development of cancer is from studying certain rare families where family members over several generations develop similar cancers. It appears that these families are passing on an altered gene that carries with it a high chance of getting cancer. Several genes that greatly increase a person's chance of developing certain cancers (e.g., colon, breast, and ovary) have been identified. Only a very small percentage

of people in the general population have abnormal copies of these genes. Cancers caused by these genes, known as familial cancers account for only two to five percent of all cancers[15]. The etiology of childhood cancer is largely unknown. Although, most childhood cancers are thought to be sporadic or multi factorial, genetic susceptibility has been estimated to account for up to 10% of all cases[13]. However, the genetic contribution may be underestimated due to under-recognition when relying on known familial patterns and anomalies or the under reporting of family history[13, 14]. Family cancer history is dynamic, and this is important to consider when evaluating the genetic contribution, particularly in young children. Although tumors appear to be sporadic at the time of diagnosis, they may become recognized as familial when parents and siblings grow older[13].

1.6.3 Environment and Occupation

Cancer generally develops slowly over a long span of time and the causes are diverse. Several factor both inside and outside the body contribute to the development of cancer. In this context, scientists refer to everything outside the body that interacts with humans as the "environment." Factors outside the Body (Environmental Factors) are exposure to a wide variety of natural and man-made substances in the environment which accounts for at least two-thirds of all the cases of cancer. These environmental factors include lifestyle choices like cigarette smoking, chewing tobacco, excessive alcohol consumption, poor diet, lack of exercise, excessive sunlight exposure, and sexual behavior that increases exposure to certain viruses etc. Other factors include exposure to certain medical drugs, hormones, radiation, viruses, bacteria, and environmental chemicals that may be present in the air, water, food, and workplace. The cancer risks associated with many environmental chemicals have been identified through studies of occupational groups that have higher exposures to these chemicals than the general population. The importance of the environment can be seen in the differences in cancer rates throughout the world and the change in cancer rates when groups of people move from one country to another. For example, when Asians, who have low rates of prostate and breast cancer and high rates of stomach cancer in their native countries, immigrate to the United States, their prostate and breast cancer rates rise over time until they are nearly equal to or greater than the higher levels of these cancers in the United States. Likewise, their rates of stomach cancer fall, becoming nearly equal to the lower U.S. rates. Lifestyle factors such as diet, exercise, and being overweight are thought to play a

major role in the trends for breast and prostate cancers, and infection with the Helicobacter pylori bacterium is an important risk factor for stomach cancer. Recently, the rapid rise in the rates of colorectal cancer in Japan and China suggests an environmental cause such as lifestyle factors. Different environmental exposures are linked to specific kinds of cancer. For example, exposure to asbestos is linked primarily to lung cancer, whereas exposure to benzidine, a chemical found in certain dyes, is associated with bladder cancer. In contrast, smoking is linked to cancers of the lung, bladder, mouth, colon, kidney, throat, voice box, esophagus, lip, stomach, cervix, liver, and pancreas[15].

Examples of strong causal links between environmental and occupational exposures and cancer include[16]:

- Metals such as arsenic and cancers of the bladder, lung, and skin.
- Chlorination byproducts such as trihalomethanes and bladder cancer.
- Natural fibers such as asbestos and cancers of the larynx, lung, mesothelioma, and stomach.
- Petrochemicals and combustion products, including motor vehicle exhaust and polycyclic aromatic hydrocarbons, and cancers of the bladder, lung, and skin.
- Pesticide exposures and cancers of the brain, Wilmstumor, leukemia, and non-Hodgkin's lymphoma.
- Reactive chemicals such as vinyl chloride and liver cancer and soft tissue sarcoma.
- Metalworking fluids and mineral oils with cancers of the bladder, larynx, nasal passages, rectum, skin, and stomach.
- Ionizing radiation and cancers of the bladder, bone, brain, breast, liver, lung, ovary, skin, and thyroid, as well as leukemia, multiple myeloma, and sarcomas.
- Solvents such as benzene and leukemia and non-Hodgkin's lymphoma; tetrachloroethylene and bladder cancer; and trichloroethylene and Hodgkin's disease, leukemia, and kidney and liver cancers.
- Environmental tobacco smoke and cancers of the breast and lung.

1.7 Environment of Dhaka city

Dhaka has the highest population growth rate compared to any major cities in the world. With more than 13 million inhabitants with an area of 1,353 km^2, it is now the 8th largest city of the world and by the end of 2015 it is forecasted to be the world's second with a population of around 23 million [50].

The main problem of Dhaka city is dense population and pollution with high level of particulate matter. Both PM 10 and PM 2.5 levels are high, being much above the safety standards especially during the dry season. The increasing number of vehicles and their improper management and operation are responsible for degradation of the air quality. The economic valuation of the air pollution revealed that between US$ 121 to 353 million per year (2003 estimate) can be saved in Dhaka from healthcare cost if the PM10 pollution level is reduced by a modest 20% of the current level[50].

A large number of people are involved in industrial and utility service jobs, but most of the industries do not adopt precautionary and safety measures for the workers. Millions of people work in Hazaribagh tannery, Tejgaon industrial area, textile mills, dyeing and other factories in Postagola, municipal solid waste management, motor and refrigerator repairing workshops and garments industries all over Dhaka. All these workers are substantially exposed to occupational health risk through inhalation, skin contact and ingestion route of hazardous chemicals. Tannery, battery, textile and dyeing industries should provide enough safety measures in their industrial operation but they hardly adhere to the safety regulations required to protect worker's health. Every single tannery worker is exposed to hazardous chemicals that are released from tannery processing and operation. Surprisingly, 40% of the total workers are children. This direct and chronic exposure of such chemicals might have significant carcinogenic and long-term non-carcinogenic effect on the health of the workers, especially the children[49].

From a research done on poultry chicken and fish sold in markets of Dhaka city, frightening results come out after separately examining blood, meat, bone, liver, brain and skin of chickens which were fed with poultry-fish feed. The test results were analyzed after feeding this feed to the chickens for one month at the first instalment and for another month in the second instalment. Maximum quantity of chromium was found from the brain of these chickens.

The maximum tolerance rate of chromium in human body is 25 PPM or microgram per day. If it exceeds this limit, to a certain stage it will result in fatal diseases. But in the tests, after feeding the chicken with the particular chicken-fish feed for 1 month, the brains of chickens taking these feeds, 799 PPM chromium was found in per kg chicken brain while 4561 PPM per kg chromium was found in chicken taking feeds for two months. Besides, 244 PPM and 344 PPM respectively in meat, 557 PPM and 328 PPM in skin respectively, 1011PPM and 1990 PPM respectively in bone, 570 PPM and 611 PPM respectively in liver and 718 PPM and 792 PPM chromium respectively in blood were found. As chromium is a potent carcinogenic material, it pose a high risk of generating cancer in human body[50].

Thereby, several carcinogenic materials are exposed to the environment and food materials available in Dhaka city. It might be a major reason for the increased incidence of cancer now a days.

1.8 Literature Review

1.8.1 Global scenario of cancer

There were 14.1 million new cancer cases, 8.2 million cancer deaths and 32.6 million people living with cancer (within 5 years of diagnosis) in 2012 worldwide. 57% (8 million) of new cancer cases, 65% (5.3 million) of the cancer deaths and 48% (15.6 million) of the 5-year prevalent cancer cases occurred in the less developed regions. The overall age standardized cancer incidence rate is almost 25% higher in men than in women, with rates of 205 and 165 per 100,000, respectively. Male incidence rates vary almost five-fold across the different regions of the world, with rates ranging from 79 per 100,000 in Western Africa to 365 per 100,000 in Australia/New Zealand. There is less variation in female incidence rates (almost three-fold) with rates ranging from 103 per 100,000 in South-Central Asia to 295 per 100,000 in Northern America. In terms of mortality, there is less regional variability than for incidence, the rates being 15% higher in more developed than in less developed regions in men, and 8% higher in women.

