

Evaluation of genetics of cancer predisposition in patients and efficacy of various chemotherapeutic drugs in Bangladesh

A project submitted

by

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to

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Inspiring Excellence

BRAC University

Dhaka, Bangladesh

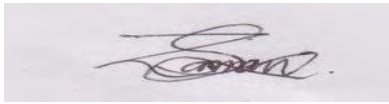
November, 2017

Dedicated to my parents

Certification Statement

This is to certify that this project titled 'Evaluation of Genetics of Cancer Predisposition in Patients and Efficacy of Various Chemotherapeutic Drugs in Bangladesh' submitted for the partial fulfillment of the requirements for the degree of Bachelor of Pharmacy from the Department of Pharmacy, BRAC University constitutes my own work under the supervision of Dr. Mesbah Talukder, Associate Professor, Department of Pharmacy, BRAC University and that appropriate credit is given where I have used the language, ideas or writings of another.

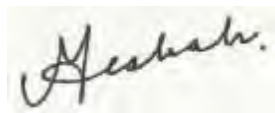
Signed,



Date:

23 November 2017

Countersigned by the supervisor



23 November 2018

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Abstract

The number of cancer patients in Bangladesh is increasing at an alarming rate in the recent days, thus it has become a common disease in our country. In this study, to evaluate the genetics of cancer predisposition in patients and efficacy of various chemotherapeutic drugs in Bangladesh, a survey was done on 100 patients from August 2017 through November 2017 on random basis. The study was done in National Institute of Cancer Research and Hospital and Ahsania Mission Cancer Hospital based on a constructed questionnaire. Majority of the patients were female with a number of 65 and male were 35 in number. Cancer was seen more prevalent in the age group of 45-64 years. The top most cancer found in patients was breast cancer (34%). The other top four cancers were lung (14%), ovary (6%), gallbladder (6%) and cervix (5%). The most common forms of diagnosis were histopathology report, PET CT scan, Cytopathology report, X ray and MRI. The major treatment types were surgery, chemotherapy and radiotherapy used alone or in combinations. The purposes of the treatments were curative (62%), terminal (25%) and palliative (13%). The study also focused on various complications after the administration of chemotherapy like alopecia, loss of appetite, pain and nausea as the top most. In terms of frequency of anticancer drugs, the most used ones were Cisplatin (45%), Paclitaxel (41%), Cyclophosphamide (33%) and Doxorubicin (30%). In this study the majority of the patients displayed hereditary cancer which may be boosted through carcinogens, refrigerated raw meats, excess sugar intake, and obesity and food habits.

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Chapter One: Introduction

1.1 Cancer, global scenario

The reason behind most of the deaths worldwide is Cancer (Sharmin et al. 2014). It has been assumed that the worldwide cancer will be about 13.1 million by 2030 (Islam et al. 2015). Statisticians have informed us about 80% deaths that will occur very soon due to stroke, cancer and heart disease. It has been assumed by The World Health Organization (WHO) that every year there will be additional 10 million cancer patients. At present cardiovascular disease is considered as the most responsible disease for majority of the deaths which is very soon going to be put back by cancer (Lam 2003). In the United States in 2016, the overall amount of new cancer was 1,685,210 and overall death due to cancer was 595,690. Though in female population all around occurrence of cancer are almost constant, it has been going down every year in men by 3.1% (from 2009-2012) due to fast decrease in the identification of prostate cancer. Declination of deaths due to cancer has been observed by 23% since 1991 and upto 2012, there is report about above 1.7 million deaths to be turned away. In spite of having progress, deaths due to liver cancer, pancreatic cancer and uterine cancer are shooting up and at present cancer is considered as the most responsible factor of deaths (Siegel, Miller, and Jemal 2017).

According to European Union, in a single year due to cancer the number of deaths is nearly 707,000 men and 555,000 women and about 1.4 million in male and 1.2 million in female new cases of cancer. WHO highlighted that, deaths due to cancer can be prevented minimum 30–40% (Sharmin et al. 2014). According to American Cancer Society, in the United States, alone in 2017 new cancer patients numbered 1,688,780 and deaths numbered 600,920 are more likely to occur. In case of all types of cancer the frequency has been observed 20% less in the female than in male. Still, cancer type varies depending on sex (Siegel et al. 2017). From (2004- 2013) the available data indicated consistency in all over cancer frequency in case of women every year downward movement of about 2% in men while 1.5 % death (2005-2014) reduction has been noticed in case of both the men and the women (Siegel et al. 2017).

In the less developed countries or developing countries more than six cancer deaths out of ten occur (“Cancer Incidence Statistics,” 2014). Between 1990 and 2010 about 71% boost up in cancer deaths have been observed in the countries that are developing, due to demographic changes alone whereas less than half (31%) increase in the developed countries has been projected. In the developing countries the rate of cancer will gear up from 650000 to 2.2 million per year (Kumar et al. 2009). In 2012 three million cases of newly diagnosed cancer has been reported by China and India alone who contain 37% of the world population (Hertz et al. 2008). Cancer of the lung, breast, cervix and mouth (oral) are considered as the most common type. In female, cancer of the breast and cervix are the top two occurring cancers and in male population cancer of the lung and mouth (oral) are in top positions (Hussain et al. 2013). For both cases of men and women the frequency of cancer in the countries that are developing is half of those observed in developed countries although overall cancer mortality are quiet similar (Jemal et al. 2011).

Deaths (30%) due to cancer depends on 5 guiding habits and diet risks and these are increased Body Mass Index (BMI), less amount of green food, not sufficient exercise, tobacco (smoking/chewing) and alcohol consumption (Sharmin et al. 2014). Around 21% of deaths appear due to smoking alone and it is also responsible for around 70% deaths of worldwide cancer of the lung (Sharmin et al. 2014).

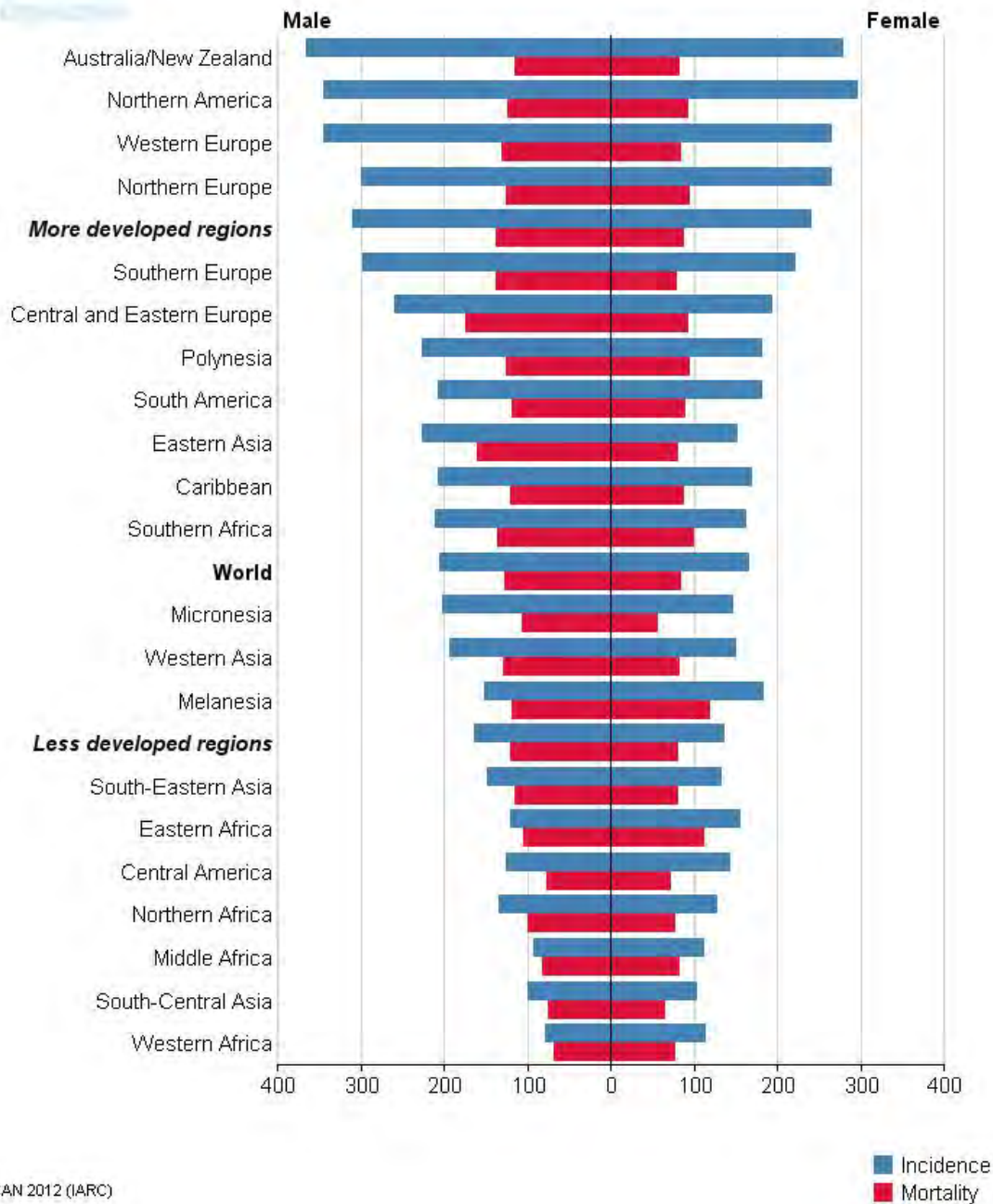


Figure 1.1 Calculated rates depending on standard age (Retrieved from GLOBOCAN 2012)

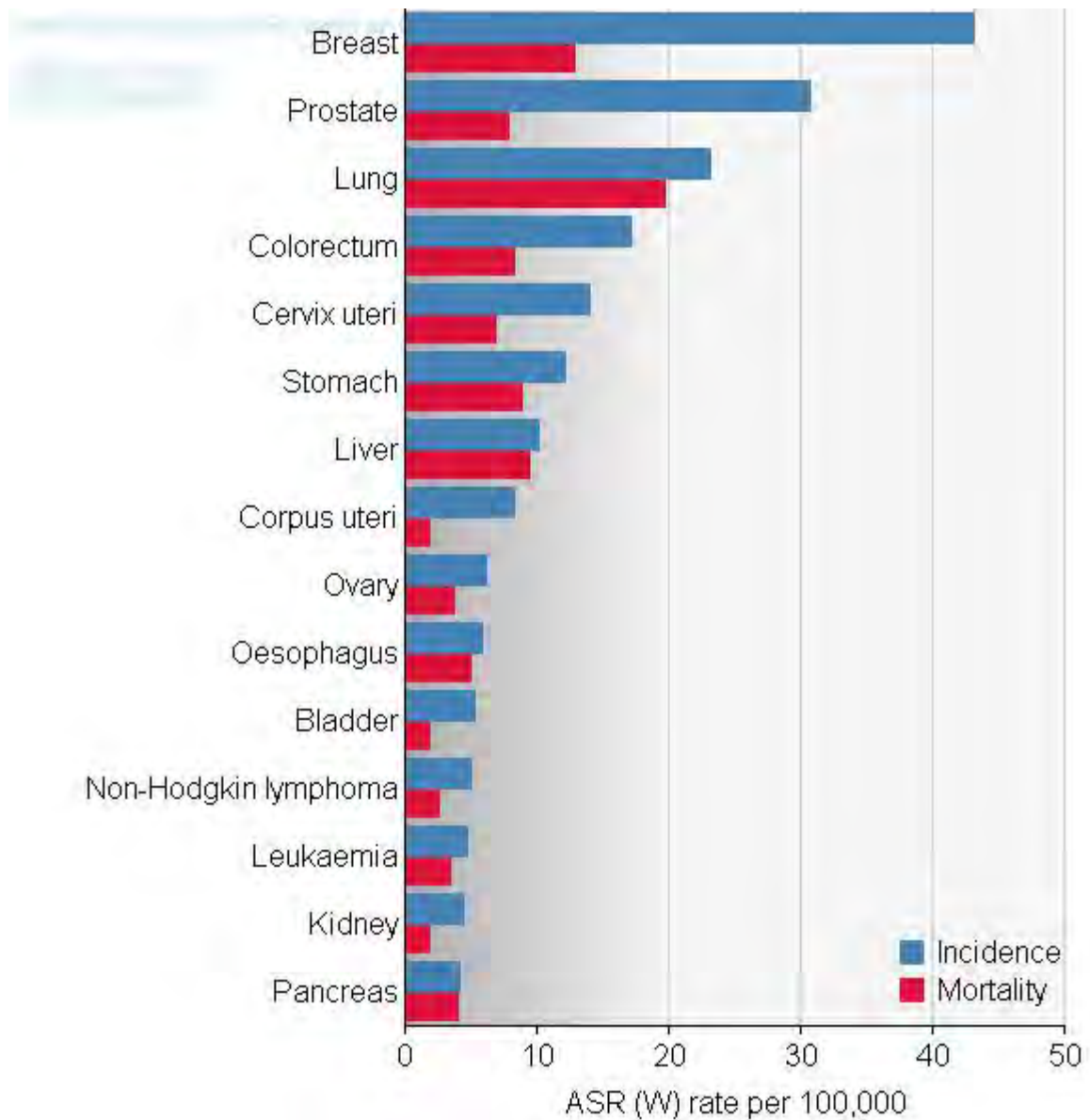


Figure 1.2 Calculated standard age frequency and rank of mortality :(Male and Female)
(Retrieved from GLOBOCAN 2012)

1.2 What is cancer?

Cancer is considered as a general name for a collection of more than 100 diseases. Though there are various types of malignancy, all malignancies begin from irregular cells that develop abnormally and uncontrollably. Untreated tumors can cause serious and death. Tumor is usually consisted of trillions of cells and may begin in any part of a person. Human cells develop as well as multiply by growing new cells according to the requirement of the

body. Once the cells become aged, they undergo death by apoptosis and new cells take their place.

Unlike to dangerous tumors, it has been observed closely that benign tumors don't stretch out or attack the tissues that are adjacent. Tumors that are benign in nature may on certain circumstances become enormous. Once the tumors are discarded, they mostly don't develop again, while tumors that are considered dangerous more often have this problem (Cancer 2015).

1.3 Variety of cancer

Over 150 varieties of cancers exists(Lam 2003). Names of the cancers are mainly given depending on the primary site of the cancer. For instance, the primary site of the cancer in lungs is lung and the primary site of the cancer in brain is brain. Naming of the cancer can be done too by the nature of the cancer forming cells like squamous and epithelial cells(Khan.SM 2003).

Cancers can be categorized as follows:

1.3.1 Carcinoma

The most common type of cancers is carcinomas. Cells enveloping inner and outer surfaces of body are known as cells called epithelial and are responsible for carcinomas. Carcinomas occurring at epithelial cells that are distinct have unique identifications:

Cancer affecting the cells producing fluids or mucus can be named as Adenocarcinoma. Majority of the colon, prostate and breast cancers are Adenocarcinoma.

Commencement of cancer in the bottom layer of epidermis is identified as carcinoma of Basal cell.

External surface of our skin contains squamous epithelial cells and cancer effect on these cells may name it as Squamous cell carcinoma. Certain body parts like stomach, intestines, lungs, bladder, and kidneys may be enveloped with this cell. Carcinoma of squamous cells can also be called epidermoid carcinomas.

Transitional cell carcinoma is known as appearance of cancer in the urothelium or epithelium that is transitional. Examples can be uterus, kidney and bladder cancer (Khan.SM 2003).

Characteristics of some carcinomas like Lung, skin, breast, stomach, colon and prostate are tumors that appear solid(Lam 2003).

1.3.2 Sarcoma

In bone and soft tissues as well as muscle, fat, vessels (blood and lymph), tendons, ligaments and other fibrous tissues cancer may appear and it may be named as Sarcoma (Khan.SM 2003). Most lethal and scarce type of cancer is sarcoma which are solid too(Lam 2003).

Most common cancer of bone is known as Osteosarcoma.

Examples of some frequent soft tissue sarcomas can be Leiomyosarcoma, Kaposi sarcoma and malignant fibrous histiocytoma, Liposarcoma, and Dermatofibrosarcoma (Khan.SM 2003).

