PATTERN OF CANCER AND ITS RISK FACTOR IN CHATTOGRAM

Dr. Sanjina Akter

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Statement of Author

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Dr. Sanjina Akter

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Dr. Sanjina Akter
Roll No- 0120/04
Reg. No – 886
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This is to certify that we have examined the above MPH (One Health) thesis and have found that it is complete and satisfactory in all respects, and all revisions required by the thesis examination committee have been made.

.....	.....
Signature of the Supervisor	**Signature of the Co-Supervisor**
Dr. Mohammad Rashedul Alam **DVM, MS, PhD** Professor Department of Physiology, Biochemistry and Pharmacology. Faculty of Veterinary Medicine	**Dr. Md Ridoan Pasha** **DVM, MS** Assistant Professor Department of Physiology, Biochemistry and Pharmacology. Faculty of Veterinary Medicine

_____

Professor Dr. Sharmin Chowdhury, PhD
Chairman of the Examination Committee
Director: One Health Institute

One Health Institute
Chattogram Veterinary and Animal Sciences University
Khulshi, Chattogram-4225, Bangladesh

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Abbreviation

Abbreviation	Elaboration
ASEAN	Association of South Asian Nations
AICR	American Institute for Cancer Research
ATL	Adult T-Cell Leukemia
BL	Burkitt's Lymphoma
CI	Confidence Interval
CMCH	Chattogram Medical College Hospital
CMOSH	Chattogram Maa-O-Shishu Hospital
CVASU	Chattogram Veterinary and Animal Sciences University
CA	Cancer
CDC	Centers for Disease Control and Prevention
EBV	Epstein–Barr virus
GLOBOCAN	Global Cancer Observatory
HPV	Human Papilloma Virus
HHV	Human herpesvirus
HBV	Hepatitis B Virus
HTLV	Human T-Cell Leukaemia Virus
LMIC	Lower Middle-Income Country
NIH	National Institutes of Health
NPC	Nasopharyngeal Carcinoma
NHL	Non-Hodgkin lymphoma
NICRH	National Institute of Cancer Research & Hospital
OPD	Outpatient Department
PTD	Persistent trophoblastic disease
WHO	World Health Organization
WCRF	World Cancer Research Fund

Abstract

Cancer is the one of the most important causes of morbidity and mortality worldwide. In Bangladesh, Cancer is the 6th leading cause of death in general population. Over the next decade, it is expected that the incidence of cancer and its related death cases will become double. To deftly tackle this catastrophe, it is necessary to understand the sociodemographic distribution and risk factors of various cancer types. The main objective of this study was to investigate the sociodemographic profile of the cancer patients and exploring the underlying risk factors. The study was a descriptive type of cross-sectional study that was conducted using primary data from patients attending the oncology outpatient departments of the two largest tertiary care hospital from Chattogram Division. The survey was conducted by face-to-face interview with a pretested questionnaire. Two hundred (200) samples were collected from these two above mentioned hospitals from September 2022 to October 2022. Data analysis was conducted by IBM SPSS Version 23.0, And STATA/IC1. The majorities of respondents (65.5%) came from Chattogram Division's rural districts and were female (56%). The age group between 40-60 was found to be the most prevalent (44%) among study participants. The bulk of respondents (57.5%) among survey participants were from CMCH. Breast cancer was the most common type of cancer (19.5%) regardless of gender. The most prevalent types of cancer in women were breast cancer (33.93%), cervical cancer (13.39%), and ovarian cancer (9.93%). However, lung cancer (29.55%) was the most prevalent cancers in men. Based on the Pearson chi square test with 95% CI, patients who took contraceptives have a significantly increased risk of developing breast cancer and cervical cancer ($p<0.05$). Considering the emergence of cancer in Bangladesh, I am in search of effective monitoring of cancer trends and efficient plan of cancer control, it is also essential to start the creation of a regional cancer registry system.