In men, the rates is highest in Central and Eastern Europe (173 per 100,000) and lowest in Western Africa (69). In contrast, the highest rates in women are in Melanesia (119) and Eastern Africa (111), and the lowest in Central America (72) and South-Central (65) Asia[38]. The most common cancer sites were cancers of the female breast (464,000 cases), followed by colorectal (447,000), prostate (417,000) and lung (410,000). These four cancers represent half of the overall burden of cancer in Europe. The most common causes of death from cancer were cancers of the lung (353,000 deaths), colorectal (215,000), breast (131,000) and stomach (107,000). In the European Union, the estimated numbers of new cases of cancer were approximately 1.4 million[42]. Europe carries a significant load of the global burden, with one quarter of the global burden of cancer observed in Europe in 2008 despite a total population that comprises one-ninth of the world's population[43].Cancer is responsible for killing more people globally then tuberculosis, HIV and malaria worldwide. Back in 1990s, almost 25% of global cancer was diagnosed in low income and lower middle income countries. But the scenario has changed in

2010,this percentage increased to share 55% of global cancer burden from these countries. According to a study, by 2030,more than 30 million people may die from cancer every year and from this almost 9 million deaths will be shared by these developing countries.[1] Pisani et al have projected a 30% increase in the number of cancer deaths in developed countries, and more than twice this amount (71%), in developing countries, between 1990 and 2010, due to demographic changes alone. Rising incidence will only add to this burden[33.] Factors that contribute to regional differences in the types or burden of cancer include regional variations in the prevalence of major risk factors, availability and use of medical practices such as cancer screening, availability and quality of treatment, and age structure. The most common cancer prevailing in these region are lung cancer, oral cancer, cervical cancer and breast cancer. Mainly breast cancer and cervical cancer has the top two position occurring in female and lung cancer followed by oral cancer acquire the top two position for occurrence in male population[1]

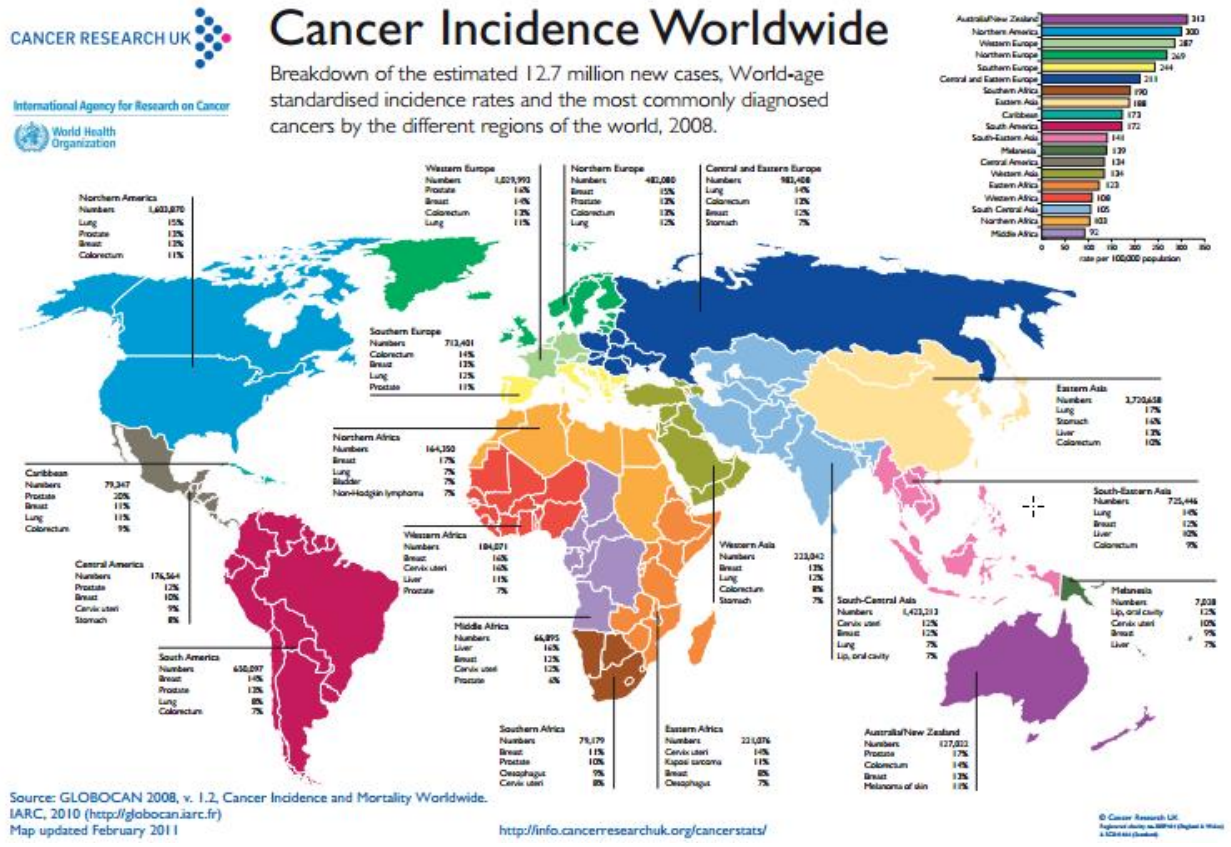


Figure 1.5: Cancer incidence Worldwide-2008. (Source: GLOBOCAN 2008, v 1.2, Cancer Incidence and Mortality Worldwide, IARC, 2010)

1.8.2 Cancer scenario: Bangladesh

According to a study carried out by the International Centre for Diarrhoeal Disease Research, Bangladesh, in 2010, cancer causes 21 percent of maternal casualty in the country. A survey of the Bangladesh Bureau of Statistics in 2008 identified cancer as the sixth deadly disease in the country[41]..In Bangladesh, cancer is one of the major cause of morbidity and mortality among the non-communicable disease, Each year about 200000 people develop cancer and 150000 die of the disease. Cancer is the sixth cause of morbidity in Bangladesh and 60% patients diagnosed with cancer die within 5 years of diagnosis. At least one third of the cancers can be cured by the existing knowledge and support in our country.[5] Lung cancer is one of the leading cancers in Bangladeshi population[4]. Smoking is the single most preventable risk factor for lung cancer[39]. In this registry about 60% of the male lung cancer patients were smokers whereas 5% female lung cancer patients were smokers. The corresponding figures in Bangladeshi general population are 41% and 1.8% respectively[39].Females are prone to expose second hand smoke and indoor air pollution. These facts could explain the development of lung cancer in Bangladeshi females. In children aged 14 years or younger, lymphoma, retinoblastoma, osteosarcoma, leukaemia and kidney disease were most commonly found. Cancer control progammes should keep this in mind during the planning process[40].

1.8.3 Types of Cancer in Bangladesh

Different common cancers are prevailing in Bangladesh in addition with numerous unknown cancer cases. According to the cancer registry report 2005-2007 the top ten primary site of malignancies.