1.3.3 Leukemia

Leukemia is the name of a cancer that may come into existence in the blood-forming tissue of the bone marrow. Rather than forming tumors that are solid, leukocytes block out usual blood cells by mounting up in a huge amount in the blood and bone marrow. It becomes difficult for the body to reduce blood oozing from a cut, over power infection and supply sufficient oxygen to tissues when the volume of normal blood cells gets depressed (Khan.SM 2003).Uncontrolled creation of WBC is the characteristics of Leukemia (Lam 2003). Usually leukemia can be categorized into 4 major classes depending on the speed of spreading and the primary starting blood cells. Leukemia that spreads rapidly generally becomes worse soon and it is known as acute leukemia whereas not so fast developing leukemia worsens taking time known as chronic leukemia. Leukemia's are named based on various classes of blood cells that are affected by cancer like lymphoblastic leukemia (affected white blood cells). Though the most effected blood cells are WBC, platelets (required for blood clotting) and RBC (oxygen supply to the whole body) may also get affected (Khan.SM 2003).

1.3.4 Lymphoma

Generation of cancer in the lymphocytes like T cells and B cells can be named as Lymphoma which uncontrolled lymphocytes pile up lymph nodes and vessels along with other organs of body. Major 2 classes of lymphomas are:

Hodgkin lymphoma –Reed-Sternberg cells are unusual lymphocytes found in people with this disease which are mainly generated from B cells. In the classic type there are generally huge unusual lymphocytes which appear most common in people and it can be healed.

Non-Hodgkin lymphoma – Cancers generated in B cells or T cells and may develop rapidly in the lymphocytes. The variety of NHL depends on types of B-cells, T-cells, NK cells and majority is from B-cells. NHL can be rapid progressing in nature or slower progressing. (Khan.SM 2003).

1.3.5 Multiple Myeloma

A distinct class of immune cell is plasma cell where the cancer may also appear and it is named as multiple myeloma. Unusual myeloma cells gather and form tumors in the bone marrow as well as the whole body. It may also be recognized by the name Kahler disease. Myeloma with only one tumor is named as Plasmacytoma and presence of several tumors are known as multiple myeloma. Multiple myeloma may not be recognized until the advanced stage and it may remain silent without anyone noticing it. The serious consequences of these tumors include feeble bone, excessive calcium in blood, kidney and other organ injury. People with this problem may start to get infections now and then, anemic, uncontrolled blood loss and sensitive (Khan.SM 2003).

1.3.6 Melanoma

Melanocytes that produce pigment can also be cancer affected and may be called as melanoma. Apart from skin, eyes can also be affected. Most assaulting class of skin cancer is Melanoma which if not identified at the beginning may attack adjacent tissues and extend to other organs. In case of frequency, melanoma may be only 2% but the amount of deaths it causes is considered larger than other skin cancers (Khan.SM 2003).

1.3.7 Tumors of Brain and Spinal Cord

There are different types of brain and spinal cord tumors. Naming of the tumors depends on the class of cell from where it originated. Tumor may occur in astrocytes which are brain cells for maintaining healthy nerve cells and thus may be named astrocytic tumor (Khan.SM 2003).

1.3.8 Tumors of Germ Cell

Cells connected to sperm or egg generation are known as germ cells which may also be victim of cancer which may appear at any portion of the body (Khan.SM 2003).

1.3.9 Neuroendocrine Tumors

Hormones secreted in blood by certain cells as an order of the nervous system may become a victim to tumors named neuroendocrine tumors. Formation of tumors leads to excessive release of hormones (Khan.SM 2003).

1.3.10 Carcinoid Tumors

Tumors that develop in the gastrointestinal system (most often in the rectum and small intestine) gradually may also be classified as neuroendocrine tumors and named as carcinoid tumors. It may scatter in other sites of the body and extract serotonin or prostaglandins to develop (Khan.SM 2003).

1.4 Cancer Staging

Doctors have developed I to IV staging of cancer depending on the type and intensity of cancer (further distinguished by “A” or “B”). Cancers of stage I are generally curable small localized, stage II and III cancers are mainly enhanced and involves local lymph nodes while stage IV is mostly metastatic cancer. Staging varies depending on cancers. TNM system is used in case of solid tumors which represents Tumor, Nodes, and Metastases and these allotted various number to identify the exact stage(Lam 2003).

1.5 Factors Affecting Cancer

There are some major proven cancer risk factors and they are following:

1.5.1 Sunlight

It has been observed that every year approximately 4000,000 skin cancer occurs in the US because of solar radiation. Ultraviolet-B and C radiations are most destructive. It has been believed by the scientists that UV part of sunlightharms the skin cell DNA permanently resulting in mutational destruction which may appear as carcinomas of basal cell , squamous cell and melanoma(Lam 2003).

1.5.2 Chronic Exposure to Electromagnetic Fields (EMFs)

Electromagnetic fields are energy fields that have a magnetic effect on their surroundings. EMF is found in nature and human body. Everyday used electronic devices like computers, cell phones, microwave ovens and television also emits EMF. It disturbs hormonal balance natural resonance frequency of brain and increases the risk of brain cancer 2.5 times (Lam 2003).

1.5.3 Ionizing Radiation

Radiation like X-rays contains high energy rays that may lead to genetic mutations and ultimately cancer. Radiation may be responsible for various cancers which may remain silent for ages. Again all kinds of cancer can be induced by radiation, with its effect often felt only decades after the primary exposure(Lam 2003).

1.5.4 Toxins of Industries

High amount of toxicity is found in various industrial materials that enter almost every day in our body and they are lead, mercury, aluminum, nickel and cadmium. These may come inside our body by smoking, fish, cosmetics, drugs and so on and affect our nervous system and eventually become carcinogenic. These chemicals are considered responsible for epidemic breast cancer(Lam 2003).

1.5.5 Tobacco

Tobacco smoke procreates above 2000 poisonous chemicals. Due to smoking more than 350,000 deaths result in the US and 33% are due to lung cancer. If smoking is prohibited, lung cancer can be reduced by 90%. Second hand smoke or invasive smoking is responsible for benzene, radon, asbestos and other dangerous carcinogens. It has been found that about20% lung cancers appear due to invasive smoking(Lam 2003).

1.5.6Hormone Therapies

Abundant release of estrogen deficiency of progesterone is linked to breast cancer. Intake of hormone therapy 5 years or more may lead to breast cancer by 1.6 to 1.85%.Again women taking birth control pills have higher risk of getting breast cancer and it has been established through various studies(Lam 2003).

1.5.7 Diet and Nutrition

Cancer in various organs like breast, prostate, colon and pancreas are directly related to animal protein intake which converts into carcinogens. Large amount of unused proteins gradually takes to osteoporosis(Lam 2003).

1.5.8 Emotional Stress

Brain signals the adrenal gland to release an anti-inflammatory hormone called cortisol under emotional stress which affects the immune system of our body and gradually weakens it. Chronic stress may imprint a great negative effect on the thymus gland by shrinking it and minimizing WBC activities. Depression may be one of the causes of cancer and it has been statistically proved that depressed persons are 16 times more likely in a chance to develop cancer than healthy normal people(Lam 2003).

1.5.9 Viruses

Cancer can be initiated by viruses too. One of the most commonly seen cancers like cervical cancer can be initiated by Human *papillomavirus* (type 16 and 18). Another most widely spread cancer is liver cancer which may be a reason of Hepatitis B virus. There are several other cancers like Hodgkin's Lymphoma, Non-Hodgkin's Lymphoma, Upper pharynx and gastric. Virus plays a vital role in the cancer deaths and it may be not less than 15%(Lam 2003).

1.5.10 Blocked Detoxification Pathway

Our immune system cannot work against all types of unwanted intruders and carcinogens to protect our body. Making our body free of toxic materials to keep us healthy the liver of our body plays a vital role but this system can be hampered and eventually lead to cancer if the liver gets somehow blocked. Human body can be loaded heavily with metabolic secondary products like smoke, drugs, toxic chemicals, heavy metals, secondary products of hormone, free radical secondary products. As liver is considered the most important organ for detoxifying our body, any situation or substance that hampers liver function may lead to cancer gradually(Lam 2003).

1.5.11 Cellular Oxygen Deficiency

Oxygen is not at all necessary for cancerous cells to survive. Tremendous impact in cancer research has been observed after the discovery of this fundamental difference. Normal cells of embryo can get converted to cancerous cell by eliminating prime nutrients. In this changed situation, the cells get dependent on fermentation process for their energy. The fermentation process is not the usual way for energy production for human body as it produces huge amount of toxic secondary products like lactic acid which is highly acidic for the normal cellular functions. Incidents that tend to reduce our oxygen intake rather increases carbon monoxide intake has increased time to time. Human body can always adjust to the normal energy production system once dependence on fermentation is stopped(Lam 2003).

1.5.12 Genetic Factors

Recent years it has been discovered that there are numerous genes with direct links to cancer. There is up to 80% higher chance of getting breast cancer in women with a defective gene BRCA1. It has also been discovered that numerous oncogenes convert cells into cancerous cells. Some factors of the environment may be responsible for provoking oncogenes production(Lam 2003).

1.5.13 Age

For different types of cancer age can be a relevant factor. The midpoint of cancer appearance can be the age of 66 according to statistics. It indicates that half of cancer cases occur in people before they can reach their middle age. For instance, in case of breast, colon-rectum, lung and prostate the middle point can be the age of 61, 68, 70 and 66 accordingly. Actually cancer cannot be framed by the age. More than $\frac{1}{4}$ diagnoses are below the age of 20 in case of bone cancer this may be the case of other types of cancers too (Cancer 2015).

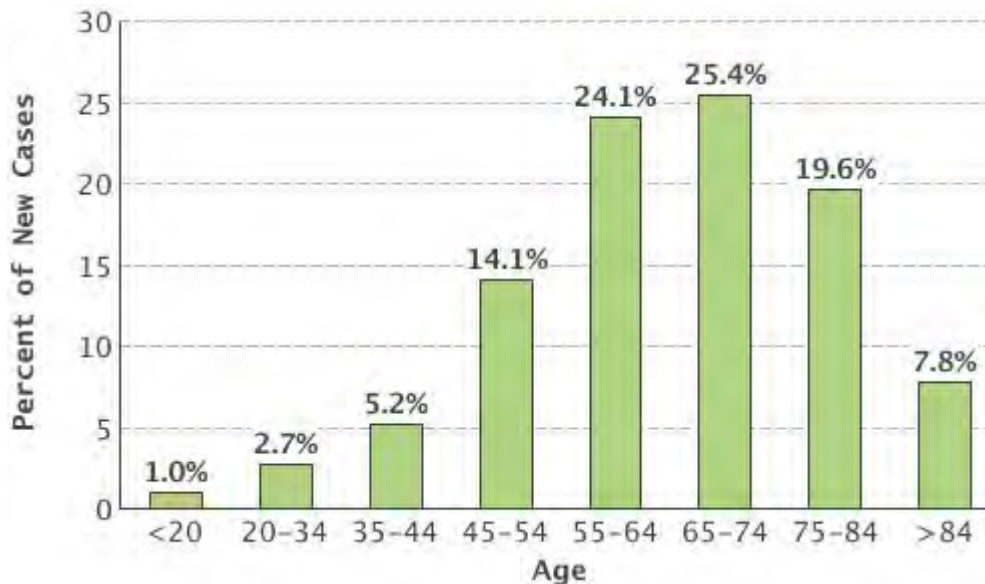


Figure 1.3 Cancer percentages by means of age (Retrieved from National Cancer Institute)

1.5.14 Chronic Inflammation

Inflammation is our body's resposory activity during any damage to tissue. When damaged tissues release chemicals, an inflammatory process starts to restore the wound. Inflammatory process ends after the wound heals.

In case of chronic inflammation, even if there is no injury the inflammatory process may begin and would not stop when it should. The reason behind this continuous inflammation is sometimes unknown and at times there may lay various factors behind it like obesity, infection, abnormality in tissues. All these may lead to a serious consequence like cancer by damaging the DNA. Colon cancer may be good example in this case (Cancer 2015).

1.5.15 Immunosuppression

People who go through organ transplantation process usually intake medicines like immunosuppressant that are designed to reduce the possibility of rejecting organs. In this new compromised condition of the body, it becomes quite impossible to identify and fight off substances liable for cancer. The immune system can be weakened and increases the risk of certain cancers by infections with HIV.

It has been observed that the recipients of the organ transplants may fall a victim to variety of cancers easily. Infectious agents may cause some of these cancers. In this compromised

body's the most common cancer that has been seen to appear is non-Hodgkin lymphoma (NHL). There are some other varieties too that are also not left that behind to occur like cancer in the lung, kidney, and liver. Some viruses may also be accountable for causing NHL like Epstein-Barr virus (EBV). People whose health condition is already compromised due to HIV/AIDS are more likely to fall prey to cancer by the attack of various infectious agents (Cancer 2015).

1.6 The Genetics of Cancer

1.6.1 Genetic Changes and Cancer

Cancer may be known as genetic disease due to the alteration in the genes to disrupt growth and division

Proteins are made by the instructions from the genes. When alterations are seen in the genes, normal growth functions may hamper and gradually lead to cancer.

Parents may also be behind the scene of cancer by generating that defected germ cells and this phenomenon is known as germline changes. Genetic changes are not only dependent on parents but also on some environmental toxic substances too like tobacco smoke, UV ray. Somatic (or acquired) changes are genetic changes that appear after conception.

There are more genetic changes in cancer cells than normal cells but there is a unique combination of genetic alterations in each person's cancer. Additional changes will occur as the cancer continues to grow. There may be different genetic changes even within the same tumor (Genetics 2017).

1.6.2 Hereditary Cancer Syndromes

Apart from genetic reasons, heredity may also be responsible for 5-10% of all cancers. Genetic can be done to ensure any presence of cancer.

It has been recommended by the experts that if there is anyone in a family victim of cancer, others should be careful and take the necessary tests to ensure their safety.

It is not obvious that only the presence of mutation alone will lead to cancer though some family member suffers from it already. The activation of the mutation may be dependent on triggering of the mutation by various factors that varies person to person (Genetics 2017).

1.7 Types of Cancer Therapy

There are several ways to treat cancer like surgery, chemotherapy or radiation therapy.

1.7.1 Surgery

Most used and major treatment in cancer is surgery. The main purpose of it is to eliminate localized tumors but it is not that much effective when cancer extends and affects other organs. Though it is rarely fruitful treatment for the cancer of prostate, it can be very successful for the treatment of breast cancer together with chemotherapy (Lam 2003).

1.7.2 Chemotherapy

During chemotherapy cancer cells are easily destroyed. The processes used by normal cells are also followed by the cells that are cancerous. As a result, chemotherapy gives toxic effect to the normal cells also that lies alongside the cancerous cells and also damaged during the process. Again most of the chemotherapy drugs are that much toxic to alter DNA and the side effects impose huge negativity on health and may lead to even death.

As the toxicity level of chemotherapy is too high for human body, it should only be used when toxic effects outweigh the necessity of the patient. Not all types of cancer are that much benefited by chemotherapies except few epithelial cellcancers and the rate of success is 7% in case of eliminating cancer. It has been evident from the statistics that in case of 80% of malignant tumors chemotherapy is not very effective treatment (Lam 2003).

1.7.3 Radiation Therapy

Radio therapy has almost similar side effects as chemotherapy. Even though the most of the effect of it is seen during palliative care for few still the use should be very selective. For example, it has been proved that radiation treatment reduces death by 13.2% in breast cancer. Nevertheless, the incidents of death may increase to 21.2% in heart disease patients because of using this therapy.

Although radiation therapy is less painful the major purpose of constricting tumors are used only the tumors are approaching the vital parts of the body. The main limitation in this case is patients tolerance limit of radiation is limited and excess may take a great toll on life by showing poisonous effect(Lam 2003).