Keywords: Cancer, Breast Cancer, Institution based study, Bangladesh, Chattogram

CHAPTER I: Introduction

The term cancer refers to a group of diseases that involve abnormal cell growth with the potential to invade other parts of the body. It occurs as a result of a number of genetic alterations that arises within a cell (Vogelstein and Kinzler, 2004). These changes disrupt the balance between proliferation and programmed cell death (apoptosis) mechanisms, causing cell transformation. The National Cancer Institute defines a tumor as 'an abnormal mass of tissue that results when cells divide more than they should or do not die when they should' (NIH, 2022). These malignant transformations are further divided into three stages: initiation, promotion and progression (Pitot, 1993). Usually, a long latent period persists from the moment of carcinogenic exposure to the neoplastic transformation during which the somatic cell is allowed to proliferate while multiple genetic mutations take place (Schottenfeld et al., 2006). Multiple factors have been associated with the development of oncogenic process such as lifestyle, host factors, infectious agents and environment. Apart from this, inherited genetic alterations can also occur in somatic and gonadic cells resulting in neoplasia. Understanding cancer etiology and recognizing their determinants is a key tool in the identification of high-risk populations. As a result, improved screening procedures can be aimed at these high-risk populations so that early detection and better treatment outcomes can be projected.

Cancer is the leading cause of death worldwide and accounted for almost a million deaths in the year 2020 (WHO, 2022). In lower and lower middle-income countries, about 30% cases of cancer were due to infections such as hepatitis and Human Papilloma virus (HPV). In 2020, the most common sites of cancer worldwide were breast (2.26 million cases); lung (2.21 million cases); colon and rectum (1.93 million cases); prostate (1.41 million cases), skin (non-melanoma) (1.20 million cases) and stomach (1.09 million cases). While the most common causes of cancer deaths were lung (1.80 million deaths); colon and rectum (916 000 deaths); liver (830 000 deaths); stomach (769 000 deaths); and breast (685 000 deaths). Even children are not exempted from this disease and approximately 400 000 child cases were reported in the year 2020. Although there is an idea about the worldwide prevalence of the different types of cancers the prevalence of cancer type varies depending on the

geographical locations, local habits, and lifestyles. (Fogleman et al., 2015 and Palladino et al., 2015)

In Bangladesh, an estimated 156 thousand new cases of cancer were diagnosed in the year 2020 (WHO, 2020). The most common types of cancer among the Bangladesh population were cancer of the esophagus (13.9%), cancer of lip and oral cavity (8.9%), breast (8.3%), lung (8.3%) and cervix (5.3%). In males, esophageal cancer (16.1%) was the most common followed by lung cancer (11.1%), cancer of lip and oral cavity (10.6%), cancer of the hypopharynx (7.3%) and cancer of the stomach (5.8%). In Bangladeshi females, breast cancer (19%) was the most common type of cancer observed. This was followed by cancer of the uterus and cervix (12%), cancer of the esophagus (11.1%), gall bladder cancer (7.8%), lip and oral cavity cancer (6.7%) and so on (GLOBOCAN, 2020). While there are many risk factors associated with the development of cancer, certain modifiable factors play a significant role in causing cancer (Sasco et al,. 2004). Identification of these factors are necessary to make lifestyle changes especially among the high-risk population. Hence, this study is being undertaken to identify which cancers are most prevalent in the city of Chattogram and what risk factors were associated with patients who developed the disease.

The causes of cancer are many and varied. In fact, what causes this disease intrigued generations of people around the world (Blackadar, 2016). Not so long ago, it was discovered that people who migrated to other countries developed cancers indigenous to the migrant country rather than their homeland (Blackadar, 2016). This finding lead to the suspicion that environmental exposure played an even larger role in the contribution to cancer development rather than genetic factors. Environmental exposure causes cancer by damaging DNA. While the term “environment” includes air, water, and soil, it also includes the conditions in the workplace and at home. It includes the use of tobacco, exposure to chemicals; and exposure to sunlight and other forms of radiation. Among them lung cancer is the most common cancer to occur due to environmental exposure. According to Global Cancer Observatory 2018, 11.6% of all types of cancers were lung cancers, out of which 80% were attributed to smoking. Outdoor air pollution contributed to 108,000 lung cancer deaths; solid fuels frequently used in developing countries for cooking and heating, caused 36,000 lung cancer