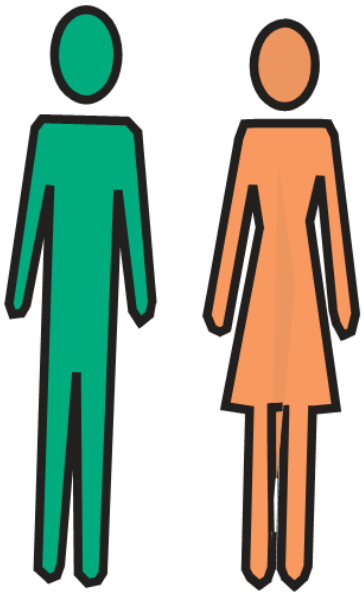
Positions	2005		2006		2007		2005-2007	
	Cancer sites	n (%)	Cancer sites	n (%)	Cancer sites	n (%)	Cancer sites	n (%)
1	Lungs	902 (16.7)	Lungs	1,076 (16.4)	Lungs	1,231 (17.3)	Lungs	3,209 (17.0)
2	Cervix	561 (10.4)	Breast	715 (11.0)	Breast	840 (12.3)	Breast	2,073 (11.0)
3	Breast	559 (10.3)	Cervix	583 (9.0)	Lymph node and lymphatics	581 (8.4)	Cervix	1,718 (9.1)
4	Lymph node and lymphatics	300 (5.5)	Lymph node and lymphatics	372 (5.7)	Cervix	574 (8.4)	Lymph node and lymphatics	1,128 (6.0)
5	Larynx	268 (5.0)	Oesophagus	295 (4.5)	Oesophagus	404 (5.8)	Oesophagus	914 (4.6)
6	Oesophagus	215 (4.0)	Larynx	229 (4.5)	Stomach	330 (4.8)	Stomach	722 (3.8)
7	Oral cavity	213 (3.9)	Stomach	269 (4.1)	Liver	229 (3.3)	Larynx	666 (3.5)
8	Bones and cartilages	177 (3.3)	Oral cavity	257 (4.0)	Tongue	215 (3.1)	Liver	480 (2.5)
9	Stomach	169 (3.1)	Bones and cartilages	165 (2.5)	Larynx	163 (2.4)	Tongue	296 (2.1)
10	Unknown primary sites	337 (6.2)	Unknown primary sites	424 (6.5)	Gall Bladder	139 (2.0)	Unknown primary sites	857 (4.6)

Table 1.1: Distribution of patients by top ten malignancies. (Source: National Cancer registry report by NICRH 2005-2007[40]).

Lung cancer occupied the leading position in each year. This was followed by breast cancer, cervical cancer and lymph nodes and lymphatic cancers. Others are cancer of larynx, oseopahagus, stomach, oral cavity and gall bladder. Sex-specific top ten malignancies for three years are given in Figure 1. In males lung cancer topped the list (25.5%) that far exceeds the proportion of others. In females breast (25.6%) and cervix of uterus (21.5%) are leading sites of cancers.

There is also diversity in the top ten malignancies between men and women. The following figure shows the top ten types malignancy cases among male and female.

Males		
Lungs	2763	25.5%
Lymph node	804	7.4%
Oesophagus	641	5.9%
Larynx	586	5.4%
Stomach	555	5.1%
Liver	353	3.3%
Tongue	281	2.6%
Skin	266	2.5%
Rectum	249	2.3%
Pyriform fossa	201	1.8%



Females		
Breast	2044	25.6%
Cervix	1718	21.5%
Lungs	446	5.6%
Lymph node	324	4.1%
Oesophagus	273	3.4%
Ovary	265	3.3%
Gall bladder	217	2.7%
Stomach	211	2.6%
Rectum	140	1.8%
Uterus	130	1.6%

Figure 1.6: Top ten malignancies in male and female. (Source: National Cancer registry report by NICRH 2005-2007[40]).

In a study in 2005 it has been found that among male the highest no of cancer was in lung (24.1%) followed by carcinoma of lymph nodes and lymphatic (7.0%), larynx (6.5%). In female it was ca breast (23.7%) followed by ca cervix (21.4%). The main difference between these two studies is the emergence of breast cancer as the leading cancer in female[43].

Chapter Two: Objective & Methodology

2.1 Objective

The cancer toll in Bangladesh is high without any doubt. According to a study conducted by NICRH (National Institute of Cancer Research and Hospital) from 2005 to 2007, there were 24,847 cancer patients who attended in the outpatient ward. In Bangladesh sufficient survey on cancer is not done by different health care organizations to show the real scenario of cancer. Some cancer cases go undetected and some cancer cases are not registered in a proper data base. Therefore, there is still a need to conduct more surveys to show and compare the actual statistics of cancer in Bangladesh. The objective of this project is to represent the current scenario of cancer in Dhaka city which will emphasize on the distribution of cancer based on different parameters like age, gender, location, distribution of cancer in primary sites, family history of cancer, mode of diagnosis, treatment received and medication prescribed to the patients. In addition, efforts will be taken to find correlation of cancer with various factors like genetics, exposure to environmental carcinogen and distribution of cancer with primary site.

2.2 Methodology

A five months long survey was conducted from July 2014 till January 2015 to evaluate the current scenario of cancer statistics in Dhaka city. In the surveys, 128 patients were directly interviewed with a revised questionnaire in two most familiar hospitals of Dhaka city namely National Institute of Cancer Research and Hospital (NICRH) and Green Life Medical College Hospital (Oncology ward). The questionnaire included a number of related questions that complies with the objective of the project. To get the desired data for the project, the patients, doctors and nurses of the oncology unit of the respective hospitals were interviewed. Limited access of patient's information file was also provided to collect much necessary information about the patients and their prescriptions.

The two hospitals which were chosen for collecting patient's information are among the reputed hospitals for cancer treatment in the country. National Institute of Cancer Research and Hospital (NICRH) is one of the most improvised public hospitals in the country with different modernized facility for cancer care. Besides it offers best services free of cost or at a minimal cost. So patients from all socio economic classes come here to utilize the cost effective treatment and to consult the best cancer specialist in the country. Therefore, NICRH is a reliable source to collect information of cancer patients. The second hospital was the oncology unit of Green life Medical College and hospitals Pvt. LTD which is a modernized private hospital which offers treatment of variety of disease along with cancer.

The questioner prepared was based on literature review to fulfill the objective of this project. Using the questioner, attempts were made to find the distribution of cancer with age, gender, marital status, family history of cancer (genetic factor), environment and habits of the patient, exposure to carcinogen, occupation and exposure to tobacco. Possible correlation was also analyzed between the incidence of cancer and various parameters that are mentioned above..Data regarding type of diagnosis, prescribed medication to the patients, and progress of treatment were also collected and analyzed. . From the data obtained, the current trend of cancer and its correlation with various factors like genetics, exposure to environmental carcinogen and distribution of cancer with primary site of cancer was analyzed. For data analysis various statistical tools like SPSS (Statistical Package for Social Science) and MS Excel was used. All questions in the questionnaire were relevant and statistically valid and it was also evaluated and approved by the by the ethical committee of National Institute of Cancer Research and hospital (NICRH). A copy of the questionnaire and its approval by NICRH is attached to appendix 1 and II respectively.

Chapter Three: Results

3.1 Incidence of cancer among male and female population

A total of 128 cancer patients were interviewed among which 79 were male and 49 were female. Male patients comprised 61.7% and female patients comprised almost double the no of male patients i.e., 38.29% of the total survey population as shown in figure 3.1.