Chapter Two: Literature Review

2.1 Global Cancer Overview

Cancer is considered as global health burden due to its affect and severity regardless of region and socioeconomic groups. At present cancer is responsible for every 1 out of 7 deaths globally and this rate is much higher than HIV/AIDS, tuberculosis and malaria altogether. In 2012, the worldwide estimated cancer cases were 14.1 million and the cancer deaths were 8.2 million. It has been observed that underdeveloped and developing countries who have limited resources to resolve this issue are main victim of cancer which indicates 60% deaths (Facts 2017). Usually men are affected more than women which are about 25%. Generation of cancer in male may vary in different regions of the world like out of 100,000 in Western Africa 79 are affected and in Australia/New Zealand 365 are affected. Generation of cancer in women shows similarity regardless of area like out of 100,000 in South-Central Asia 103 are affected and in Northern America 295 are affected. Mortality rates show lower variations than incidence rate in terms of region. In case of male population, mortality rate seems to be the highest in Central and Eastern Europe and lowest in Western Africa showing the deaths of 173 per 100,000 and 69 per 100,000 respectively. The highest mortality rates in Melanesia (119) and Eastern Africa (111) and the lowest in Central America have been observed in case of female population out of 100,000 , 119; 111 and 72 respectively (Incidence 2012). The most prevailing cancer types are breast, colorectal and lung. In Europe these 4 cancers are responsible for majority of cancer deaths and the number of deaths is 131,000; 215,000; 353,000 accordingly. Cancer is responsible for killing more people globally then tuberculosis, HIV and malaria worldwide. The most common cancer prevailing in these regions are on lung, mouth, cervix and breast. 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. It has been assumed that in 2030 alone, 13.0 million deaths are going to take place because of this deadly cancer. It has been assumed that the future burden may further increase as a result of improper lifestyles like smoking, poor diet and physical inactivity etc.

The most common and responsible factor for global cancer is tobacco. Worldwide most preventable cause of death is tobacco related diseases which is responsible for almost half of all the deaths. Nearly worldwide 6 million deaths have been observed every year because of

tobacco (Facts 2017). Tobacco is also a major reason for 22% worldwide deaths by cancer and if we consider lung cancer only the percentage would become much higher like 71% (Islam et al. 2015). Moreover, by 2030 the overall death is assumed to be more than 8 million (Facts 2017).

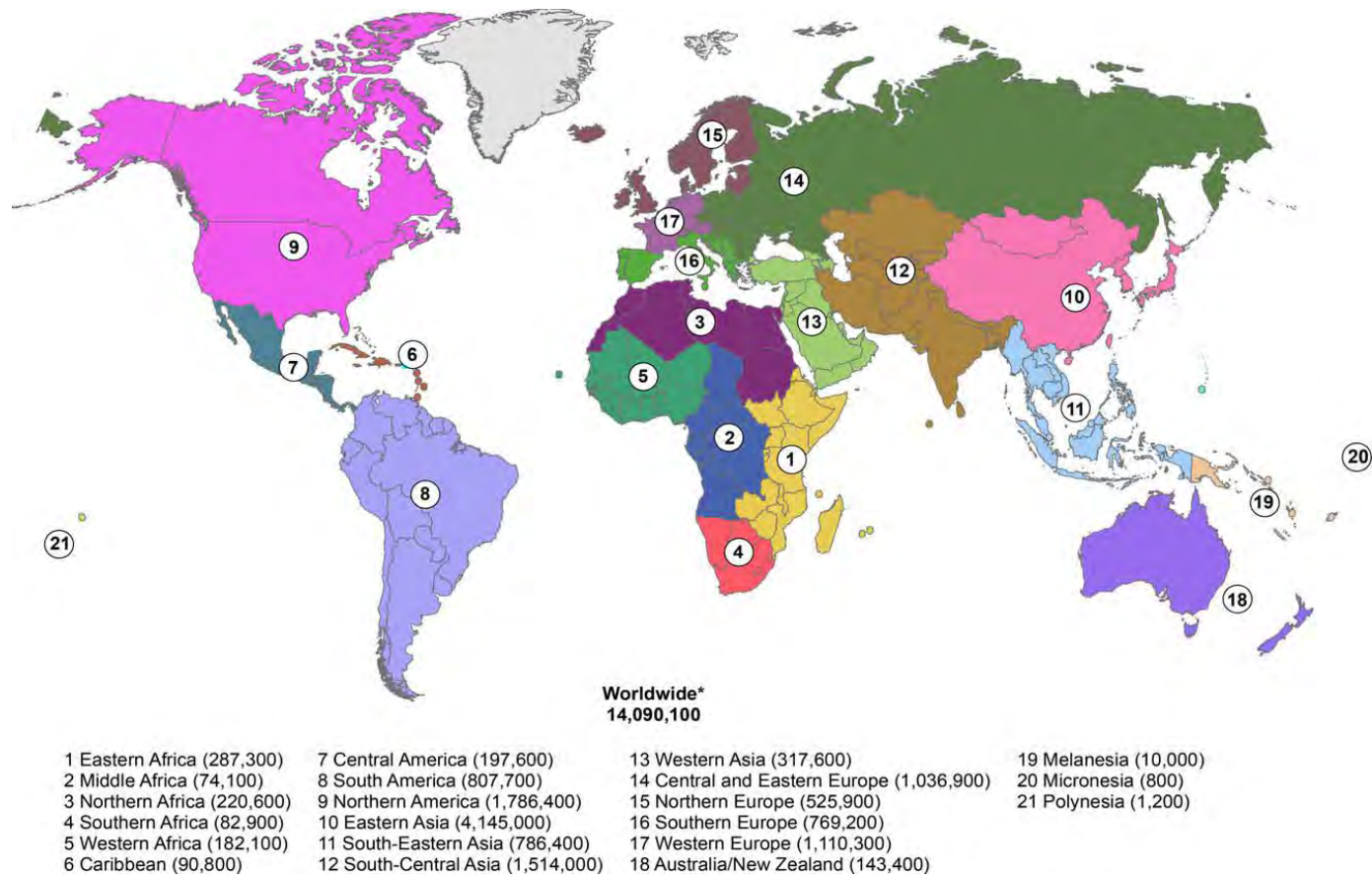


Figure 2.1 Calculated new cases of cancer around the world, 2012 (Source: GLOBOCAN 2012)

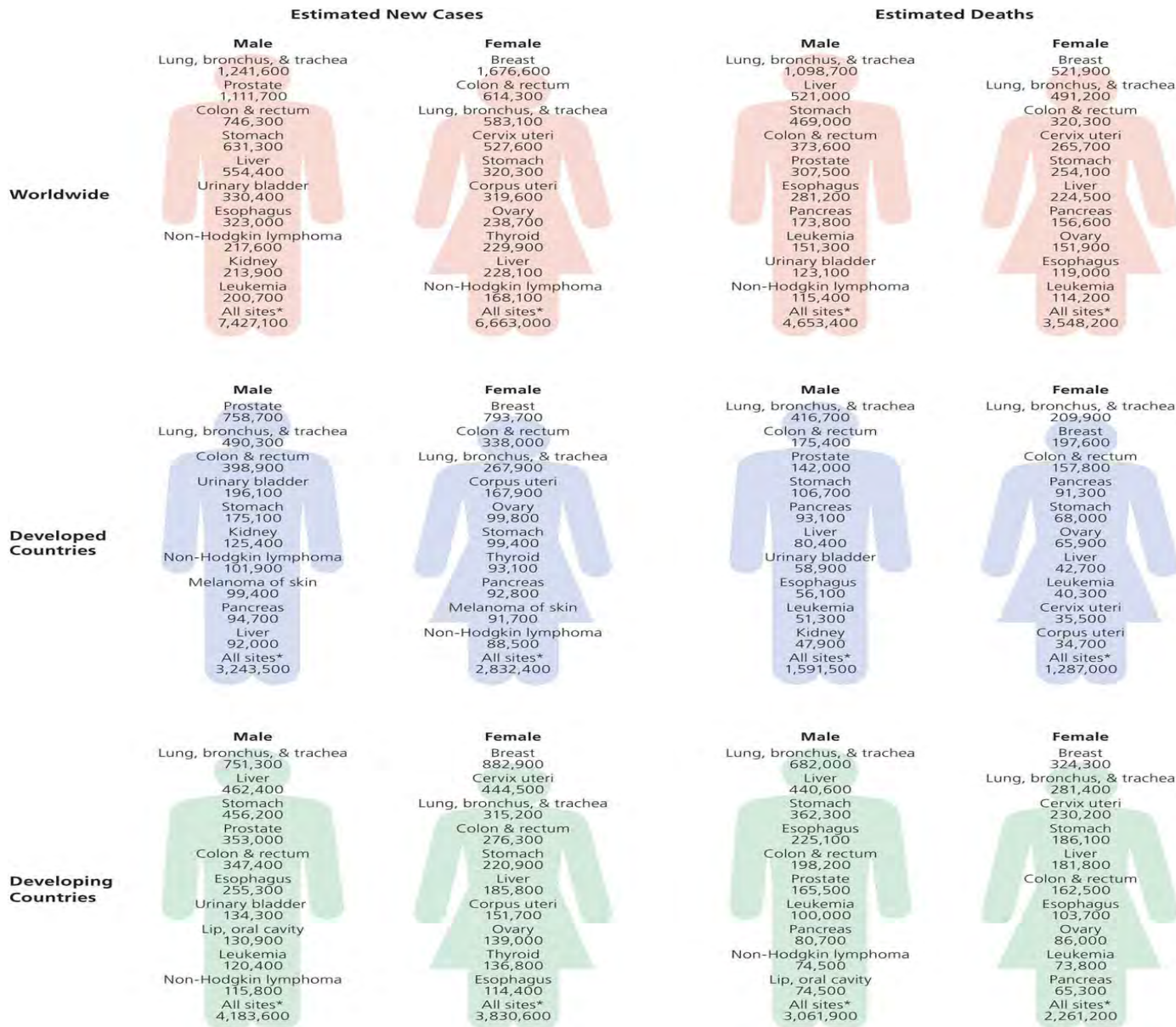


Figure 2.2 Calculated worldwide new cases of cancer and deaths based on gender and economy (Source: GLOBOCAN 2012)

2.2 Cancer Status of Bangladesh

In 2008 about 1.1million people died of cancers in the South East Asia Region (SEAR) according to WHO (2008).It has been observed that economically productive age group has become a victim of death due to cancer. Below60 years52% women die of cancer and 45%men die of cancer. About 1.7 million cancer casesappear in the SEAR yearly. In case of males, the most common sites of cancers are the lung, mouth andoropharynx and liver with a percentage of 17%, 15%, and 7.5% accordingly. In terms of women, the most common are cervical and breast cancers with a death toll of 35% out of all cancer deaths.

Bangladeshis considered as the ninth most populous country in the world(Hussain 2013). In terms of mortality, cancer is in the 6th position in Bangladesh(Abul, Sarker, and Hiroswawa 2012). Each year in Bangladesh diagnosis of cancer are done for almost 2 lakh new patients and at present there are 13-15 lakhs existing patients (Hussain 2013).

It has been calculated that for the 130 million people of Bangladesh the approximate figure of cancer load can be 1,200,000, incidence 200,000, prevalence 800,000 and mortality 150,000. In the next20 to 25 years like other developing countries, cancer is expected to increase two times in Bangladesh. At least 30% of these cancers are preventable according to WHO(Abul et al. 2012).

One of the major causes of morbidity and mortality among the non-communicable disease is cancer in Bangladesh. Approximately 200000 people develop cancer and 150000 die of the disease every year. Sixth cause of morbidity in Bangladesh is cancer. After the diagnosis 60% of the patients diagnosed with cancer die within 5 years. By the existing knowledge and support at least one third of the cancers can be treated in our country.

The most cancer deaths each year occur due breast, colorectal, prostate, lung, stomach and liver cancers. However, types varies depending on men and women (Sharmin et al. 2014). The two leading cancers in males appear in the lung and mouth and in terms of female, the most affected organs are breast and cervix(Hussain and Sullivan 2013).The major or prevailing cancers in Bangladesh are lung cancer in men and cervical and breast cancer in women which makes about 38% of all cancers(Sharmin et al. 2014).

Chapter Three: Objective and Methodology

3.1 Objective

- i) To find out the distribution of cancer in primary sites
- ii) Family history of cancer
- iii) Hereditary information regarding cancer
- iv) Mode of diagnosis
- v) Treatment received and
- vi) Medication prescribed to the patients
- vii) Efficacy level of various chemotherapeutic drugs

3.2 Methodology

This study was observational and retrospective. Both primary and secondary data were used for the purpose of this study. As the population was scattered countrywide and hard to find out, the study was a centralized study and conducted within ‘Ahsania Mission Cancer Hospital’ and ‘National Institute of Cancer Research and Hospital’. 100 were determined as the sample size randomly. However, to collect primary data in light of the objectives of the study a self-designed questionnaire was used for defining genetic pattern and hereditary pattern of cancer as well as the comparison of efficacy of various chemotherapeutic drugs. Patients and doctors were asked for gathering information and it was collected individually. Secondary data was collected from the patient history, the tests that performed to determine the presence of tumor or cancer. Available books, publications, research studies, journals, articles, and websites were also be used to collect secondary data. Different kinds of charts and statistical tools (Microsoft Excel) were used for analyzing data.

Chapter Four: Results and Discussion

4.1 Socio-Demographic History of Patients

4.1.1 Incidence of Cancer between Different Sexes

A total of 100 cancer patients were interviewed among which 35 were male and 65 were female. Male patients comprised 35% and female patients comprised almost double the no of male patients i.e., 65% of the total survey population as shown in figure 4.1 (See APPENDIX 1 for detailed incidences).

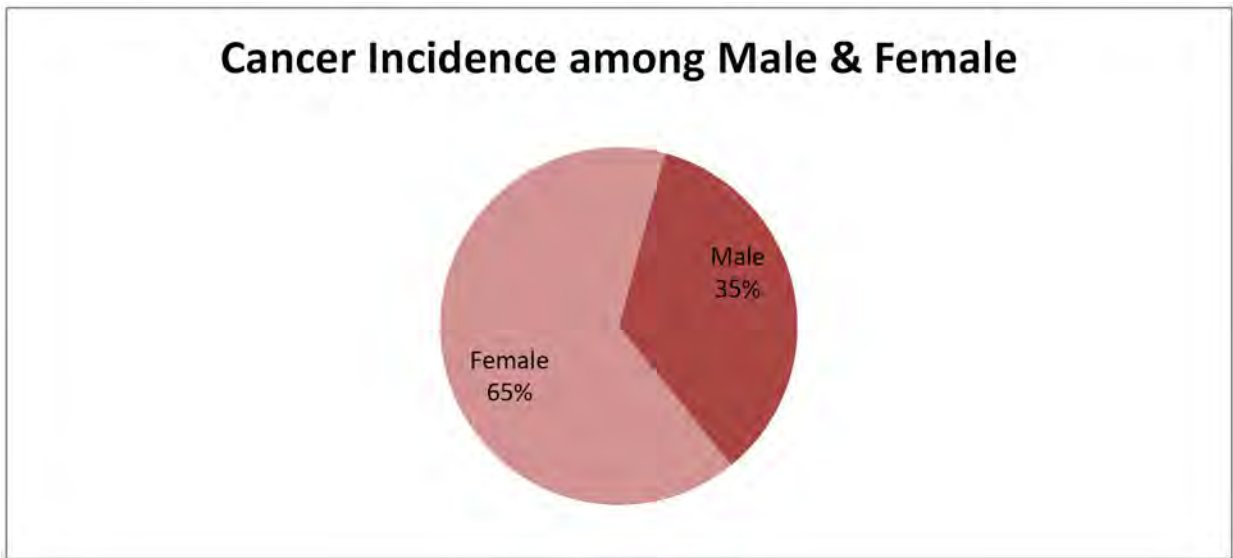


Figure 3.1 Cancer incidences among male and female patients

4.1.2 Incidence of Cancer among Different Age Group

Table 4.1 Incidence of cancer among age groups

Age Group	Patient Number
0- 14	1
15-24	7
25- 44	41
45- 64	45
65+	6

From the survey result we can see that the age distribution of the patients surveyed. The age group 45-64 years shows the highest number of patients which is 45 (Table 4.1 & Figure 4.2). The second highest number of 41 patients is observed in the age group of 25-44. In the age group 15-24 years and 65+ the number patient is almost same. However in the lowest

age group 0-14 years the number of patients is only 1 (See more detailed information in APPENDIX 2).