deaths; while secondhand smoke most likely resulted in 21,000 lung cancer deaths (Shankar et al., 2019). Radon, a natural radioactive gas found in many homes, is another element that raises the risk of lung cancer (Choi and Mazzone, 2014). Other than that, benzene, which is a common pollutant in vehicle exhaust, causes human leukemia (Pearson et al., 2000). Arsenic that contaminates drinking water supplies has been linked to skin, liver, bladder and lung cancer (Bates et al,. 1992). For the past three decades, agencies and institutes have cited the same estimate when regulating carcinogens in the workplace, air, water and consumer products. An estimated 20,000 deaths per year were ascribed to occupational exposures while around 10,000 deaths per year were attributed to environmental exposures (Israel, 2010). A WHO study found that at least 1.7 million cancer deaths annually could be prevented through healthy working and living environments. (Prüss-Üstün et al., 2016)

Other than environmental exposure, dietary and lifestyle exposure also plays a significant role in the development and adverse outcome of cancer. The correlation between lifestyle and cancer is evidenced by the large variation in rates of specific cancers in different countries. According to a prospective cohort study in 2003, obesity was associated with an increase in cancer mortality among patients in United States (Raffelsbauer, 2012). In both men and women, body mass index (BMI) was significantly associated with higher rates of death due to cancer of the esophagus, colon and rectum, liver, gallbladder, pancreas, kidney, non-Hodgkin's lymphoma, and multiple myeloma.

According to the World Health Organization (WHO) estimates for 2011, cancer now causes more deaths than all coronary heart disease or all stroke. The continuing global demographic and epidemiologic transitions signal an ever-increasing cancer burden over the next decades, particularly in low- and middle-income countries (LMIC), with over 20 million new cancer cases expected annually as early as 2025. This increase number should be controlled when we still have time. Whether that control be achieved through prevention or through treatment, it will probably necessitate a better understanding of the etiology, pathogenesis, and pathophysiology of cancer than is current. In the process of research, we should also be aware of man's mortality and the possibility that cancer is an intricate part of that larger, uncontrollable problem. Cancer is caused by spontaneous, time-dependent changes, such as accumulation from

somatic mutation, to the extent that it becomes accelerated by controllable environmental agents. Hence it is necessary to have a firm understanding of the etiology of cancer and of the interaction of genetic and environmental factors involved therein. Therefore, this study will help to identify which cancer is prevalent in Chattogram and what factors contribute to this so that we can at least attempt to prevent them as early as possible.

Multiple studies have reported a rising trend in the incidences of cancer worldwide including Bangladesh (Nolen et al., 2017 and Hossain, et al., 2014). While several factors are involved in the causation of the disease, it is necessary to find out what risk factors are associated with the development of cancer among our population. Hence, this study has been undertaken to describe the demographic variation and identify the risk factors associated with the development of cancer among our study population.

OBJECTIVES

- To investigate the prevalence of the different types of cancer among the study population in Chattogram
- To evaluate the demographic variation among the cancer patients
- To identify risk factors associated with various types of cancers

CHAPTER II

Review of Literature

2.1. Introduction:

Cancer is a standard term that defines a large group of diseases affecting any part of the body. It is also referred to as malignant tumors and neoplasms. Globally, cancer is a leading cause of death accounting for nearly 10 million deaths in the year 2020 alone (WHO, 2022). Not just the mortality, but the physical as well as emotional suffering of impending doom perpetrated by the disease is even more painful (Pinquart and Duberstein, 2010). While much advancement have been made in the treatment of this disease, finding an exact cure for all cancers is difficult. This is because, cancer is an amalgamation of many disorders with extensively different natural histories and responses to therapies. On one spectrum are cancers like Hodgkin lymphoma that are completely curable (Connors et al., 2020), whereas on the other side of the spectrum are cancers such as pancreatic adenocarcinoma, which are almost always fatal (Algül and Schmid, 2008). The most frequently occurring new cases of cancers in 2022 were breast (2.26 million cases); lung (2.21 million cases); colon and rectum (1.93 million cases); prostate (1.41 million cases); skin (non-melanoma) (1.20 million cases); and stomach (1.09 million cases) (WHO, 2022). Even children are not spared from this bane. Every year, around 400 000 children develop cancer worldwide (WHO, 2022). In case of cancer prevalence, the frequency of different types of cancers varies between countries (Armstrong and Doll, 1975). Nevertheless, risk factors for the disease more or less remain the same. Hence in order to control the rising trend of this disease, the only hope seems to lie in learning more about its causes and pathogenesis and identify the associated risk factors in developing the disease. According to one study, between 30-50% of cancers can be easily prevented by avoiding risk factors and applying existing evidence-based prevention strategies (WHO, 2022).