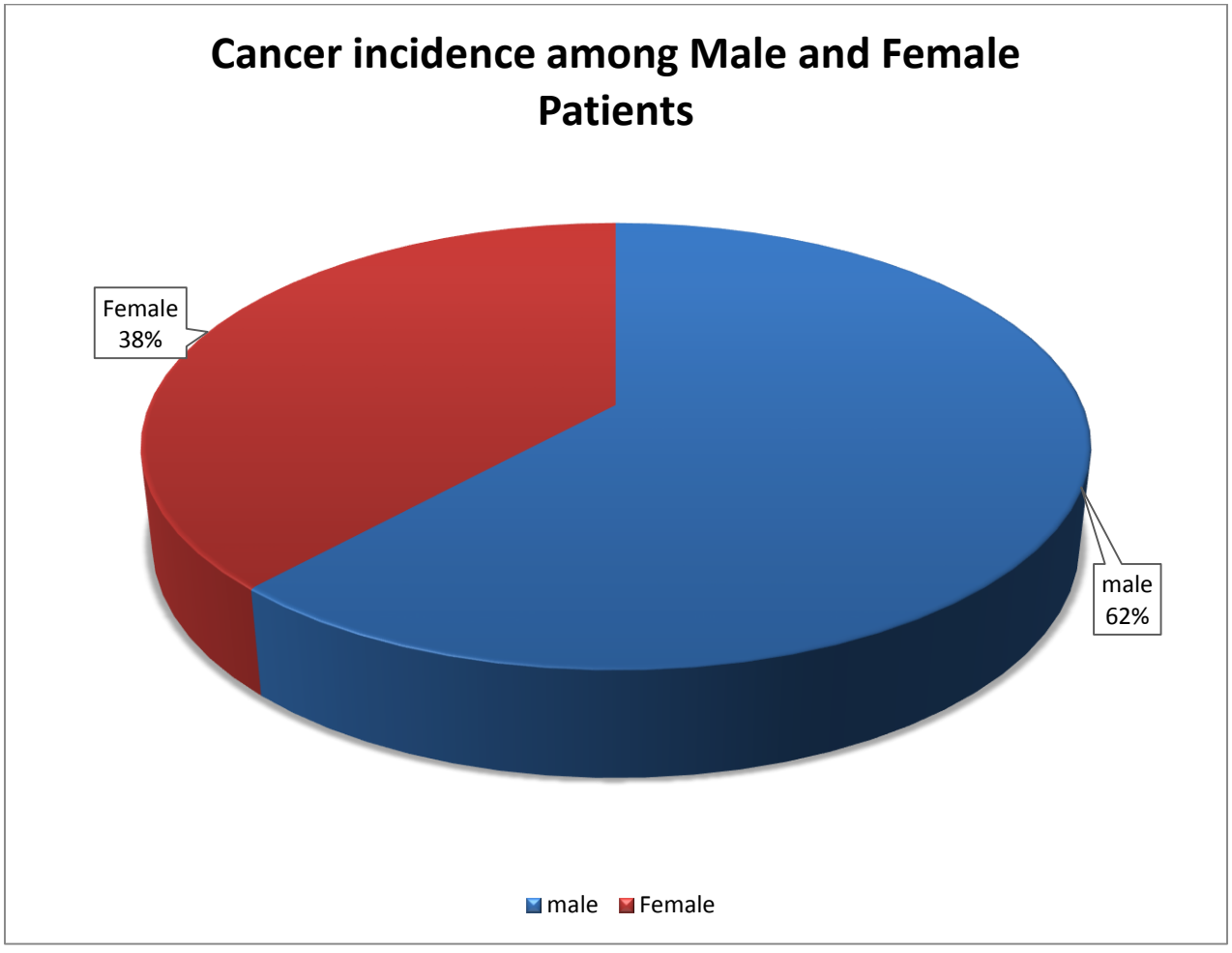


Figure 3.1 Cancer incidences among male and Female patients.

3.2 Marital Status of the Patients

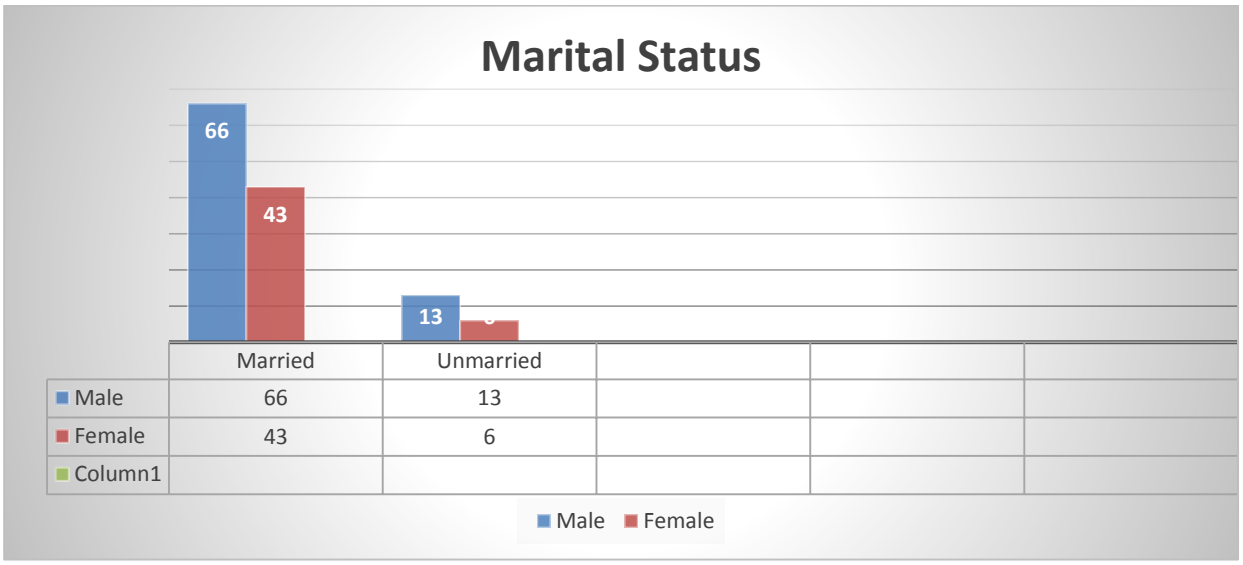


Figure 3.2: Marital Status of the patients.

From the study it has been found that (Figure 3.2) most of the patients were married. However, among the unmarried patients some have not reached the age to be married. Here out of 79 male patients 66(90.41%) are married and 43(87.8%) out of 49 female patients are married. The remaining 19 patients are unmarried among which 13 are male and 6 are female.

3.3 Incidence of cancer among different age group

From the survey result we can see that the age distribution of the patients surveyed. In case of male patients the age group 51-60 years shows the highest number of patients which is 23 whereas for female patients it is highest in the age group 31-40 years with a count of 14 patients (Figure 3.3).

In the age group 13-19 years and 20-30 years the number of male and female patients are almost same. In the age group 20-30 years, the number of male and female patient is equal which is 7. However in the lowest age group 0-10 years the number of male patients is three times the number of female patients.

For the age group 41-50 years and 51-60 years numbers of male patients are higher than female patients. In the age group 51-60 years the no of male patients is almost six times higher than female patents. But in case of age group 31-40 years, count of female patients exceeds the no of male patients by 5.

For the age group 61-70 years, male patients are higher than that of female patients. But for the age group 71-80, it is devoid of any female patients, counting only 4 male patients.