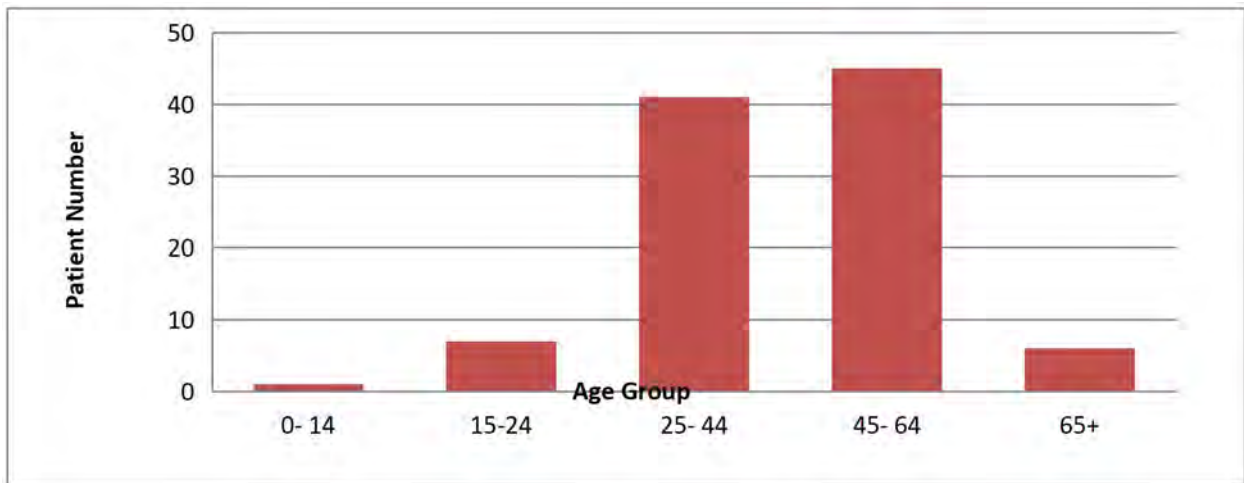


Figure 4.2 Distribution of cancer among various age groups

4.1.3 Incidence of Cancer among Different Blood Groups

It is evident from the survey that among 100 patients, in most of the cases people were not aware of their blood group and otherwise necessary it was not determined too. Among the available data it is evident that blood group of B (+ve) is found in the highest number of 9 patients (Figure 4.3). The number of patients of blood group O(+ve) and A (+ve) are 7 and 4 accordingly (Figure 4.3). Only 1 patient has seen to have AB (+ve) blood group. Again there are 1 patients for both A (-ve) and O (-ve) (Figure 4.3) (See APPENDIX 3 for more details about each patients).

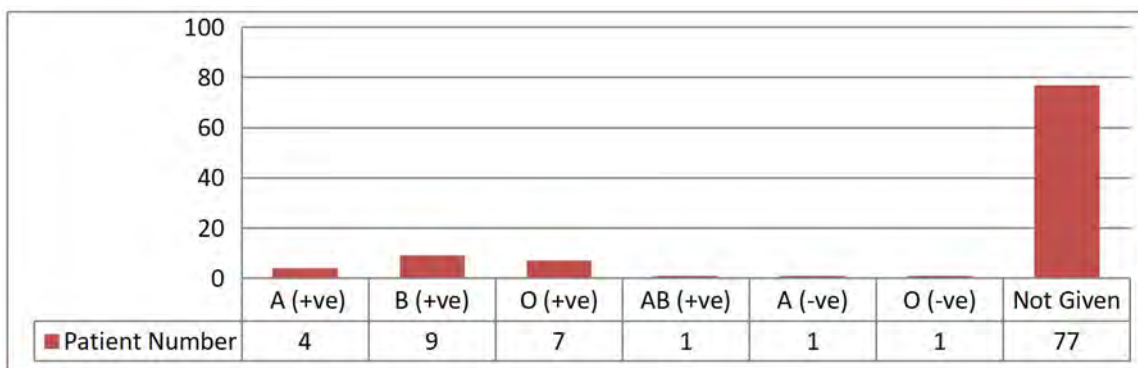


Figure 4.3 Incidence of cancer among different blood groups

From the survey patients can also be distinguished according to the positive and negative blood group (Table 4.2). From the survey we can see the presence of 21 patients with

positive blood group and only 2 negative blood groups with a huge number of undefined groups (Table 4.2).

Table 4.2 Incidence of cancer among patients depending on blood group appearance

Blood Group	Patient Number
Positive	21
Negative	2
Undefined	77

From the Figure 4.4 we can see the percentage of patients according to the blood groups.

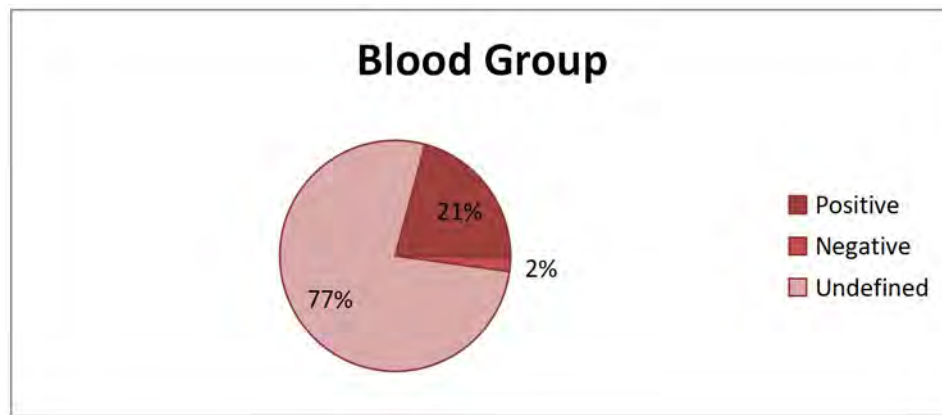


Figure 4.4 Incidence of cancer among patients depending on blood group appearance

4.2 Family History of the Patients

4.2.1 Affect of Cancer in the Family

Table 4.3 Affect of cancer in the family

Family History	Patient Number
Cancer Affected	9
Not Cancer Affected	91

In most of the cases there is no family history behind the generation of cancer in a particular patient (Table 4.3 & Figure 4.5). It has been clear from the survey that only 9 out of 100 patients had/have family members affected by the cancer (Table 4.3 & Figure 4.5). So the cancer in this survey is hereditary (See details in APPENDIX 4).

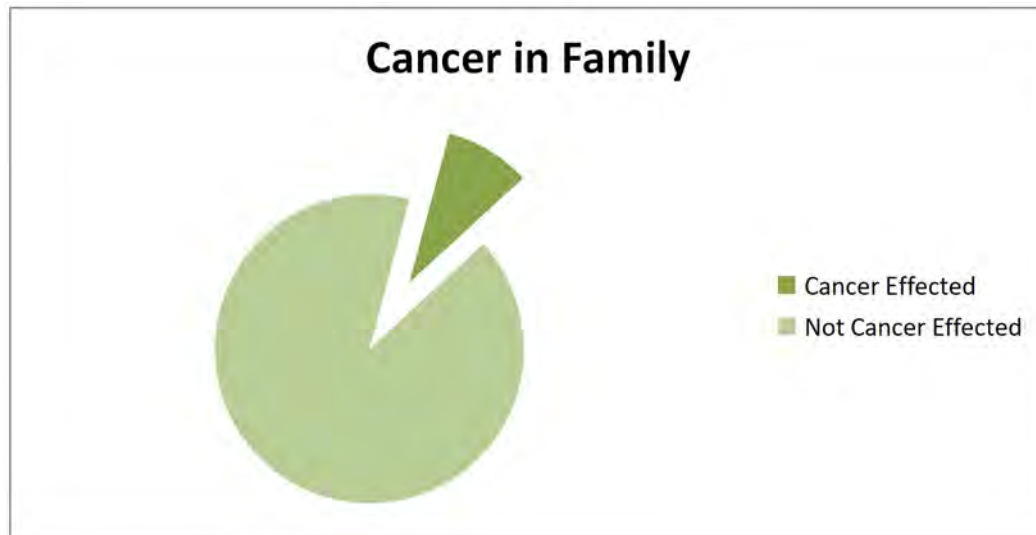


Figure 4.5 Affect of cancer in the family

4.3 Patients Condition

4.3.1 Symptoms before Diagnosis

Various symptoms have been observed among the patients before diagnosis (Table 4.4). Among the symptoms the most frequent one is sudden weight loss due to unknown reason which is evident in 48 patients and the second most symptoms is unexplained pain (Table 4.4). On an average other symptoms are unusual breast changes and unusual lumps. Bleeding, heavy night sweats and breathlessness are observed in very few patients (Table 4.4) (See APPENDIX 5 for details).

Table 4.4 Symptoms before diagnosis

Serial No.	Health Conditions	Patient Number
1	Unusual Breast Changes	33
2	Unexplained Sudden Weight Loss	48
3	Unexplained Pain or Ache	47
4	Unusual lump or Swelling Anywhere	33
5	Difficulty Swallowing	18
6	Croaky Voice or Hoarseness	17
7	Breathlessness	7
8	Bleeding	4
9	Cough	19
10	Weakness	45
11	Heavy Night Sweat	3

From the figure 4.6 it is apparent that 18% people showed the symptom of unexplained sudden weight loss whereas other symptoms like unexplained pain, unusual lumps are also more or less present (Figure 4.6). Difficulty in swallowing and croaky voice was not so evident in patients (Figure 4.6)

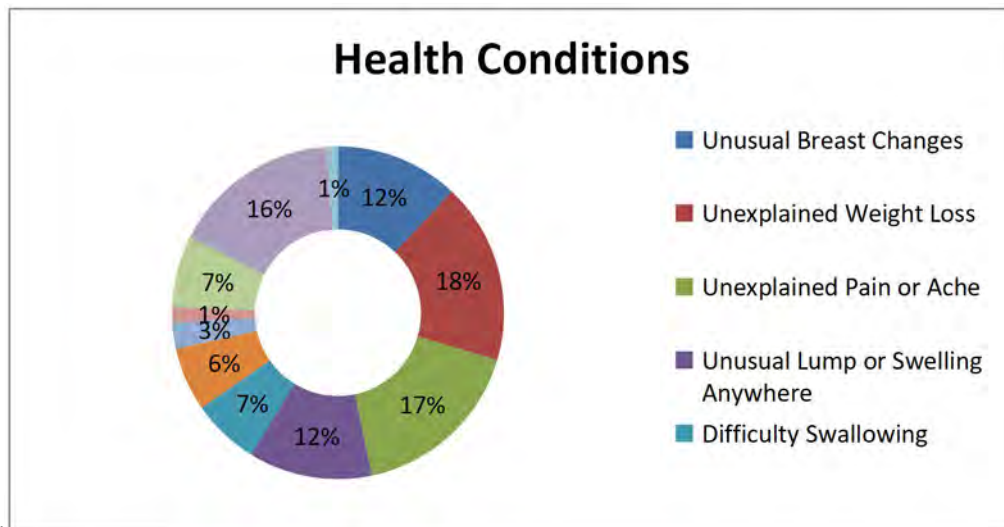


Figure 4.6 Symptoms before diagnosis

4.3.2 Physical Condition before Attending Hospital

From the survey various physical conditions have been observed among 100 patients (Table 4.5). The most observed physical conditions were restricted in physically strenuous activity but able to carry out light work and able to carry out all normal activities (Table 4.5). Again it is also evident that there were 0 patient who were completely disabled (Table 4.5).

Table 4.5 Physical condition of the patients before attending hospitals

Physical Condition	Patient Number
Able to Carry Out All Normal Activities Without Restriction	40
Restricted in Physically Strenuous Activity But Able to Carry Out Light Work	42
Capable of All Self Care But Unable to Carry Out Any Work Up	9
Capable of Only Limited Self Care, Confined to Bed or Chair More Than 50% of Waking Hours	6
Completely Disabled	0

From Figure 4.7 we can see that only 6% people are capable of self care but unable carryout any work up and about 44% patients were able to carry out light works.

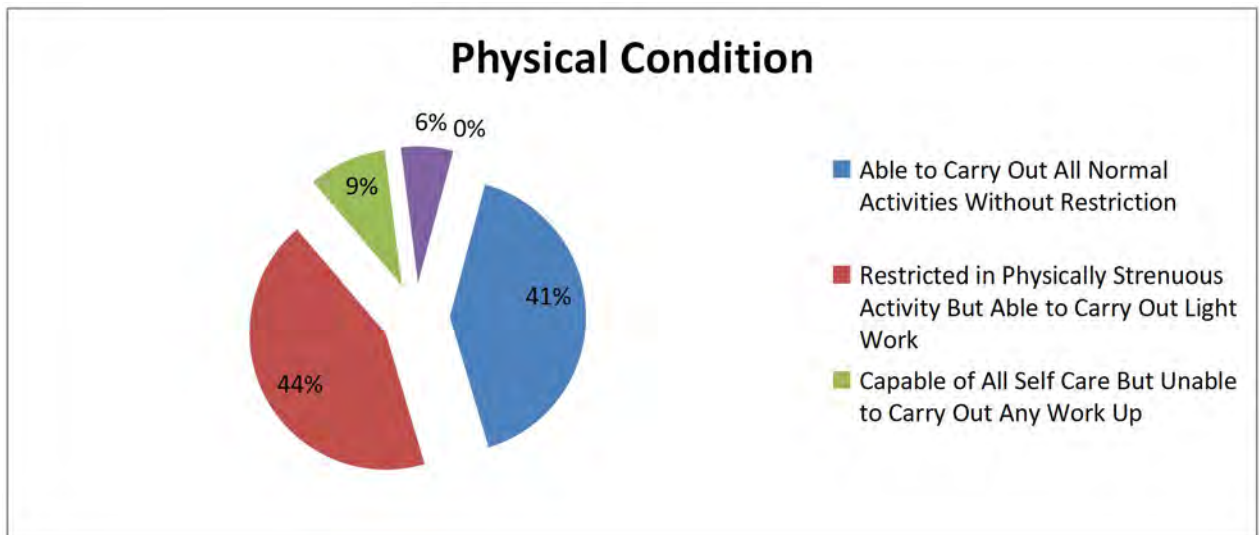


Figure 4.7 Health conditions of the patients before attending hospital

4.4 Treatment History

4.4.1 Primary Sites of Cancer Predisposition

Total 32 types of cancer have been observed among 100 patients during survey (Table 4.6 & Figure 4.8). The most common site for cancer predisposition was breast which is 34 in number out of 100 (Table 4.6 and Figure 4.8). The second most prevalent cancer was Lung. Other than cervix, ovary and gallbladder other cancer are seen in only 1 patient for each site (Table 4.6 & Figure 4.8) (For details see APPENDIX 6).