2.2. Tumor (Neoplasia)

Neoplasia meaning “new growth,” is the uncontrolled growth of cells and such growths are referred to as a neoplasm (Klapwijk, 2007). Tumors on the other hand are any abnormal masses of tissue that forms when cells grow and divide more than they should or do not die when they should (Dvorak,., 1986). Earlier, tumor was used to describe the swelling caused by inflammation. However, with time, the non-

neoplastic usage of tumor has almost vanished and lately, the term is now associated with neoplasm. Studies nowadays describe a tumor as a pathologic disturbance of cell growth that is distinguished by excessive and abnormal cell proliferation (Sinha, 2018). The Eminent British oncologist Willis from the pre-molecular era came closest to this definition. He defined neoplasm as 'an abnormal mass of tissue, the growth of which exceeds and is uncoordinated with that of the normal tissues and persists in the same excessive manner after cessation of the stimuli which evoked the change'. All tumors consist of two basic components: (1) neoplastic cells comprising of the tumor parenchyma and (2) reactive stroma that is made up of blood vessels, connective tissue, and variable numbers of cells of the innate and adaptive immune system (Dvorak, Tumor stroma, tumor blood vessels, and antiangiogenesis therapy, 2015). While the classification of tumors and their biological behavior are primarily based on the parenchymal element, their growth and spread are significantly dependent on their stroma (Cooper, 2000). Though some tumors have scanty connective tissue and hence a soft and fleshy neoplasm; others have parenchymal cells which stimulate formation of extracellular matrix proteins and collagen also known as desmoplasia. A tumor can be classified as being benign or malignant.

2.3. Characteristics of Benign and Malignant neoplasm

a) **Benign Tumor:** Benign tumors are noninvasive and remain localized. These tumors stay in their primary location without invading other sites of the body. Such neoplasms normally have smooth borders and are sharply delineated from the normal tissue at the tumor site. A fibrous capsule encapsulates such tumors and forms a barrier between the neoplastic cells and the host cells. Benign neoplasms, such as lipomas, are typically slow growing whereas malignant neoplasms often display rapid growth (Connolly et al., 2003).

b) **Malignant Tumor**: Malignant tumors are the ones that are collectively referred to as cancers. The word cancer is derived from the Latin word for crab, since they adamantly attempt to adhere to any part that they can seize on. Malignant neoplasms have the following characteristics:

- Rapid increase in size
- Lack of cell differentiation (anaplasia)
- Inclination towards invading surrounding tissues
- Ability to metastasize to distant areas of the body.

- Cytologically, malignant tumors display the following features:
- Increased size of the nucleus with an increased nuclear/cytoplasmic ratio--N/C ratio.
- Disparity in nuclear or cell size (pleomorphism).
- Lack of differentiation (anaplasia).
- Increased content of nuclear DNA with dark staining on H and E slides (hyperchromatism).
- Obvious nucleoli or irregular distribution of chromatin within the nuclei.
- Usually irregular or bizarre mitoses (Cotran et al.,1999).

c) Mixed Tumor: In most cases of benign and malignant neoplasms, all parenchymal cells closely resemble one another. Rarely, however, slight deviation in the differentiation of a single neoplastic clone creates a mixed tumor. An example of such a tumor is the mixed tumor of salivary gland. These tumors contain epithelial elements randomly dispersed within a myxoid stroma containing islands of cartilage or bone. All these elements usually come from a single clone that can produce both epithelial and myoepithelial cells. Hence, such a neoplasm is called pleomorphic adenoma. Majority of neoplasms, including mixed tumors, are composed of cells that arise from a single germ layer. An exception to this is a tumor called a teratoma that contains identifiable mature or immature cells or tissues belonging to more than one germ cell layer (Parotid Malignant Mixed Tumor, 2017).