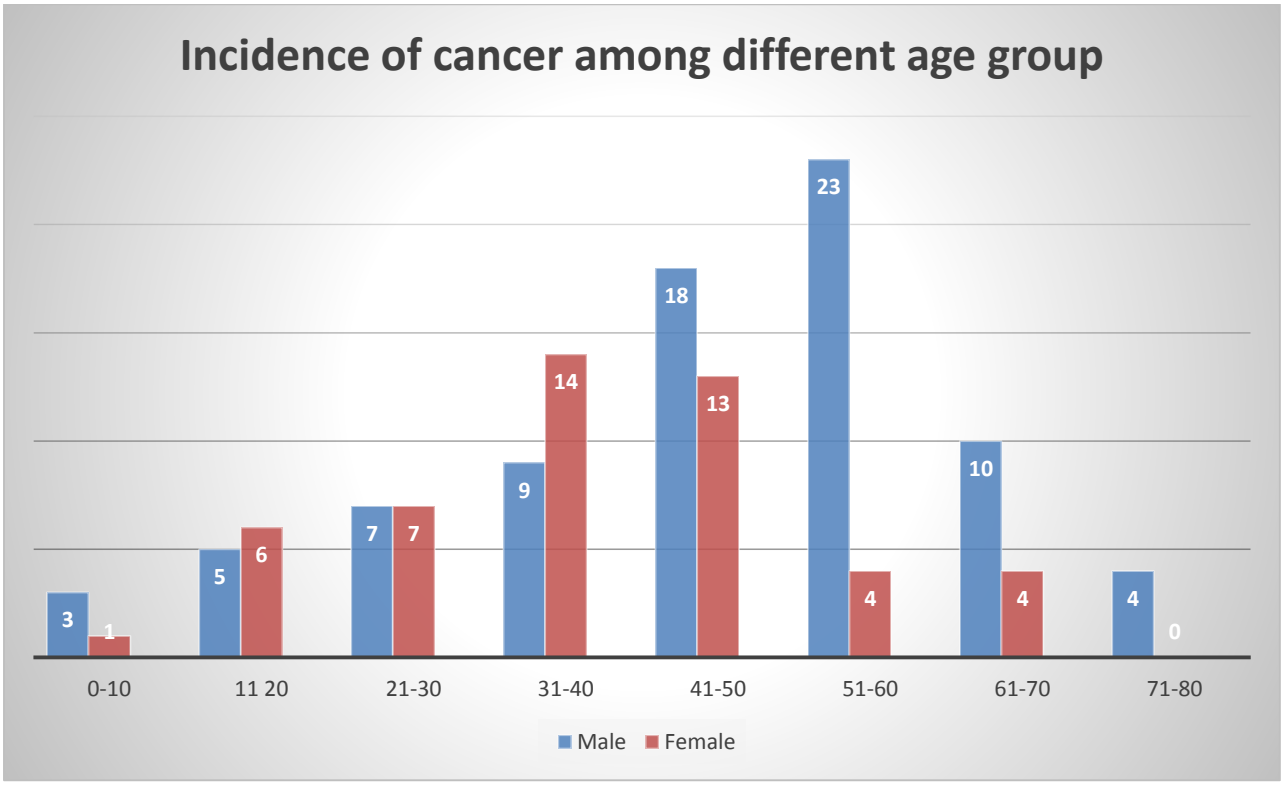


Figure 3.3: Incidence of cancer in different age group.

3.4 Distribution of primary site of cancer

Table 3.1 Distribution of patients by primary sites of cancer.

Primary site of the cancer					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Respiratory tract	24	18.8	18.9	18.9
	Gastro-Intestinal tract	23	18.0	18.1	37.0
	Female genital organ	14	10.9	11.0	48.0
	Head and neck	1	.8	.8	48.8
	Breast	9	7.0	7.1	55.9
	Lympathic and Lymph Node	4	3.1	3.1	59.1
	Bones	4	3.1	3.1	62.2
	Connective Tissue	5	3.9	3.9	66.1
	Skin	21	16.4	16.5	82.7
	Male genital organ	3	2.3	2.4	85.0
	Endocrine glend	5	3.9	3.9	89.0
	Leukemia	2	1.6	1.6	90.6
	colorectal part	12	9.4	9.4	100.0
	Total	127	99.2	100.0	
Missing	System	1	.8		
Total		128	100.0		

Respiratory tract cancer is the highest (24 cases) incidence among all type of cancers (Table 3.1) in the survey which is followed by Gastro intestinal tract cancer (23 cases).Together they toll to 36.8% of primary site of the diagnosed cancer. There is 14 cases of Cancer diagnosed in female genital organ which is 10.9% of the all type of cancer listed here. Head and neck is the primary site of cancer of 1 patient(Figure 4.5). 9 Female patients are diagnosed with breast cancer (7%). Lymphatic and Lymph nodes and cancer related to bones both have 4 cases each and tolls 6.2% of the total detected cancers. Skin and other soft tissues are the primary site of cancers for 21 cases (16.5%).Cancers with connective tissue (mainly hematologic malignancy) as primary site have 5 cases among all type of cancer detected here.

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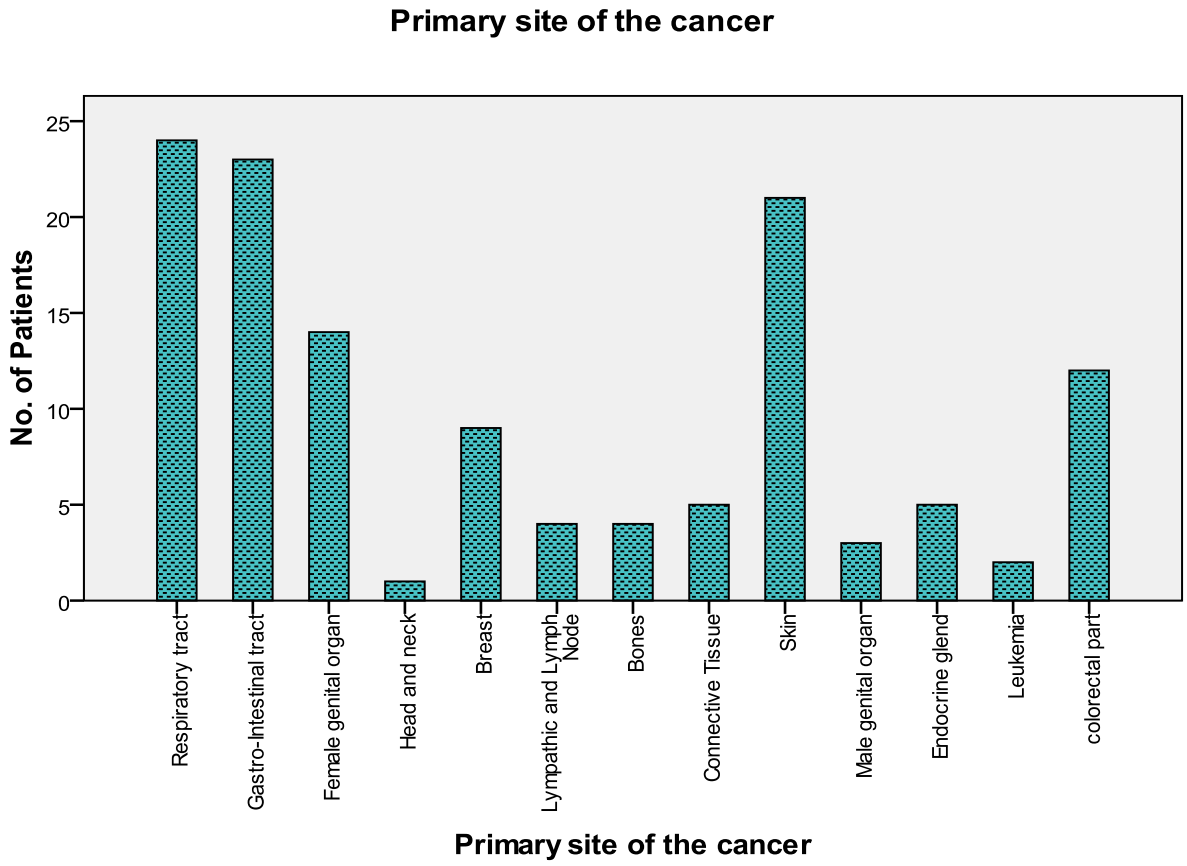

Figure 3.4 Distribution of patients by the primary site of cancer.