Table 4.6 Distribution of patients by primary sites of cancer

Serial No.	Type of Cancer	Patient Number
1	Breast	34
2	Lung	14
3	Cervix	5
4	Ovary	6
5	Gallbladder	6
6	Colon	1
7	Small Cell Carcinoma	1
8	Soft Tissue Sarcoma	2
9	Oesophagus	3
10	Stomach	2
11	Larynx	1

Serial No.	Type of Cancer	Patient Number
12	Pancreas	1
13	Carcinoma of Unknown Primary Site (CUP)	1
14	Gestational Trophoblastic Disease	1
15	Pelvic Mass	1
16	Testes	1
17	Retro Peritoneal	1
18	Rectum	3
19	Caecum	1
20	Middle Ear	1
21	Sinonasal Malignancy	1
22	Recto Sigmoid Junction	1
23	Synovial Carcinoma	1
24	Prostate	1
25	Brain	1
26	Sebaceous Gland	1
27	Ewing's Sarcoma	1
28	Hodgkin's Lymphoma	1
29	Liver	1
30	Pyriform Fossa	2
31	Blood	1
32	Primitive Neuroectodermal Tumor	1

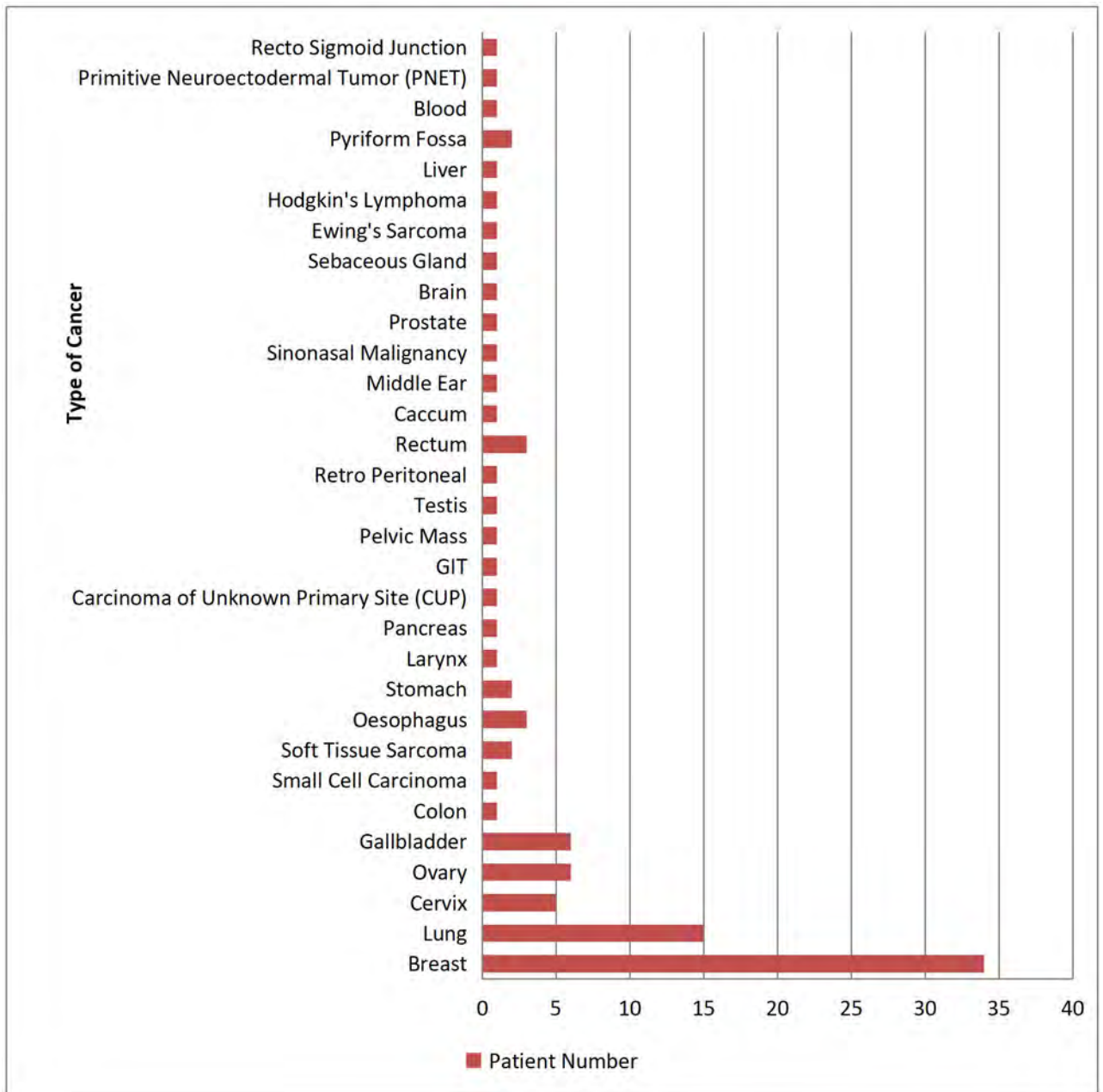


Figure 4.8 Distribution of patients by primary sites of cancer

From Figure 4.9 we can see the disposition of cancer in various sites with breast as the highest affected site among the patient population and larynx, pancreas, testis, middle ear and 18 others as the lowest affected site.

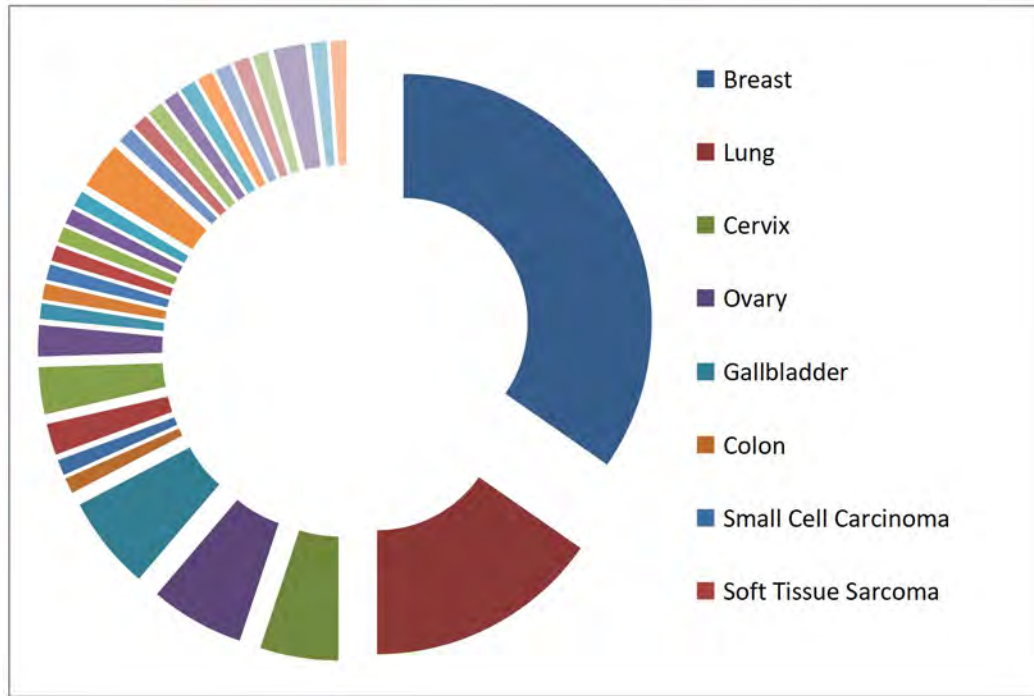


Figure 4.9 Distribution of cancer depending on primary sites of cancer

4.4.2 Treatment Type

Among the survey patients various types of treatments were observed (Table 4.7 & Figure 4.10). Combined treatment strategies were also observed. Only chemotherapy was the treatment in case of 25 patients whereas chemotherapy and surgery in combination and chemotherapy, radiotherapy and surgery in combination were observed in equal amount of 28 patients (Table 4.7). Again there were 0 patients found in only radiotherapy, only surgery and radiotherapy and surgery combination (Table 4.7).

Table 4.7 Types of treatment

Treatment Type	Number of Patients
Chemotherapy	25
Radiotherapy	0
Chemotherapy + Radiotherapy	18
Surgery	0
Chemotherapy + Surgery	28
Radiotherapy + Surgery	0
Chemotherapy + Radiotherapy + Surgery	28
Chemotherapy + Surgery + Hormone	1

From Figure 4.10 the percentage of various treatment strategies can be seen with the highest percentage in combined treatment of chemotherapy and surgery and the lowest percentage 1% in combination of chemotherapy, surgery and hormone therapy (See APPENDIX 7 for detailed information).

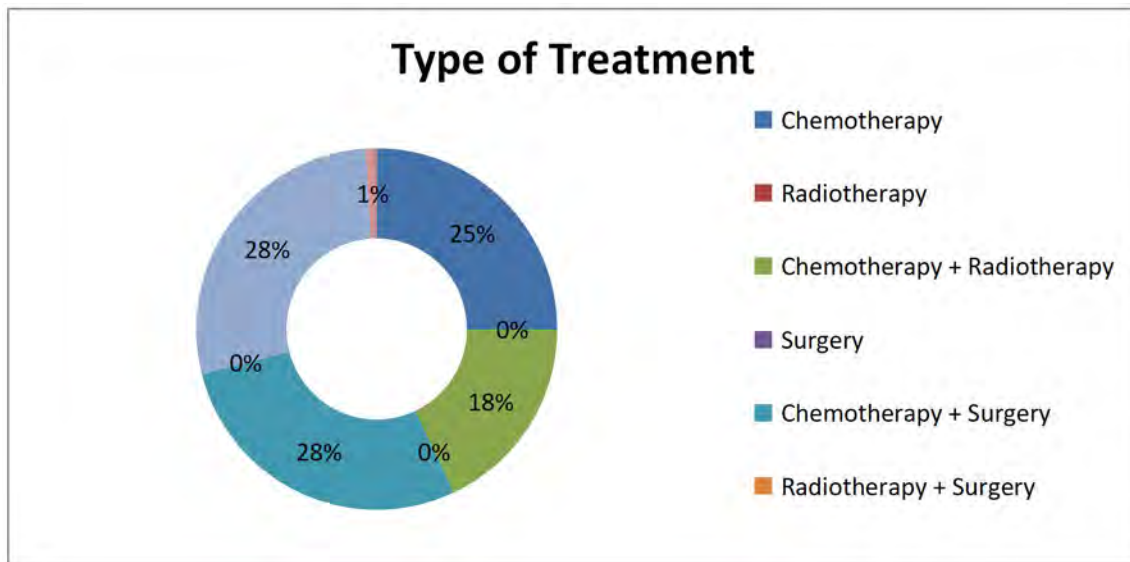


Figure 4.10 Various types of treatments

4.4.3 Diagnostic Status

Confirmation of the presence of cancer was done through various diagnostic systems and among them Histopathology report was the most commonly seen in case of 93 patients whereas PET CT scan and X Ray were used equally for the confirmation (Table 4.8).

Table 4.8 Diagnostic status of the patients

DIAGONISTIC STATUS	PATIENT NUMBER
Histopathologically Confirmed	93
PET CT Scan	16
Cytopathologically Confirmed	13
X Ray	16
Citologically Confirmed	4
MRI(Magnetic Resonance Imaging)	10

Figure 4.11 shows that 61% patients' cancer status was confirmed by histopathology and only 3% and 7% diagnostic status of cytology and MRI were observed accordingly.

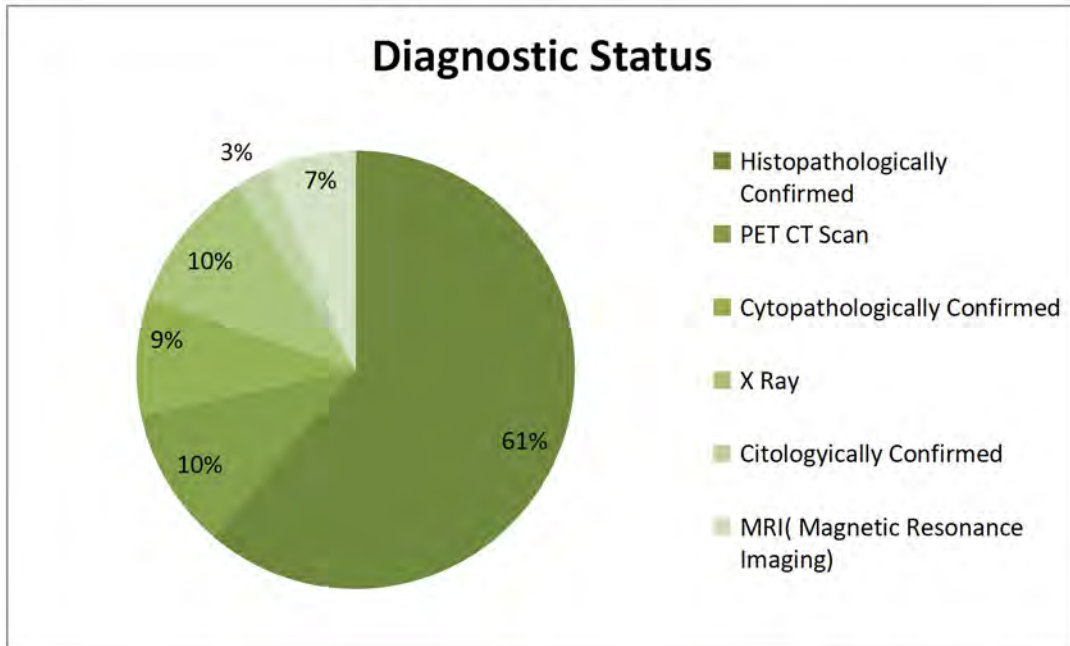


Figure 4.11 Diagnostic statuses of cancer patients

4.4.4 Intention of Treatment

Treatments are selected for the patients depending on the health condition of the patients and based on that indentation of treatment is divided into 3 categories with the highest number of 62 patients for cure purpose and 13 patients for palliative purpose (Table 4.9& Figure 4.12).

Table 4.9 Intention of treatment

Intention of Treatment	Patient Number
Curative	62
Palliative	13
Terminal	25

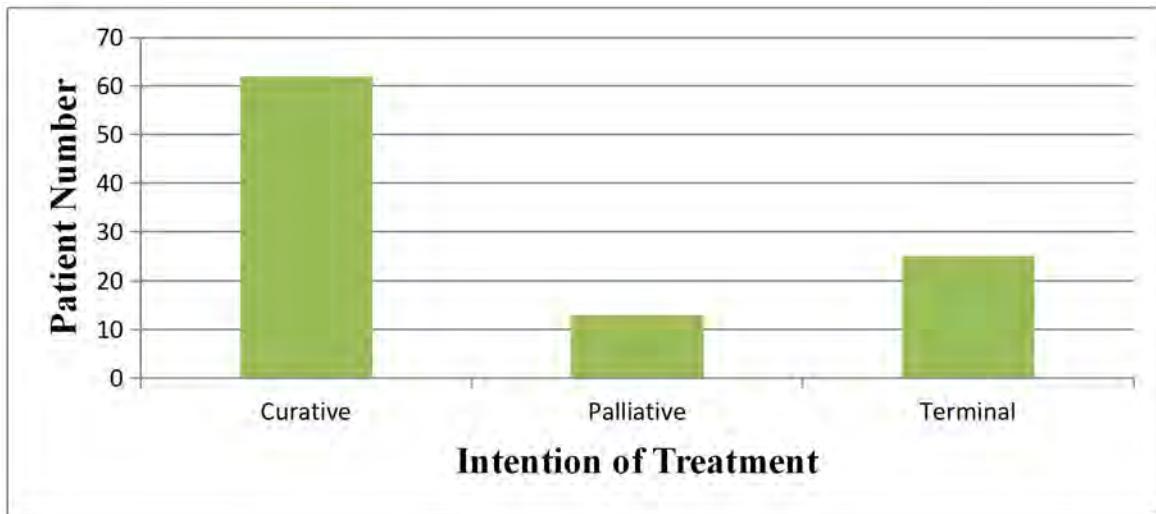


Figure 4.12 Purpose of treatment

4.5 Treatment History

Most of the patients went for modern treatment and 0 patients relied on Ayurvedic treatment (Table 4.10 & Figure 4.13). It is also seen that 1 patient went for homeopathic treatment first and later on for modern treatment (Table 4.10 & Figure 4.13).

Table 4.10 History of treatments

Treatment History	Patient Number
Homeopathic Treatment	1
Ayurvedic Treatment	0
Only Modern/ Allopathic Treatment	100

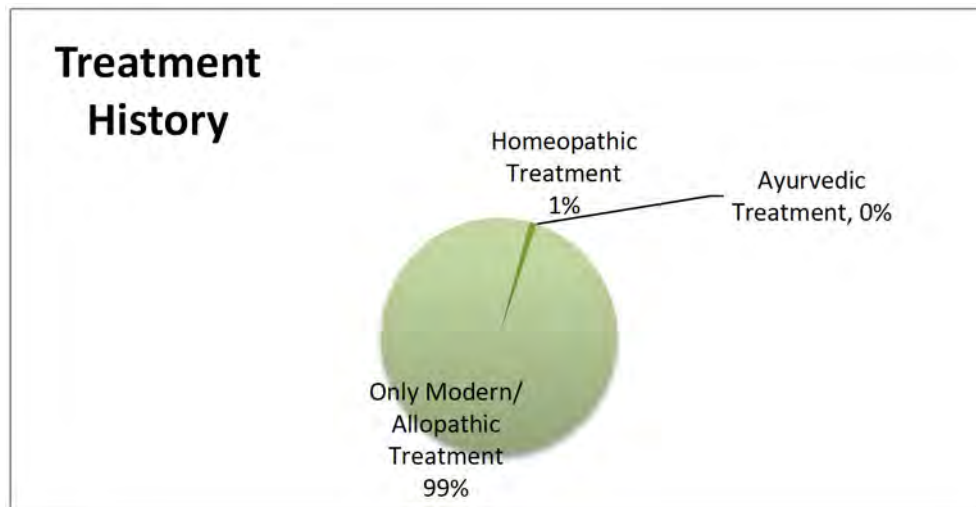


Figure 4.13 Use of various treatments

4.6 Complications

4.6.1 Complications after Chemotherapy

Various complications can be observed after chemotherapy and among them alopecia and loss of appetite were present in all patients (Table 4.11 & Figure 4.14). The second most observed complication was unexplained pain whereas itching was evident in only 2 patients (Table 4.11 & Figure 4.14).