d) Difference between benign and malignant neoplasm:

Under a microscope, a benign tissue looks well differentiated. Structure sometimes resembles a typical tissue of origin. It's rate of growth is usually progressive and slow. In some cases it may come to a standstill or regress; mitotic figures rare and normal. Usually composed of cohesive, expansive, well-demarcated masses that do not invade or infiltrate surrounding normal tissues. Metasis is absent. On the other hand, a malignant tissue is anaplastic; which often displays atypical structure. It's rate of growth may be erratic, but may be slow to rapid. Mitotic figures may be numerous and abnormal. It is locally invasive, infiltrating surrounding tissue; sometimes may be misleadingly cohesive and expansile. Its metastasis is frequent. (Carlo, 1954)

2.3.1. Differentiation and Anaplasia

Differentiation is the degree to which neoplastic parenchymal cells bear a resemblance to the equivalent normal parenchymal cells, both in morphology and function. When there is a lack of differentiation, it is called anaplasia. Generally, most benign tumors are well differentiated. Lack of differentiation is a hallmark of malignancy which is often associated with many other structural changes. Some of the characteristics of cancer cells are mentioned below (Baba & Câtoi, 2007).

a) **Pleomorphism.** This is the variation of the size and shape of cells. Cancer cells often display pleomorphism where cells within the same tumor are not even, but range from cells that are small and undifferentiated in appearance, to cells that are many times larger than their adjacent cells (tumor giant cells). Some of these giant cells possess only a one large polymorphic nucleus, while others may have two or more large, hyperchromatic nuclei. Although the inflammatory Langhans or foreign body giant cells look similar to these abnormal giant cells, one distinguishing feature is that the nucleus of the inflammatory Langerhans cells have small and normal appearing nuclei. (Koenig et al.,2017).
b) **Abnormal nuclear morphology**. Nuclei of cancer cells are disproportionately large for the cell, with a nuclear-to-cytoplasm ratio that may approach 1: 1 instead of the normal 1: 4 or 1: 6. The nuclear shape is usually irregular with a coarsely clumped chromatin distributed along the nuclear membrane, or a darkly stained (hyperchromatic) nucleus. Abnormally large nucleoli are also a common finding (Coleman & Tsongalis, 2010).

c) **Mitoses:** In malignant tumors, many cells are usually in the stages of mitosis. This characteristic reflects the high proliferative activity of the cancer cells. Although presence of mitosis does not certainly indicate that a tumor is malignant or that the tissue is neoplastic, it does point to rapid cell growth. Under normal circumstances, rapid cell growth is usually observed in tissues displaying rapid turnover such as the epithelial lining of the intestines. If frequent cell mitosis is accompanied by atypical and bizarre mitotic features with some having tripolar, quadripolar, or multipolar spindles, it is suggestive of malignancy. Benign tumors and some well differentiated malignant neoplasms may not display such features (Coleman and Tsongalis, 2010).

d) **Loss of polarity**: Along with the cytologic abnormalities, the alignment of anaplastic cells is noticeably disturbed. There are large masses of tumor cells that grow in a radical and unsystematic way (Nese et al., 2009).

e) **Necrosis:** As the tumor cells grow rapidly and accumulate, they require a blood supply to maintain their metabolism. However, often times, the vascular stoma cannot provide sufficient blood supply and as a result necrosis develops. In many malignant tumors that grow rapidly, ischemic necrosis is a common finding (Barker et al., 1996).