3.5 Family history of cancer

31 out of the 128 patients surveyed have been acknowledged to have at least one family member who had suffered from any kind of cancer (Figure 4.2). It counts 24.21% (Approx. 25%) of the total patients surveyed .The following chart will show the information about the type of cancer the patients are suffering from and the history of cancer in their family.

Table 3.2 Patients having history of cancer in their family and type of cancer they are suffering from.

Serial No.	**Gender**	**Age**	**Type of cancer the patient suffering from**	**Type of cancer the family member suffered from**	**Relation with the patient.**
1	Male	18	Non-Hodgkin's lymphoma	Lung Cancer	Aunt
2	Male	55	Stomach cancer	Soft tissue cancer	Mother
3	Male	58	Lung Cancer	Lung Cancer	Father
4	Male	20	Lymphoblastic leukemia	Liver Cancer	Grandfather
5	Male	57	Lung cancer	Liver Cancer	Uncle
6	Male	42	Tumor in Stomach	Pancreatic Cancer	Uncle
7	Male	34	Stomach Cancer	Liver Cancer	Grandfather
8	Male	16	Osteosarcoma	Colon Cancer	Uncle
9	Male	33	Stomach Cancer	Lung Cancer	Uncle
10	Male	13	Nasopharyngeal Cancer	Lung Cancer	Grandfather
11	Male	45	Colon Cancer	Colon Cancer	Brother
12	Male	20	Soft Tissue Cancer	Breast Cancer	Grandmother

13	Male	45	Pancreatic Cancer	Liver cancer	Grandmother
14	Male	50	Soft tissue cancer	Liver Cancer	Mother
15	Male	36	Liver cancer	Blood Cancer	Aunt
16	Male	50	Soft Tissue cancer	Blood Cancer	Mother
17	Female	40	Stomach Cancer	Liver Cancer	Sister
18	Female	45	Ovarian Tumor	Liver(F),Intestinal(M)	Father,Mother
19	Female	50	Cervical Cancer	Thoracic cancer	Father
20	Female	17	Ewing's sarcoma	Soft Tissue cancer	Uncle
21	Female	35	Lung Cancer	Duodenal cancer	Mother
22	Female	45	Soft Tissue	Soft Tissue cancer	Aunt
23	Female	30	Rectal Cancer	Blood cancer	Cousin
24	Female	21	NonHodgkin's lymphoma	Cervical cancer	Aunt
25	Male	46	Lung Cancer	Liver Cancer	Father
26	Male	48	Soft Tissue	Lung cancer	Uncle
27	Male	15	Blood cancer	Not Known	Uncle
28	Male	59	Lymph Node Cancer	Prostate Cancer	Father
29	Male	45	Lung Cancer	Colon cancer	Father
30	Male	57	Colon Cancer	Liver Cancer	Brother
31	Male	46	Gallbladder Cancer	Liver Cancer	Father

Here it can be seen that Lung cancer is the most common type of cancer case (6 cases) among the patients recognized to have family history of cancer. However stomach cancer, liver cancer and pancreatic cancer also detected in the patients having a family history of cancer.

3.6 Correlation of family history with primary site of cancer

In the table below (table 3.3) a correlation of family history of cancer with the primary site of cancer can be seen. Here 8 respiratory tract cancer patients have a family history of cancer while the other 16 lung cancer patients do not have any family history of cancer. Similarly, for gastro intestinal tract cancer, 5 patients have a family history of cancer while the other 18 patients didn't have any kind of family history. Table 3.3 is generated using SPSS which shows the correlation of family history with primary site of cancer. Here 24% of total patients have family history of cancer.33% patients diagnosed with respiratory tract cancer have family history. The chi-square test gives a p-value of 0.064 which is less than 0.1. From the test we can see there is a significant correlation of family history and primary site of cancer.

Table 3.3: Correlation of Family history with Primary site of Cancer

Primary site of the cancer vs Family History of Cancer of the Patients Cross tabulation: Chi-square test

			Family History of Cancer of the Patients		Total
			Yes	No	
Primary site of the cancer	Respiratory tract	Count	8	16	24
		Expected Count	6.0	18.0	24.0
	Gastro-Intestinal tract	Count	5	18	23
		Expected Count	5.8	17.2	23.0
	Female genital organ	Count	1	13	14

		Expected Count	3.5	10.5	14.0
	Head and neck	Count	0	1	1
		Expected Count	.3	.7	1.0
	Breast	Count	1	8	9
		Expected Count	2.3	6.7	9.0
	Lympathic and Lymph Node	Count	3	1	4
		Expected Count	1.0	3.0	4.0
	Bones	Count	2	2	4
		Expected Count	1.0	3.0	4.0
	Connective Tissue	Count	1	4	5
		Expected Count	1.3	3.7	5.0
	Skin	Count	4	17	21
		Expected Count	5.3	15.7	21.0
	Male genital organ	Count	0	3	3
		Expected Count	.8	2.2	3.0
	Endocrine glend	Count	3	2	5
		Expected Count	1.3	3.7	5.0
	Leukemia	Count	1	1	2
		Expected Count	.5	1.5	2.0
	colorectal part	Count	3	9	12
		Expected Count	3.0	9.0	12.0
Total		Count	32	95	127
		Expected Count	32.0	95.0	127.0

3.7 Distribution of Cancer Patients in different divisions of Bangladesh

Now the bar graph will show the distribution of patients from different divisions.

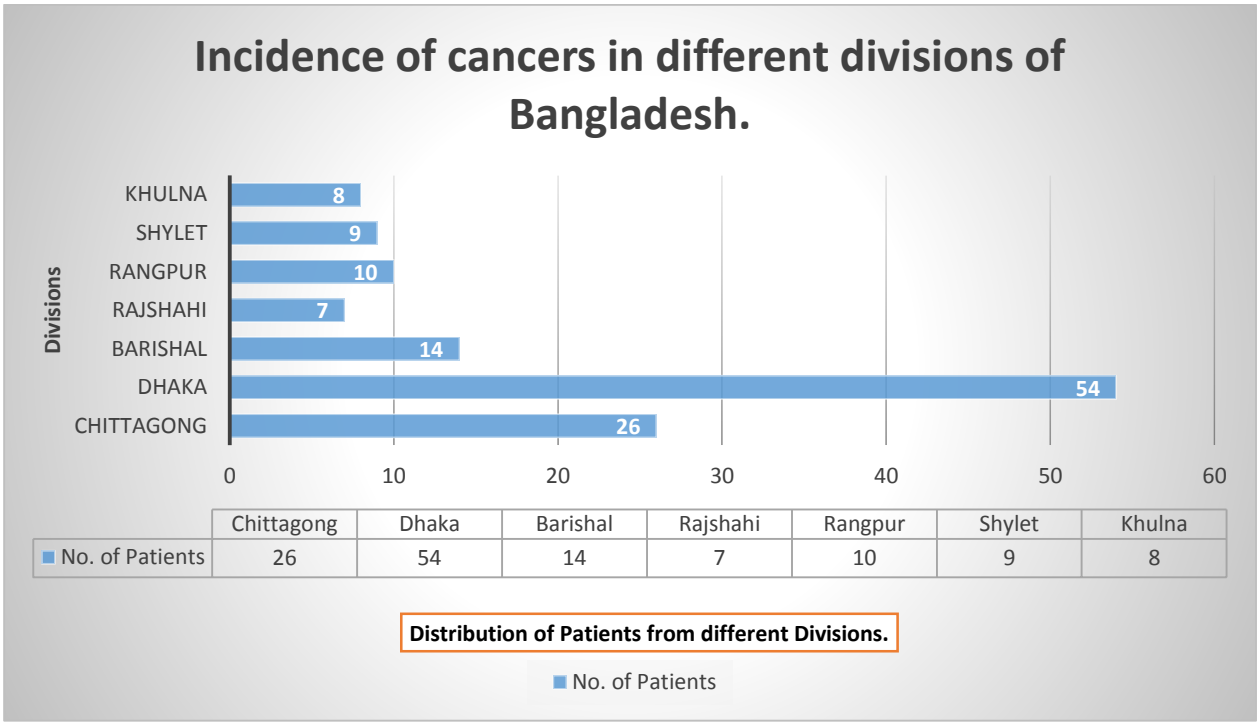

Figure 3.5 Incidence of cancers in different divisions of Bangladesh.