Table 4.11 Complications after chemotherapy

Incidents After Chemotherapy	Patient Number
Alopecia	100
Loss of Appetite	100
Nausea	48
Sleeping Disorder	15
Cough	18
Breathlessness/Dyspnea	9
Unexplained Pain	75
Itching	2
Constipation	69

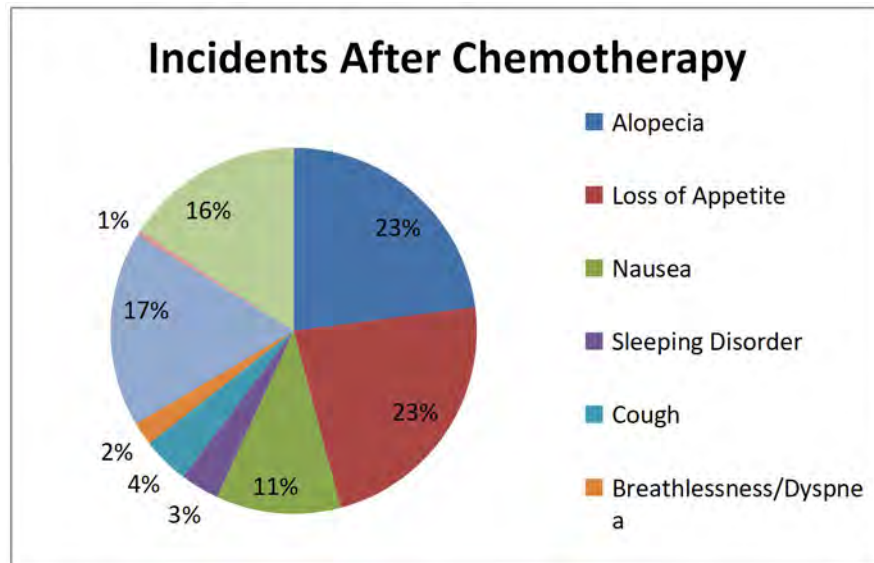


Figure 4.14 Symptoms after chemotherapy

4.7 Patient's Injurious Habits

Exposure to tobacco is considered as injurious habit and about 26 patients were exposed to tobacco smoking or chewing or both whereas more than 50% patients were not exposed to tobacco directly (Table 4.12 & Figure 4.15).

Table 4.12 Patients exposure to tobacco

Parameter	Patient Number
Directly Exposed to tobacco (Smoking/Chewing)	26
Not exposed to tobacco	74

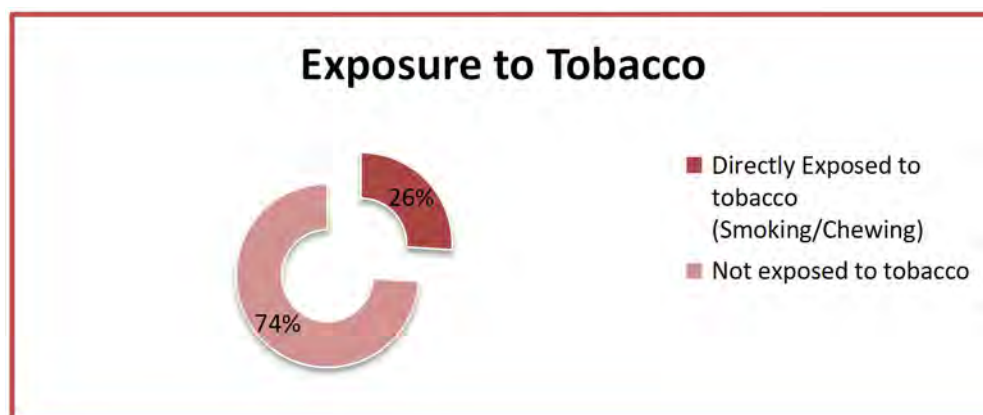


Figure 4.15 Distribution of patients depending on tobacco exposure

4.8 Food Habits

4.8.1 Various Food Habits

Table 4.13 Various food habits of patients

Food Habit	Patient Number
Mostly Vegetarian	28
Mostly Non- Vegetarian	13
Balanced Diet	59

During survey patients were also categorized according to their food habits with most patients having balanced diet and vegetarian about 28 patients and non-vegetarian only 28 patients (Table 4.13 & Figure 4.16).



Figure 4.16 Food intake patterns of the patients

4.8.2 Soft Drinks Intake Frequency

Soft drink intake frequency was observed in the patients where 97 patients used to intake it occasionally and there was 0 patients who never consumed soft drinks (Table 4.14 & Figure 4.17).

Table 4.14 Distribution of patients depending on soft drinks intake

Soft Drink Intake Frequency	Patient Number
Almost Daily	2
Weekly	1
Occasionally	97
Never	0

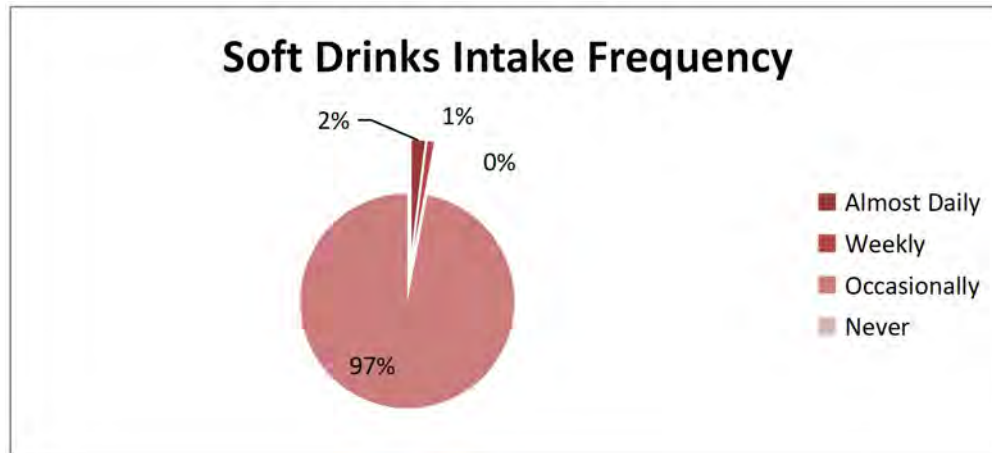


Figure 4.17 Intake frequencies of soft drinks

4.8.3 Extra Sugar Intake

From the survey we can see that about 70 patients took little amount of extra sugar of 1-2 tea spoons only whereas only 8 patients used to consume more than 3 teaspoons of extra sugar besides their daily usual sugar in the foods (Table 4.15 & Figure 4.18).

Table 4.15 Amount of extra sugar intake

Extra Sugar Intake Amount	Patient Number
1-2 Teaspoon	70
2-3 Teaspoon	22
More Than 3 Teaspoon	8

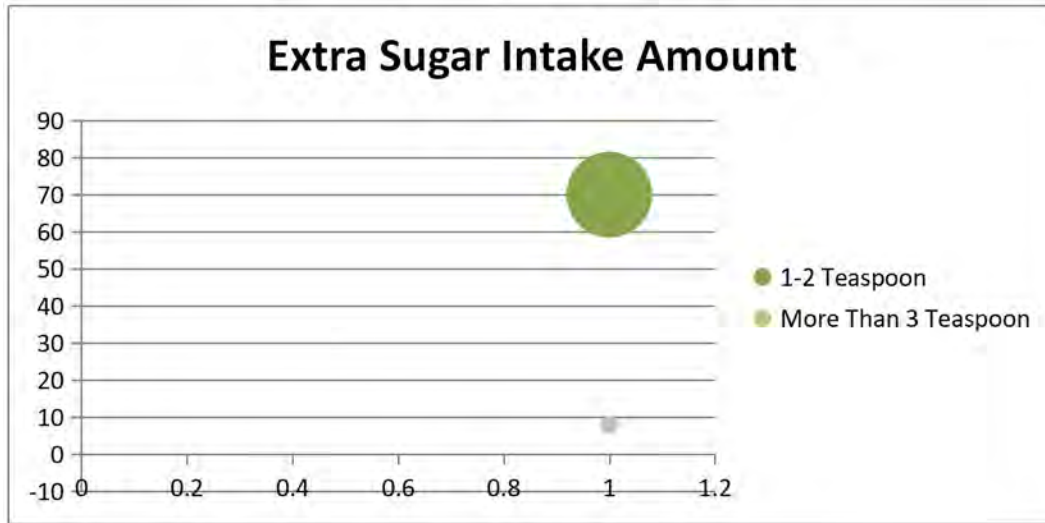


Figure 4.18 Extra sugar intakes

4.8.4 Refrigeration of Raw Meat

Survey on 100 patients shows us that more than 50% patients were not dependent on refrigerator in terms of storing meat whereas only 15% patients used long term refrigerated meat (Table 4.16 & 4.19).

Table 4.16 Patient distribution depending on refrigerated raw meat

Raw Meat Refrigeration	Patient Number
Refrigerated More Than 3 Months	15
Refrigerated Not More Than 3 Months	85

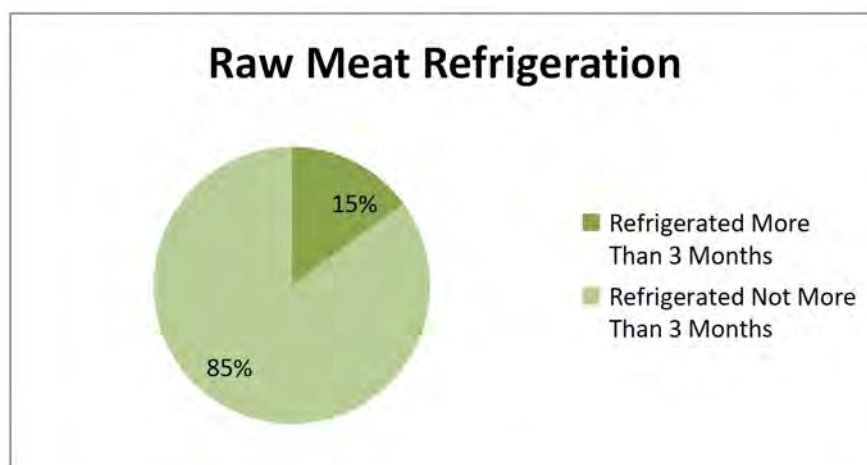


Figure 4.19 Distribution of patients depending on refrigerated raw meat

4.9 History of Health Problems

4.9.1 Various Diseases of the Patients

Table 4.17 Diseases of the patients

Name Of The Disease	Patient Number
Diabetes	9
High Blood Pressure	13
Heart Diseases	1
Hypertension	0
Asthma	1
None	79

Besides cancer other various diseases were evident on surveyed patients (Table 4.17). Among those diseases 79 patients had no disease other than cancer (Table 4.17 & Figure 4.20). High blood pressure was seen among 13 patients which was the most seen disease in the patients (Table 4.17). The next most common disease was diabetes and the least 2 diseases were heart diseases and asthma (Table 4.17 & Figure 4.20).

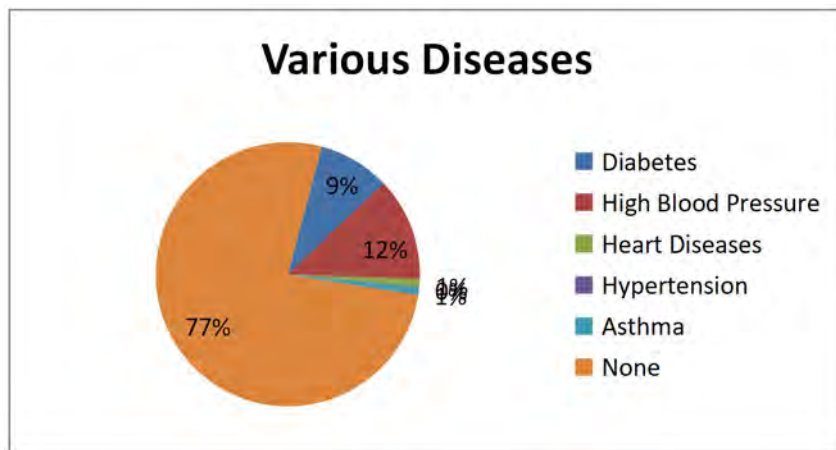


Figure 4.20 Percentages of various diseases occurring in patients

4.9.2 Weight Problems of the Patients

The survey focused on obesity also and we can see that about 20% people were obese anytime in their life and about 80 people had normal weight always (Table 4.18 & Figure 4.21).

Table 4.18 Patient distribution depending on weight

Weight Problem Before Diagnosis	Patient Number
Over Weight/ Obese	20
Average/ Normal	80

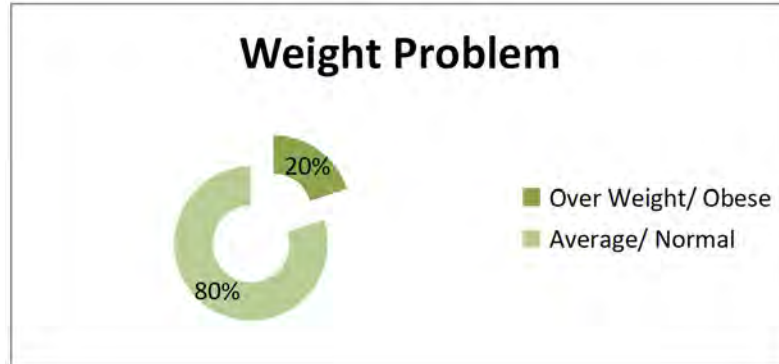


Figure 4.21 Distribution of patients depending on weight

4.9.3 Harmful Carcinogens

Table 4.19 Presence of harmful carcinogens

Contact With Harmful Carcinogen	Patient Number
Present	4
Not present	96

From the survey we can see that only 4 patients came into direct contact of different harmful carcinogens during any phase of their life whereas more than 95% patients had no contact with any type of harmful substances (Table 4.19 & Figure 4.22).

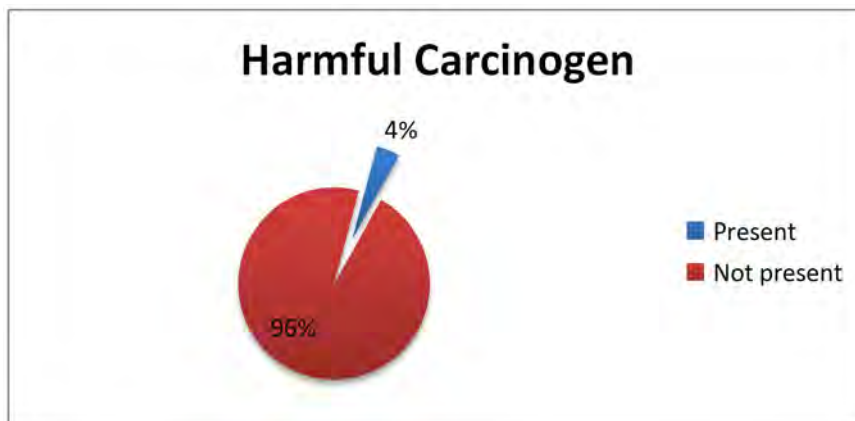


Figure 4.22 Presence of harmful carcinogens

4.10 List of Chemotherapy Drugs

From the survey we can find the list of various chemotherapy drugs used in by the 100 patients of National Cancer Institute and Research Center & in Ahsania Mission Cancer Hospital (Table 4.20). Again we can find the frequency of these drugs by the number of patients used the particular drug (Table 4.20 & Figure 4.23).

Table 4.20 Frequency of chemotherapy drugs

Serial No.	Name of The Chemotherapy	Patient Number (Frequency)
1	Paclitaxel	41
2	Cylophosphamide (CPA)	33
3	Cisplatin (CPL)	45
4	Epirubicin	3
5	Gemcitabine	18
6	Etoposide	10
7	Oxaliplatin	11
8	Capecitabine	6
9	Doxorubicin	30
10	Methotrexate	2
11	Carboplatin	11
12	Dactinomycin	1
13	Vincristin	3
14	5 Flurouracil	13
15	Bleomycin	4
16	Ifosphamide	4
17	Docetaxel	2
18	Dacarbazine	1
19	Vinblastin	1
20	Foliic Acid	1
21	Filgrastim	1
22	Dexamethason	1
23	Temozolomide Hydrochloride	1
24	Irinotecan Hydrochloride Trihydrate	1

From Table 4.20 & Figure 4.23 we can see that Cisplatin was used in most of the patients and then Paclitaxel, Cyclophosphamide and Doxorubicin having frequency of 45, 41, 33 and 30 accordingly. Other chemotherapies had frequency lower than 20.