From the graph showing the distribution (Figure 3.5) of patients from different division of Bangladesh, we can see that Dhaka division has the maximum number of patients showing whereas Rajshahi division has least number of patients tolling 7.The number of patients from Dhaka division is almost 8 times the number of patients from Rajshahi division. However no of patients from Chittagong and Barisal is also comparatively higher than other divisions.

3.8 Type of treatment given to the patients

The two hospitals surveyed are fully equipped to give curative, palliative and terminal care to the cancer patients. However, maximum patients receive curative and palliative care in these

hospitals. The table 3.4 below will show what type of treatment was given to the patients those are surveyed:

Table 3.4: Type of treatment given to the patients.

Serial No.	Type of treatment given	No. of patients
01	Surgery	23
02	Chemotherapy	50
03	Radiotherapy	3
04	Surgery + Chemotherapy	21
05	Surgery + Radiotherapy	5
06	Surgery + Chemotherapy + Radiotherapy	4
07	Others	22

From table 3.4 it can be seen that chemotherapy is prescribed in 50 cases (39%).Combination of surgery and chemotherapy is also prescribed to 21 patients (16%).Only surgery is prescribed to 23 patients followed by others medications. A combination of surgery, chemotherapy and radiotherapy is also prescribed to 4 patients (3.12%) out of 128.

Chemotherapy is the most common type of treatment given to the patients diagnosed with cancer. However combination of surgery chemotherapy and radiotherapy is also given to the patients according to the requirements. Chemotherapy is the combination of several anticancer drugs out of which are very common. Approximately 52% patients surveyed in this project were prescribed chemotherapy. Though anticancer drugs and their dose depend upon the type of cancer and the condition of the patient, some of the most prescribed anticancer drugs in this survey are Etoposite, 5-Fluro Uracil, Cisplatin, ,Doxorubicin, Iphosphamide etc.

Chapter Four: Discussion

In the study 128 patients were surveyed. Among them 79 were male and 49 female. Male and the female ratio is 1.63:1. A similar study was conducted in 2012 shows male to female cancer patient ratio is 2.1:1[20].In this study the ratio of male is quiet higher than that of the ratio of male patients found in the current survey. From another related study done in 2006 at NICRH it was found that the ratio of male and female patient was 1.4:1, which is close to the result found in this research[18].from another study by the same institute, male and female ratio is 1.17:1[19].From this project and reviewing other similar recent research papers, we can see that percentage for male patients has been increased than that of male patients. Another possible reason for this result may be because Bangladesh is a developing country. Less attention is given to the females when the early symptoms of cancer are observed. Many female patients (mostly poor) die even before they get any kind of treatment for cancer; in many cases the cancer remain undetected. Increased practice of tobacco exposure is responsible for lung cancer in male which also increase the count of male cancer patients. To confirm the lower incidence of cancer in female compared to male further study has to be done in greater population.

From the survey, it has been found that maximum patients (both male and female) are married. Here 66 out of 79 male patients and 43 out of 49 female patients are married. The percentage of married male patient is 90.41% and married female patient is 87.8%. Marietal status have little effect on survival rate. According to a study the patients who are married has better survival rate than patients who are single, divorced or widowed when examining all major primary site cancers[21].From another research it has been found that marital status has positive impact on the survival rate of Norwegian people[22].In case of breast cancer in women, marital status play an important role to have an improved quality of life apart from life expectancy and stage of cancer[23].Another study on 1260,898 patients showed that unmarried patients are at higher risk of getting metastatic cancer, under treatment and death resulting from their cancer[24].Patients who are married display less distress, depression, and anxiety than their unmarried counterparts after a diagnosis of cancer, as a partner can share the emotional burden and provide appropriate social support[25].

From the survey result we can see the incidence of cancer in different age groups. In case of male patients the age group of 51-60 years has the highest incidence of cancer which is 23 out of 128 patients. Where as for female patients incidence of cancer is highest in the age group 31-40 years. Here the number of patients of middle age is greater but from many studies it has been found that the risk of cancer increase with increasing age. There is an intense relation of cancer risk with age[29].Increasing age is one of the major risk factors for breast cancer. Although breast cancer can occur early in life, most cases showed that it is a disease of old age. For a woman in her 30s the risk is approximately 1 in 250 cases, whereas for a woman in her 70s, it is approximately 1 in 30 cases which is much higher.Most breast cancers are diagnosed after the menopause; about three fourth of breast cancer cases occur after 50 years of age. Age is considered to be a likely backup for DNA damage accumulated during life[27]. However, according to a research by demographic study of Germany, the cancer incidence rate declines at old age after steep increase during adult life[29].Any organism over the course of its lifetime occasionally deals with substances that cannot be utilized by its cells (e.g. talc and heavy metals) [30].It may be due to age-related decline in the proliferation rate, including the rate of lymphocytes. Nevertheless, at least some age-associated exposures might increase vulnerability to cancer with age[31].

31 out of 128 i.e., approximately 25% of the patients surveyed acknowledged to have a history of at least one blood related family member who had cancer. 33% of the total Respiratory tract cancer cases have been found to be related with family history in this project. Family history is an important and well recognized risk factor that contributes to the development of certain types of cancer like breast cancer. If an women with a mother, sister or daughter with breast cancer, she is, on average, at twice the risk of developing cancer than those with no affected first degree relative. The risk increases with the number of affected first degree relatives. There are some rare harmful mutations in genes such as BRCA1 and BRCA2 that are associated with a high risk of the disease. A family history of ovarian cancer increases the risk of breast cancer because the risk of ovarian cancer is also associated with these genes. The primary factors that contribute to the striking international variation in incidence rates include differences in reproductive and hormonal factors. Reproductive factors that increase risk include a long menstrual history (menstrual periods that start earlier and/or end later in life), never having children, recent use of oral contraceptives, and having one's first child after age 30[34]. In addition, common variants in

other genes are each associated with only a small increase in risk[27].Prostate cancer "runs" in certain families, although hereditary forms of prostate cancer account for only about 5%-10% of all prostate cancer cases. But even in the non-hereditary form, family history does matter: having a brother or father with prostate cancer (especially diagnosed at younger ages) increases a man's prostate cancer risk 2-or 3-fold[28].

Smoking pose to be a leading cause of cancer in Bangladesh. 54% of total surveyed patients had direct and chronic exposure to tobacco (Cigarette smoking), among which 13.28% of the patient had Lung cancer and the remaining patients have other type of cancers like gastro intestinal tract cancer, hepatic cancer etc. In case of lung cancer smoking is the main disposing factors. Smoking is responsible for more than four of five cases of lung cancer. Lung cancer has the lowest survival rates of all cancers in UK. Smoking increase the risk of 13 other types of cancer including another including larynx, oesophagus, mouth and pharynx, bladder, pancreas, liver , kidney, stomach, bowel, cervix, ovary, nose, sinus and some types of leukemia[45]. According to a study done by World Health Organization shows that the 5 trillion cigarettes are smoked per year which is going to cause nearly 10 million fatalities per year by 2030. Lung cancer is the most common cancer caused by tobacco exposure, with one case being produced for every 3 million cigarettes smoked[46]. Tobacco smoke contains over 4000 chemicals. As well as tar and nicotine, these harmful chemicals include carbon monoxide, ammonia and arsenic. Smoking is a leading cause of cancer, and substantially increases the risk of cardiovascular disease, stroke and chronic lung disease[47]. Keeping all these concerns in mind we should follow every means to stop or minimize tobacco smoking.

Regarding the treatment of cancer, chemotherapy is the most common type of treatment given to the patients diagnosed with cancer. However combination of surgery chemotherapy and radiotherapy is also given to the patients according to the requirements. Chemotherapy is the combination of several anticancer drugs out of which are very common. Approximately 52% patients surveyed in this project were prescribed chemotherapy. Though anticancer drugs and their dose depend upon the type of cancer and the condition of the patient, some of the most prescribed anticancer drugs in this survey are Etoposite, 5-Fluro Uracil, Cisplatin, ,Doxorubicin, Iphosphamide etc.

Chapter Five: Concluding Remarks

Cancer is disease of old age and the survey result supports this fact. Majority of patients surveyed are above the age 45 years old. Apart from this, there were patients of very tender age implying the incidence of cancer in young people. Though marriage has no direct effect on cancer but it ensures better patient care and thereby increases the survival rate. Similar to the cancer survey results by different international cancer research organization like GLOBOCAN and cancer Research UK, result of this survey reveals that lung cancer has the highest frequency among all type of cancer. There is a significant correlation of lung cancer with the family history. Lung cancer, GIT cancers and breast cancer also has a significant correlation with family history of cancer which indicates genetic link. Although, genetics play an important role in cancer generation, but in many cases it is initiated by exposure to environmental carcinogen. Dhaka and Chittagong are two of the most polluted metropolitan cities of Bangladesh which share the maximum number of cancer patients among all other divisions of Bangladesh. Bangladesh has achieved a notable advancement in cancer care with establishment of National Institute of Cancer Research and Hospital; a specialized hospital for cancer care. Also some private hospital gives quality cancer care with ultra modern treatment facilities. Chemotherapy is the most common mode of treatment where some common anticancer drugs like Cisplatin, 5-Fluro Uracil, Doxorubicin are often prescribed. Latest anticancer drugs like monoclonal antibodies are rarely used due to high price and unavailability of such drugs. This project presents a real picture of current scenario of cancer in Dhaka city. Further study on a larger population and longer duration of time can give a more reliable picture of cancer in Dhaka city.

Cancer treatment is a cost oriented and it seems to be a great problem for patients from poor and middle class. Latest technology and medication in cancer care are often not possible due to economic strain of these patients. Proper screening of cancer at right time is very important in successful cancer treatment. In most of the cases, cancer metastasis occurs due to failure of early detection and treatment which tolls the cancer death rate. Using harmful carcinogenic chemical compounds as food preservatives and toxic waste products as fish and poultry feed is considerable risk factor for cancer generation. Moreover, using toxic pesticides for growing and preserving crops, vegetables and fruits pose a major problem as they accumulates in the human

body. Industrial and hospital toxic waste discharge in the water body also affects the level of carcinogen as this water is used by surrounding people for different purpose.

Government should introduce a nationwide subsidized cancer screening program which will play a important role in early detection of cancer. Besides, Government should introduce latest technology for cancer screening and treatment and the new system will be supported by experienced doctors and efficient technicians. Widespread awareness campaign about the cancer screening and causative carcinogens can be operated with help of NGO's. Taxation for tobacco containing product can be increased to 3-4 fold to discourage smoking. Enforcement of the law against toxic food preservatives and food adulteration should be exercised regularly to decrease the deliberate exposure to carcinogen. All the industries should be far away from locality and no factory should be permitted without proper waste disposal treatment and water treatment plant. Last but not the least individual responsibility to create awareness against cancer can be the best possible way to decrease this emerging burden of cancer.

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Appendix 1: Questionnaire of the survey

Date:

Hospital Name:

Questionnaire to assess the present scenario of cancer in Dhaka city, Bangladesh.

1. Name of the patient: ……..(Optional)

2. Date of admission in hospital/Registration no.: ……..

3. Occupation (Self/Family): ……

4. Present Address (where the patient spent most of his/her life time):

    i. Division: ……
    ii. District: …….

5. Type of residential area (where did the patient lived) …….

6. Age:……..

7. Gender: …….

8. Religion:……

9. Marital Status: ……..

10. Education: …….

11. Family history of cancer (genetic factor): a. Yes b. No

If yes, a. Type of Cancer: …….

b. Relation with the Patient: …….

12. Exposure to tobacco (smoking/chewing):……a. Yes b. No

If yes, duration of tobacco exposure: …….

13. Stopped exposure to tobacco? a. Yes b. No

If yes, When? ……..

14. Alcohol consumption: a. Yes b. No

If yes, Duration of alcohol consumption: ……

15. Is the patient exposed to harmful carcinogen at workplace?
(Chemicals/solvents/fumes /oils etc.): a. Yes b. No

If yes, duration of exposure: …….

16. If 15 is yes, what type of carcinogenic material it was? …….

17. Was the patient exposed to X-ray/Radioactive elements during their job:

a. Yes b. No

If yes, duration of exposure…….

18. Date of diagnosis:
……

19. Type of cancer:
…….

20. Diagnostic status:
a) Histopathologically confirmed
b) Cytopathologically confirmed
c) Suspected
d) Clinical diagnosis
e) Others

21. Method of diagnosis:
……

22. Clinical stage of the disease:
……..

23. No of time coming to the hospital for treatment (Chemotherapy cycle): ……

24. Performance status before coming to hospital for treatment:

a) Able to carry out all normal activity without restriction.
b) Restricted in physically strenuous activity but ambulatory and able to carry out light work.
c) Ambulatory and capable of all self-care but unable to carry out any work up and about more than 50% of waking hours.
d) Capable of only limited self-care;confined to bed or chair more than 50% of waking hours.

e) Completely disabled; cannot carry any self-care totally confined to bed or chair.

25. Type of treatment given:

a) Surgery
b) Radiotherapy
c) Chemotherapy
d) Immunotherapy
e) Hormone therapy.

26. Intention of treatment:
a) Curative
b) Palliative
c) Terminal cure

27. Period of treatment:

28. Prescribed medication:

Appendix II: Permission by ethical committee of NICRH to conduct the survey.

National Institute of Cancer Research and Hospital
Mohakhali, Dhaka-1212.

Ref. no: NICRH/Ethics/ 2014/ 147 Date: 02/12/2014

Certificate of Ethical Approval

Title: "Current scenario of cancer in Dhaka division, Bangladesh."

Investigator: Bratakatha Nath, Student ID: 11146019, Department of Pharmacy, BRAC University Dhaka.

Recommendation: APPROVED/~~APPROVED AFTER CORRECTION~~/NO~~T APPROVE~~D

Note: The research study to be carried out must comply with the national laws and regulations of the country and "WMA declaration of Helsinki-Ethical Principles for Medical Research Involving Human Subjects, amended, October 2008'

02/12/2014

Prof (Dr.) Md. Moarraf Hossen
Chairperson
Ethics Committee
NICRH

Prof. (Dr.) Md. Mahbubur Rahman
Member Secretary
Ethics Committee
NICRH