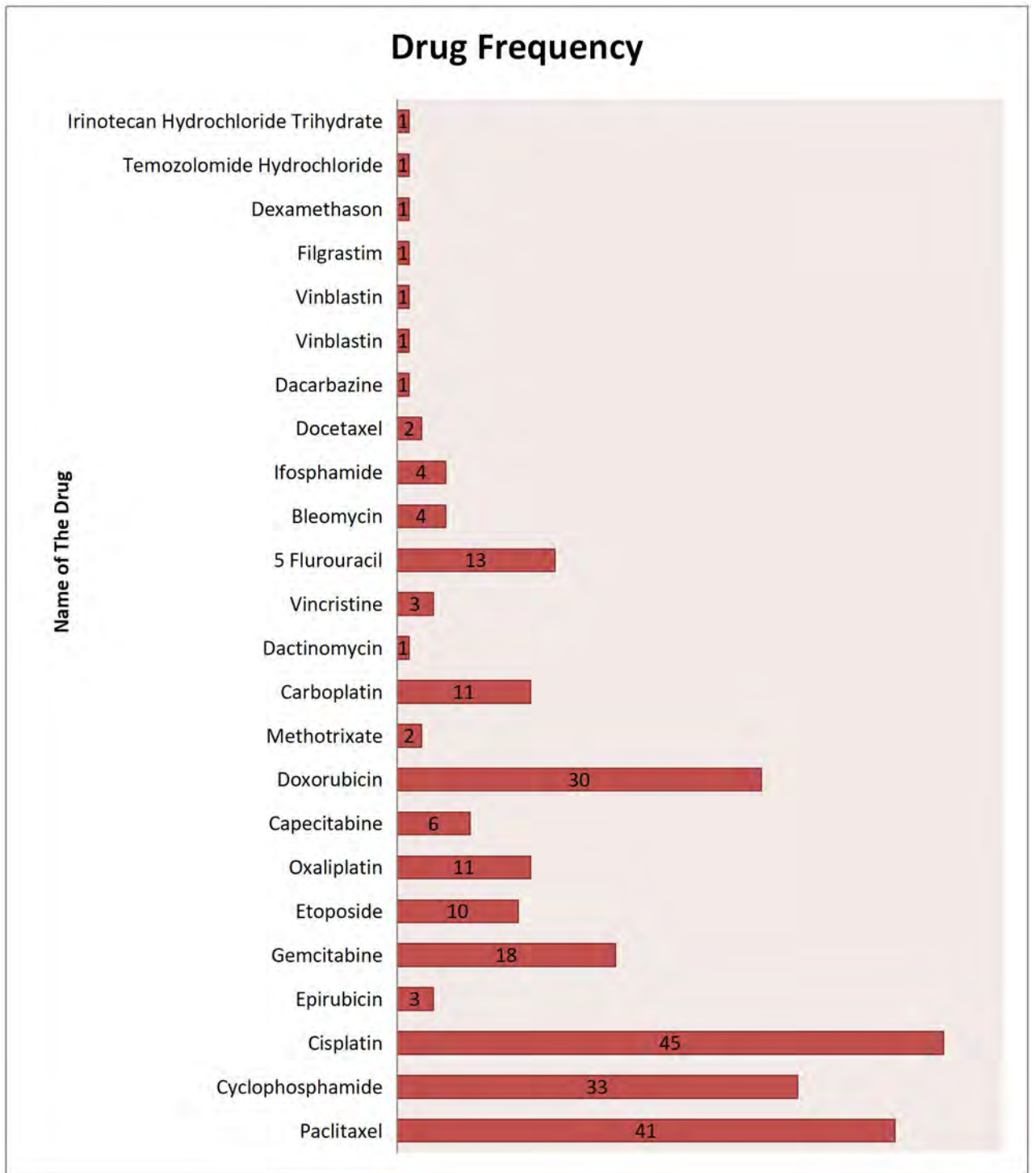


Figure 4.23 Frequency of chemotherapy drugs

Chapter Five: Concluding Remarks

Overall, it may be said that the purpose of the study is to focus on the nature of predisposition of cancers in patients and efficacy of various chemotherapeutic drugs in Bangladesh. The main focus of this survey is to find out if cancer has any obvious relation with the genetics and how effective various chemotherapy drugs are regardless of age and types of cancers.

Results of this survey reveal that cancer incidence rate is higher in women than men. It also points that though cancer is a disease that occurs regardless of age, the most prominent age for cancer incidence has been found 45-64 years. In case of predisposition of cancer it has been evident that there may be no genetic factor responsible for causing cancer as most of the patients had no history of any incidence of cancer among the relations. There may also be some other factors that may influence cancer like direct or indirect tobacco exposure and food habits. This survey also helped to figure out the most experienced health problems before the diagnosis and the physical conditions of the patients and also the side effects of the cancer treatments. Harmful carcinogenic chemicals, preservatives, pesticides, long term refrigerated raw meats and excess sugar consumption may also play a vital role in the appearance of hereditary cancer. This survey reveals that breast cancer has the highest frequency of occurrence among all types of cancers and the second most observed cancer is lung cancer.

As cancer treatment is very costly and the poor and middle class patients face difficulty to go through all the expensive treatments or medicines, latest treatment facilities and medications cannot always be administered to the patients in the National Institute of Cancer Research and Hospital and Ahsania Mission Cancer Hospital where the survey has been conducted. The most common treatment of cancer observed is chemotherapy. Alongside chemotherapy, radiotherapy and surgery are pretty common too.

In this survey about twenty four chemotherapy drugs have been found that are used for about thirty two types of cancers among one hundred cancer patients. Among these available medicines Cisplatin has the most noticeable frequency then come Paclitaxel, Cyclophosphamide and Doxorubicin in terms of frequency. From this survey it has been noticed that although the main purpose of medications or treatments is curative, at times treatments are administered for palliative purpose too.

Widespread awareness should be raised regarding the possible symptoms of various cancers and encouraged to checkups during any unnecessary changes in the body. The government should enforce strict law against tobacco usage, preservatives and other harmful chemicals in our daily life. Although in government hospitals, to a limited extent the treatment is free for the patients it is actually not that helpful for the poor and middle class patients. As the research has demonstrated, government should focus more on cost effective treatment ensuring the best health for the patients.

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APPENDIX 1

Sex of the Patients

PATIENT	SEX	
	MALE	FEMALE
Patient 1		1
Patient 2		1
Patient 3		1
Patient 4	1	
Patient 5	1	
Patient 6		1
Patient 7		1
Patient 8	1	
Patient 9	1	
Patient 10		1
Patient 11		1
Patient 12	1	
Patient 13	1	
Patient 14		1
Patient 15		1
Patient 16	1	
Patient 17		1
Patient 18	1	
Patient 19		1
Patient 20		1
Patient 21	1	
Patient 22	1	
Patient 23		1
Patient 24		1
Patient 25	1	
Patient 26		1
Patient 27	1	
Patient 28		1
Patient 29		1
Patient 30		1
Patient 31		1
Patient 32	1	
Patient 33	1	
Patient 34	1	
Patient 35		1
Patient 36	1	

Patient 37		1
Patient 38		1
Patient 39	1	
Patient 40		1
Patient 41		1
Patient 42		1
Patient 43		1
Patient 44		1
Patient 45	1	
Patient 46		1
Patient 47		1
Patient 48		1
Patient 49		1
Patient 50	1	
Patient 51		1
Patient 52		1
Patient 53	1	
Patient 54		1
Patient 55		1
Patient 56		1
Patient 57		1
Patient 58		1
Patient 59	1	
Patient 60		1
Patient 61		1
Patient 62	1	
Patient 63		1
Patient 64	1	
Patient 65	1	
Patient 66		1
Patient 67	1	
Patient 68		1
Patient 69		1
Patient 70		1
Patient 71		1
Patient 72	1	
Patient 73		1
Patient 74		1
Patient 75		1
Patient 76		1
Patient 77		1
Patient 78	1	
Patient 79		1
Patient 80		1
Patient 81		1
Patient 82	1	

Patient 83		1
Patient 84	1	
Patient 85	1	
Patient 86	1	
Patient 87		1
Patient 88		1
Patient 89		1
Patient 90	1	
Patient 91		1
Patient 92		1
Patient 93		1
Patient 94	1	
Patient 95	1	
Patient 96		1
Patient 97	1	
Patient 98		1
Patient 99		1
Patient 100		1
Total Patient 100	35	65

APPENDIX 2

Age & Weight of the Patients

PATIENT	AGE	Weight
Patient 1	35	56
Patient 2	45	58
Patient 3	32	43
Patient 4	60	55
Patient 5	70	41
Patient 6	22	35
Patient 7	40	54
Patient 8	48	51
Patient 9	42	44
Patient 10	50	58
Patient 11	40	47
Patient 12	55	62
Patient 13	55	45
Patient 14	48	47
Patient 15	35	43
Patient 16	70	42
Patient 17	40	44
Patient 18	40	59
Patient 19	40	84
Patient 20	30	63
Patient 21	40	54
Patient 22	70	45
Patient 23	30	76
Patient 24	48	35
Patient 25	23	66
Patient 26	30	54
Patient 27	40	60
Patient 28	65	55
Patient 29	28	70
Patient 30	30	53
Patient 31	42	39
Patient 32	72	68
Patient 33	51	45
Patient 34	23	65
Patient 35	32	41
Patient 36	29	75
Patient 37	40	58
Patient 38	25	40
Patient 39	55	58
Patient 40	35	70

Patient 41	36	57
Patient 42	45	55
Patient 43	23	40
Patient 44	50	40
Patient 45	40	56
Patient 46	45	40
Patient 47	31	71
Patient 48	40	65
Patient 49	36	37
Patient 50	23	49
Patient 51	11	33
Patient 52	18	46
Patient 53	61	54
Patient 54	55	52
Patient 55	50	60
Patient 56	38	42
Patient 57	40	50
Patient 58	60	55
Patient 59	60	48
Patient 60	45	55
Patient 61	60	61
Patient 62	48	40
Patient 63	45	38
Patient 64	48	56
Patient 65	55	50
Patient 66	51	70
Patient 67	50	55
Patient 68	60	63
Patient 69	50	53
Patient 70	22	52
Patient 71	45	52
Patient 72	60	43
Patient 73	32	49
Patient 74	50	48
Patient 75	38	55
Patient 76	28	76
Patient 77	45	45
Patient 78	33	75
Patient 79	37	53
Patient 80	38	54
Patient 81	38	45
Patient 82	37	52
Patient 83	30	52
Patient 84	60	45
Patient 85	50	58
Patient 86	60	41

Patient 87	45	55
Patient 88	42	57
Patient 89	40	55
Patient 90	60	72
Patient 91	45	51
Patient 92	22	70
Patient 93	60	56
Patient 94	55	40
Patient 95	52	50
Patient 96	50	40
Patient 97	54	40
Patient 98	48	35
Patient 99	55	45
Patient 100	70	55

APPENDIX 3

Blood Groups of Patients

PATIENT	BLOOD GROUP
Patient 1	O (+ ve)
Patient 2	Not Available
Patient 3	Not Available
Patient 4	Not Available
Patient 5	Not Available
Patient 6	Not Available
Patient 7	Not Available
Patient 8	Not Available
Patient 9	Not Available
Patient 10	Not Available
Patient 11	B (+ ve)
Patient 12	Not Available
Patient 13	Not Available
Patient 14	Not Available
Patient 15	Not Available
Patient 16	Not Available
Patient 17	Not Available
Patient 18	Not Available
Patient 19	Not Available
Patient 20	AB (+ve)
Patient 21	O (+ve)
Patient 22	Not Available
Patient 23	Not Available
Patient 24	Not Available
Patient 25	Not Available
Patient 26	Not Available
Patient 27	Not Available
Patient 28	Not Available
Patient 29	Not Available
Patient 30	A (+ve)
Patient 31	Not Available
Patient 32	O (-ve)
Patient 33	O (+ve)
Patient 34	Not Available
Patient 35	Not Available
Patient 36	B (+ve)
Patient 37	Not Available
Patient 38	Not Available
Patient 39	Not Available

Patient 40	Not Available
Patient 41	Not Available
Patient 42	Not Available
Patient 43	Not Available
Patient 44	Not Available
Patient 45	Not Available
Patient 46	Not Available
Patient 47	O (+ve)
Patient 48	Not Available
Patient 49	Not Available
Patient 50	Not Available
Patient 51	Not Available
Patient 52	Not Available
Patient 53	Not Available
Patient 54	Not Available
Patient 55	Not Available
Patient 56	Not Available
Patient 57	Not Available
Patient 58	Not Available
Patient 59	Not Available
Patient 60	Not Available
Patient 61	Not Available
Patient 62	Not Available
Patient 63	Not Available
Patient 64	Not Available
Patient 65	Not Available
Patient 66	Not Available
Patient 67	Not Available
Patient 68	Not Available
Patient 69	O (+ve)
Patient 70	Not Available
Patient 71	Not Available
Patient 72	Not Available
Patient 73	Not Available
Patient 74	Not Available
Patient 75	A (+ve)
Patient 76	B (+ve)
Patient 77	Not Available
Patient 78	Not Available
Patient 79	Not Available
Patient 80	Not Available
Patient 81	O (+ve)
Patient 82	Not Available
Patient 83	Not Available

Patient 84	Not Available
Patient 85	Not Available
Patient 86	A (+ve)
Patient 87	Not Available
Patient 88	Not Available
Patient 89	Not Available
Patient 90	Not Available
Patient 91	A (-ve)
Patient 92	AB (+ ve)
Patient 93	O (+ve)
Patient 94	B (+ve)
Patient 95	B (+ve)
Patient 96	B (+ve)
Patient 97	A (+ve)
Patient 98	B (+ve)
Patient 99	B (+ve)
Patient 100	B (+ve)

APPENDIX 4

Family Members Affected by Cancer

PATIENT	FAMILY MEMBER	TYPE of CANCER
Patient 1	Nil	Nil
Patient 2	Father	Lung
Patient 3	Nil	Nil
Patient 4	Nil	Nil
Patient 5	Nil	Nil
Patient 6	Nil	Nil
Patient 7	Nil	Nil
Patient 8	Nil	Nil
Patient 9	Nil	Nil
Patient 10	Nil	Nil
Patient 11	Nil	Nil
Patient 12	Nil	Nil
Patient 13	Nil	Nil
Patient 14	Nil	Nil
Patient 15	Nil	Nil
Patient 16	Nil	Nil
Patient 17	Nil	Nil
Patient 18	Nil	Nil
Patient 19	Nil	Nil
Patient 20	Nil	Nil
Patient 21	Nil	Nil
Patient 22	Nil	Nil
Patient 23	Nil	Nil
Patient 24	Husband	Blood
Patient 25	Nil	Nil
Patient 26	Nil	Nil
Patient 27	Nil	Nil
Patient 28	Mother	Cervix
Patient 29	Nil	Nil
Patient 30	Nil	Nil
Patient 31	Nil	Nil
Patient 32	Nil	Nil
Patient 33	Nil	Nil
Patient 34	Nil	Nil
Patient 35	Sister	Breast
Patient 36	Nil	Nil
Patient 37	Nil	Nil
Patient 38	Nil	Nil
Patient 39	Nil	Nil

Patient 40	Nil	Nil
Patient 41	Nil	Nil
Patient 42	Nil	Nil
Patient 43	Nil	Nil
Patient 44	Nil	Nil
Patient 45	Nil	Nil
Patient 46	Nil	Nil
Patient 47	Nil	Nil
Patient 48	Nil	Nil
Patient 49	Nil	Nil
Patient 50	Nil	Nil
Patient 51	Nil	Nil
Patient 52	Nil	Nil
Patient 53	Nil	Nil
Patient 54	Nil	Nil
Patient 55	Nil	Nil
Patient 56	Nil	Nil
Patient 57	Nil	Nil
Patient 58	Nil	Nil
Patient 59	Nil	Nil
Patient 60	Nil	Nil
Patient 61	Husband	Liver
Patient 62	Nil	Nil
Patient 63	Nil	Nil
Patient 64	Nil	Nil
Patient 65	Nil	Nil
Patient 66	Nil	Nil
Patient 67	Nil	Nil
Patient 68	Nil	Nil
Patient 69	Nil	Nil
Patient 70	Nil	Nil
Patient 71	Nil	Nil
Patient 72	Nil	Nil
Patient 73	Nil	Nil
Patient 74	Nil	Nil
Patient 75	Nil	Nil
Patient 76	Nil	Nil
Patient 77	Nil	Nil
Patient 78	Nil	Nil
Patient 79	Nil	Nil
Patient 80	Nil	Nil
Patient 81	Nil	Nil
Patient 82	Nil	Nil
Patient 83	Nil	Nil

Patient 84	Nil	Nil
Patient 85	Nil	Nil
Patient 86	Nil	Nil
Patient 87	Nil	Nil
Patient 88	Nil	Nil
Patient 89	Nil	Nil
Patient 90	Nil	Nil
Patient 91	Nil	Nil
Patient 92	Aunt	Breast
Patient 93	Mother	Breast
Patient 94	Nil	Nil
Patient 95	Father	Stomach
Patient 96	Nil	Nil
Patient 97	Nil	Nil
Patient 98	Nil	Nil
Patient 99	Mother	Throat
Patient 100	Nil	Nil

APPENDIX 5

Primary Site of Cancer Predisposition

PATIENT	Primary Site of Cancer
Patient 1	Cervix
Patient 2	Carcinoma of Unknown Primary Site (CUP)
Patient 3	Breast
Patient 4	Lung
Patient 5	Colon
Patient 6	(GTT)
Patient 7	Pelvic
Patient 8	Lung
Patient 9	Soft Tissue
Patient 10	Breast
Patient 11	Breast
Patient 12	Gallbladder
Patient 13	Lung
Patient 14	Breast
Patient 15	Caccum
Patient 16	Oesophagus
Patient 17	Breast
Patient 18	Small Cell Carcinoma
Patient 19	Breast
Patient 20	Breast
Patient 21	Lung
Patient 22	Lung
Patient 23	Breast
Patient 24	Cervix
Patient 25	Testis
Patient 26	Breast
Patient 27	Oesophagus
Patient 28	Breast
Patient 29	Breast
Patient 30	Breast
Patient 31	Breast
Patient 32	Lung
Patient 33	Stomach
Patient 34	Primitive Neuroectodermal Tumor (PNET)
Patient 35	Breast
Patient 36	Retro Peritoneal Tumor
Patient 37	Breast
Patient 38	Middle Ear
Patient 39	Lung
Patient 40	Sinonasal Malignancy

Patient 41	Ovary
Patient 42	Breast
Patient 43	Ovary
Patient 44	Stomach
Patient 45	Lung
Patient 46	Breast
Patient 47	Breast
Patient 48	Soft Tissue Sarcoma
Patient 49	Ovary
Patient 50	Recto Sigmoid Junction
Patient 51	Brain
Patient 52	Synovial Sarcoma
Patient 53	Lung
Patient 54	Gallbladder
Patient 55	Breast
Patient 56	Cervix
Patient 57	Ovary
Patient 58	Gallbladder
Patient 59	Oesophagus
Patient 60	Gallbladder
Patient 61	Lung
Patient 62	Lung
Patient 63	Cervix
Patient 64	Rectum
Patient 65	Prostate
Patient 66	Breast
Patient 67	Lung
Patient 68	Breast
Patient 69	Breast
Patient 70	Ovary
Patient 71	Breast
Patient 72	Lung
Patient 73	Breast
Patient 74	Sebacious Gland
Patient 75	Breast
Patient 76	Breast
Patient 77	Breast
Patient 78	Rectum
Patient 79	Ovary
Patient 80	Breast
Patient 81	Breast
Patient 82	Pancreas
Patient 83	Breast
Patient 84	Lung
Patient 85	Stomach
Patient 86	Larynx

Patient 87	Lung
Patient 88	Breast
Patient 89	Breast
Patient 90	Pyriiform Fossa
Patient 91	Breast
Patient 92	Ewing's Sarcoma
Patient 93	Cervix
Patient 94	Hodgkin's Lymphoma
Patient 95	Gallbladder
Patient 96	Rectum
Patient 97	Liver
Patient 98	Pyriiform Fossa
Patient 99	Gallbladder
Patient 100	Blood

APPENDIX 6

Type of Treatment

PATIENT	Treatment Type
Patient 1	Chemotherapy, Radiotherapy
Patient 2	Chemotherapy, Surgery
Patient 3	Chemotherapy, Radiotherapy
Patient 4	Chemotherapy
Patient 5	Chemotherapy
Patient 6	Chemotherapy
Patient 7	Chemotherapy
Patient 8	Chemotherapy
Patient 9	Chemotherapy, Radiotherapy
Patient 10	Chemotherapy, Surgery
Patient 11	Chemotherapy, Radiotherapy, Surgery
Patient 12	Chemotherapy
Patient 13	Chemotherapy, Radiotherapy
Patient 14	Chemotherapy
Patient 15	Chemotherapy, Surgery
Patient 16	Chemotherapy
Patient 17	Chemotherapy
Patient 18	Chemotherapy
Patient 19	Chemotherapy, Radiotherapy, Surgery
Patient 20	Chemotherapy, Radiotherapy, Surgery
Patient 21	Chemotherapy, Radiotherapy
Patient 22	Chemotherapy, Radiotherapy
Patient 23	Chemotherapy, Surgery
Patient 24	Chemotherapy, Radiotherapy, Surgery
Patient 25	Chemotherapy, Radiotherapy, Surgery
Patient 26	Chemotherapy, Radiotherapy, Surgery
Patient 27	Chemotherapy, Surgery
Patient 28	Chemotherapy
Patient 29	Chemotherapy, Radiotherapy, Surgery
Patient 30	Chemotherapy, Radiotherapy, Surgery
Patient 31	Chemotherapy, Radiotherapy, Surgery
Patient 32	Chemotherapy
Patient 33	Chemotherapy
Patient 34	Chemotherapy, Radiotherapy
Patient 35	Chemotherapy, Radiotherapy, Surgery
Patient 36	Chemotherapy, Surgery
Patient 37	Chemotherapy, Radiotherapy, Surgery
Patient 38	Chemotherapy, Radiotherapy
Patient 39	Chemotherapy
Patient 40	Chemotherapy, Radiotherapy, Surgery

Patient 41	Chemotherapy
Patient 42	Chemotherapy, Radiotherapy, Surgery
Patient 43	Chemotherapy, Surgery
Patient 44	Chemotherapy, Surgery
Patient 45	Chemotherapy
Patient 46	Chemotherapy, Surgery
Patient 47	Chemotherapy, Radiotherapy, Surgery
Patient 48	Chemotherapy, Radiotherapy, Surgery
Patient 49	Chemotherapy, Surgery
Patient 50	Chemotherapy
Patient 51	Chemotherapy, Radiotherapy, Surgery
Patient 52	Chemotherapy, Radiotherapy, Surgery
Patient 53	Chemotherapy, Radiotherapy
Patient 54	Chemotherapy
Patient 55	Chemotherapy, Radiotherapy, Surgery
Patient 56	Chemotherapy, Radiotherapy
Patient 57	Chemotherapy, Surgery
Patient 58	Chemotherapy, Surgery
Patient 59	Chemotherapy, Surgery
Patient 60	Chemotherapy, Surgery
Patient 61	Chemotherapy, Radiotherapy
Patient 62	Chemotherapy, Radiotherapy
Patient 63	Chemotherapy, Radiotherapy, Surgery
Patient 64	Chemotherapy, Radiotherapy, Surgery
Patient 65	Chemotherapy, Radiotherapy, Surgery
Patient 66	Chemotherapy, Surgery
Patient 67	Chemotherapy
Patient 68	Chemotherapy, Radiotherapy, Surgery
Patient 69	Chemotherapy, Radiotherapy
Patient 70	Chemotherapy, Surgery
Patient 71	Chemotherapy, Radiotherapy, Surgery
Patient 72	Chemotherapy, Radiotherapy
Patient 73	Chemotherapy, Surgery
Patient 74	Chemotherapy, Radiotherapy
Patient 75	Chemotherapy, Radiotherapy, Surgery
Patient 76	Chemotherapy, Radiotherapy, Surgery
Patient 77	Chemotherapy, Surgery
Patient 78	Chemotherapy, Radiotherapy, Surgery
Patient 79	Chemotherapy, Surgery
Patient 80	Chemotherapy, Radiotherapy
Patient 81	Chemotherapy, Radiotherapy, Surgery
Patient 82	Chemotherapy
Patient 83	Chemotherapy, Surgery
Patient 84	Chemotherapy
Patient 85	Chemotherapy, Surgery
Patient 86	Chemotherapy, Radiotherapy, Surgery

Patient 87	Chemotherapy
Patient 88	Chemotherapy
Patient 89	Chemotherapy, Surgery
Patient 90	Chemotherapy, Radiotherapy
Patient 91	Chemotherapy, Radiotherapy, Surgery
Patient 92	Chemotherapy, Surgery
Patient 93	Chemotherapy, Surgery, Hormone
Patient 94	Chemotherapy, Surgery
Patient 95	Chemotherapy, Surgery
Patient 96	Chemotherapy
Patient 97	Chemotherapy, Surgery
Patient 98	Chemotherapy, Surgery
Patient 99	Chemotherapy, Surgery
Patient 100	Chemotherapy

APPENDIX 7

Number of Chemotherapies & Radiotherapies

Patient	Chemotherapy Numbers	Radiotherapy Numbers
Patient 1	2	28
Patient 2	12	Nil
Patient 3	8	2
Patient 4	6	Nil
Patient 5	8	Nil
Patient 6	4	Nil
Patient 7	3	Nil
Patient 8	2	Nil
Patient 9	6	30
Patient 10	3	Nil
Patient 11	4	Not Mentioned
Patient 12	3	Nil
Patient 13	3	Not Mentioned
Patient 14	4	Nil
Patient 15	8	Nil
Patient 16	3	Nil
Patient 17	4	Nil
Patient 18	3	Nil
Patient 19	8	2
Patient 20	4	Not Mentioned
Patient 21	9	22
Patient 22	3	Not Mentioned
Patient 23	4	Nil
Patient 24	5	30
Patient 25	6	20
Patient 26	4	Not Mentioned
Patient 27	3	Nil
Patient 28	4	Nil
Patient 29	8	Not Mentioned
Patient 30	8	Not Mentioned
Patient 31	8	Not Mentioned
Patient 32	3	Nil
Patient 33	3	Nil
Patient 34	13	Not Mentioned
Patient 35	8	Not Mentioned
Patient 36	8	Nil
Patient 37	3	Not Mentioned
Patient 38	3	27
Patient 39	3	Nil
Patient 40	5	30

Patient 41	8	Nil
Patient 42	8	4
Patient 43	6	Nil
Patient 44	3	Nil
Patient 45	4	Nil
Patient 46	4	Nil
Patient 47	7	25
Patient 48	9	Not Mentioned
Patient 49	3	Nil
Patient 50	3	Nil
Patient 51	6	30
Patient 52	5	22
Patient 53	7	15
Patient 54	3	Nil
Patient 55	7	20
Patient 56	3	25
Patient 57	3	Nil
Patient 58	6	Nil
Patient 59	6	Nil
Patient 60	3	Nil
Patient 61	3	22
Patient 62	3	10
Patient 63	6	25
Patient 64	9	25
Patient 65	6	10
Patient 66	4	Nil
Patient 67	4	Nil
Patient 68	8	33
Patient 69	4	20
Patient 70	3	Nil
Patient 71	8	25
Patient 72	7	30
Patient 73	7	Nil
Patient 74	6	25
Patient 75	4	22
Patient 76	12	25
Patient 77	4	Nil
Patient 78	6	25
Patient 79	14	Nil
Patient 80	4	22
Patient 81	8	15
Patient 82	6	Nil
Patient 83	10	Nil
Patient 84	6	Nil
Patient 85	9	Nil
Patient 86	9	33

Patient 87	3	Nil
Patient 88	4	Nil
Patient 89	4	Nil
Patient 90	10	33
Patient 91	8	15
Patient 92	9	Nil
Patient 93	6	Nil
Patient 94	12	Nil
Patient 95	6	Nil
Patient 96	12	Nil
Patient 97	6	Nil
Patient 98	6	Nil
Patient 99	9	Nil
Patient 100	6	Nil

APPENDIX 8

Questionnaire of the Study

Name of the Physician:

Date:

Diagnosis:

Institution:

Case NO. :

Case Report Form (CRF) For Patient

Study Name: Evaluation of genetics of cancer predisposition in patients and efficacy of various chemotherapeutic drugs in Bangladesh

Socio-Demographic History:

1. Name (Optional):
2. Hospital/Registration no:
3. Sex:
4. Age:
5. Weight::
6. Blood Group:

Patient's Family History:

1. Is there any member in your family who had/have cancer?
 - a. Yes
 - b. No

If yes then

Which of the following type?

- a) Breast
- b) Prostate
- c) Lung
- d) Stomach cancer
- e) Cervix

- f) Ovarian Tumor
- g) Gallbladder Cancer
- h) Other

Relation with the patient:

Patient's Condition:

1. Symptoms before the diagnosis of cancer:
 - a) Breathlessness
 - b) Croaky voice or hoarseness
 - c) Difficulty swallowing
 - d) Sore that won't heal
 - e) Unusual breast changes
 - f) Unexplained sudden weight loss
 - g) Unexplained pain or ache
 - h) Unusual lump or swelling anywhere

2. Physical condition 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.
 - 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.

Treatment History:

1. Primary site of the cancer is following:
 - a) Breast
 - b) Prostate
 - c) Lung

- d) Stomach
- e) Cervix
- f) Ovarian Tumor
- g) Gallbladder Cancer
- h) Other

2. Date of diagnosis:

3. What is the stage of your cancer?

- a) I
- b) II
- c) III
- d) IV

4. Extent of disease:

- a) Less than 1 year
- b) 1 year or more
- c) 2 years or more

5. What type of treatment are you taking?(Mark one/more)

- a) Chemotherapy
- b) radiotherapy
- c) Other

6. How long you have been taking the treatment?

- a) 1-3 months
- b) 6 months
- c) 1 year
- e) 2 years or more

7. Number of Chemotherapy (CT) sessions:

- 8. If you have gone through any surgery? a) Yes b) No

9. Diagnostic status:

- a) Histopathologically confirmed
- b) PET CT Scan
- c) Citopathologically Confirmed
- d) other

10. Intention of treatment:

- a) Curative
- b) Palliative
- c) Terminal cure

Complications:

1. Did you experience any of the following incidents after chemotherapy?
 - a) Alopecia (Hair Loss)
 - b) Nausea
 - c) Pain in other body parts
 - d) Constipation
 - e) Loss of appetite

Patient's Injurious Habits:

1. Exposure to tobacco (smoking/chewing):

If yes, duration of tobacco exposure:

Patient's Food Habits:

1. What type of food habit did you have?
 - a) Mostly vegetarian
 - b) Mostly Non- vegetarian
 - c) Balanced diet containing both vegetables and meats
2. How frequent you used to consume soft drinks? (Coke / Pepsi / Miranda / 7 UP/ Sprite etc)
 - a) Almost daily
 - b) Weekly
 - c) Occasionally
3. What type of sugar do you intake?
 - a) Brown
 - b) White
4. What is the quantity of your daily sugar intake with tea / coffee /juice?
 - a) 1-3 tea spoon
 - b) More than 3 tea spoon
5. Did/ Do you used to intake long term (more than 3 months) refrigerated raw meat?

Patient's History of Health Problems:

1. Do you have other health problems like the following?
 - a) Heart Disease
 - b) Diabetes
 - c) High Blood Pressure

d) Hypertension e) Other f) None

2. Did you have obesity/ excessive weight problem before the diagnosis of cancer?

3. In your work or daily life were/are you regularly exposed to any harmful carcinogen at workplace?

If yes then

I. Which one/more of the following? (You may mark more than one option

a) X-rays / radioactive materials

b) Chemicals/ acids/ solvents

c) Diesel engine exhausts

d) Pesticides/ herbicides

e) Textile fibers/dusts

f) Environmental tobacco smoke

g) Other

II. Duration of exposure (mention duration for each type separately)

Drugs Used in Hospital:

1. Which Pre- chemotherapy medicines are you taking as cancer treatment?

2. Which medicines are you taking as cancer treatment at present?

3. During this treatment procedure if the physician has changed medicine ever:

a) Yes b) No

If yes then

I. How many times it has been changed?

II. The interval period between the changes of the drugs