f) **Metaplasia and Dysplasia:** Metaplasia is defined as the replacement of one type of cell with another type. Metaplasia is mostly associated with tissue damage, repair, and regeneration. In most cases, the replacing cell type is better suited to some alteration that may have occurred within the local environment. For example, the squamous epithelium of the esophagus is replaced by glandular epithelium in the stomach and the intestine among patients with gastroesophageal reflux disease as this is more suited to the acidic environment caused by the disease. Dysplasia means "disordered growth." It is commonly seen in epithelia and is characterized by a pattern of changes that include a loss in the consistency of the individual cells as well as a loss in their architectural alignment. Considerable pleomorphism may be exhibited by dysplastic cells with evidence of large hyperchromatic nuclei usually with a high nuclear-to-cytoplasmic ratio. When these dysplastic changes are noticeable and encompass the full thickness of the epithelium, but the lesion does not go past the basement membrane, it is considered to be a preinvasive neoplasm and is denoted as 'carcinoma in situ'. Once the basement membrane is breached, the tumor is said to be have become invasive. Although dysplasia can be the early stages of a malignant transformation, it does not always become cancerous.(Giroux & Rustgi, 2017).

2.3.2. Local Invasion

Growth of cancer cells is accompanied by penetration, invasion, and destruction of the surrounding tissue, while almost all benign tumors grow as consistent and uniform expandible masses localized to their original site and do not have the capacity to invade, infiltrate or spread to distant sites. Apart from metastasis, invasiveness of a

tumor is the most dependable feature that distinguishes a malignant tumor from a benign one. Most malignant tumors cannot recognize regular anatomical boundaries and are expected to penetrate the wall of the relevant structures (such as wall of the colon) or protrude through the surface of the skin. Such invasiveness makes surgical resection of malignant tumors difficult or impossible. Even when tumors show a clear demarcation, it is necessary to excise a significant margin of apparently normal tissues next to to the infiltrative neoplasm so as to ensure complete local excision. (Hart et al., 1978)

2.3.3. Metastasis

Metastasis is defined by the spread of a tumor into areas of the body that are physically not continuous with the primary tumor, and clearly indicates a tumor as malignant. It is the invasiveness of cancers that allows these cells to pierce into blood vessels, lymphatics, and body cavities, invading them and providing the chance for spread. Although all malignant tumors can metastasize, some rarely do it. Examples of such tumors include malignancies of the glial cells in the central nervous system (gliomas) and basal cell carcinomas of the skin. Despite invasion early in their course, both of these cells rarely metastasize. (Mattiuzzi and Lippi, 2019)

2.3.3.1 Pathways of Spread of Cancer:

Dissemination of cancers may occur through either one of these three pathways:

(1) **Direct seeding of body cavities and surfaces**: This may occur whenever a malignant neoplasm permeates into any area lacking physical barriers. The peritoneal cavity is the most frequently involved, but any other cavity such as pericardial, pleural, subarachnoid, and any joint spaces may also be affected. Such seeding is a predominant characteristic of carcinomas that arise from the ovaries and spread peritoneal surfaces.

(2) **Lymphatic Spread.** The most common pathway for the initial dissemination of carcinomas is through the lymphatics. Tumors do not contain functional lymphatics, however, lymphatic vessels located at the tumor margins are adequate for the lymphatic spread of tumor cells. Cancer cells spread by migrating through the lymphatic system to nearby as well as distant lymph nodes.

(3) **Hematogenous spread:** There are circumstances where the cancer cells break away from their primary tumor and then enter the blood stream to travel and spread to distant locations in the body. Depending on the type of cancer, different organs get involved in distant metastasis through hematogenous spread. For example, lungs are the most common site of metastasis in laryngeal and pharyngeal cancers. (Steinbichler et al., 2020)

2.4. Nomenclature of Cancer:

a. Tumors composed of one parenchymal cell type:

In connective tissue and their derivatives, benign tumors are Fibroma, Lipoma, Chondroma, Osteoma. And malignant tumors are Fibroma, Liposarcoma, Chondrosarcoma, Osteogenicsarcoma. Benign tumors of blood vessels, lymph vessels, Mesothelium, brain coverings are Hemangioma, Lymphangioma, Benign fibrous tumor and Meningioma respectively. While malignant tumors of the beforementioned vessels and coverings are Angiosarcoma, Lymphangiosarcoma, Mesothelioma and Invasive meningioma respectively. Blood cells and related cells are of two types which are Hematopoietic cells and Lymphoid tissue which do not have benign tumors but have malignant ones like Leukemia and Lymphoma.Benign Leiomyoma and malignant Leiomyosarcoma occurs in smooth muscle. While benign Rhabdomyoma and malignant Rhabdomyosarcoma occurs in striated muscle. Benign type squamous cell papilloma and malignant squamous cell carcinoma occur in stratified squamous stratified epithelium. Basal cells of skin have no benign tumor but have basal cell carcinoma of malignant type. Epithelial lining of glands or ducts have benign tumors named Adenoma, Papiloma, Cystadenoma. Respiratory passages have benign tumors called Bronchial adenoma and malignant tumors called Broncogenic carcinoma. Renal epithelium has Renal tubular adenoma of benign type and Renal cell carcinoma of malignant type. Liver cells have Hepatic adenoma as benign type and Hepatocellular carcinoma as malignant type tumor.

Urinary tract epithelium has Transitional cell papilloma of benign type and Transitional cell carcinoma of malignant type. Placental epithelium has Hydatidiform mole of benign type and Choriocacinoma of malignant type. Testicular epithelium has no tumor of benign type but has Seminoma and Embryonal carcinoma of malignant

type. Melanocyte has Nevus which is benign and Malignant melanoma which is malignant.

b. Tumors composed of more than one neoplastic cell type mixed tumors: Those are usually derived from one germ cell layer: Salivary glands have Pleomorphic adenoma of benign type and Malignant mixed tumor of salivary gland origin which is a malignant type. Renal anlage has no benign tumor but has malignant tumor called Wilms tumor.

c) Tumors composed of more than one neoplastic cell type derived from more than one germ cell layer – teratogenous: Totipotential cells in gonads or in embryonic rests have benign tumors called Mature teratoma and dermoid cyst. They also have malignant types called Immature teratoma and teratocarcinoma. (Chandrasoma et al., 1995)

2.5. Epidemiology of Cancer

The epidemiology of cancer has a history dating back to over 200 years. Bernadino Ramazzini (1633–1714), in his book De Morbis Artificum Diatriba (Diseases of Workers), described his observations that cancers of the breast occurred more frequently in nuns than in other women. He further speculates that their celibate life could be a major cause for this high risk of occurrence (Franco & Franco, 2001). Another doctor and author Percivall Pott found an astute connection between soot and scrotal cancer (Brown & Thornton, 1957). He noted that scrotal cancer, then known as 'chimney sweeps' cancer, usually occurred in young men who were directly associated with this occupation. Both these researches have been confirmed many times. Nevertheless, while the cause for breast cancer remains unknown, the association between soot and scrotal cancer led to the realization that combustion products of coal could cause cancer on any part of the skin that came in contact and became the basis for further study on chemical carcinogens. There is remarkable geographic variation in the incidence of specific cancers that is believed to occur mainly from differences in exposure to environmental carcinogens, suggesting that many cancers are preventable (Mattiuzzi and Lippi, 2019).

a) Estimated number of new cases in 2020, worldwide, females, all ages:

Out of a total of 9,227,484 cancer cases, 24.5% is composed of breast cancer which consists of the second highest number of cases (a majority from a single organ perspective), colorectum cancer consists of 9.4%, lung cancer consists of 8.4%, cervix uteri, thyroid, corpus uteri and stomach cancer consist of 6.5%, 4.9%, 4.5%, 4% respectively. Other cancers have a majority percentage of 37.8%

b) Estimated number of new cases in 2020, worldwide, males, all ages:

Out of a total of 10,065,305 cancer cases, 14.3% is composed of lung cancer which consists of the second highest number of cases (a majority from a single organ perspective), prostate cancer consists of 14.1%, colorectum cancer consists of 10.6%, stomach, liver, bladder and oesophagus cancer consist of 7.1%, 6.3%, 4.4%, 4.2% respectively. Other cancers have a majority percentage of 39.1% (GLOBOCON 2020) Although race is not a clearly defined biological variable, it can define groups at risk for certain cancers. The disparity in cancer mortality rates between white and black Americans persists, but African Americans had the largest decline in cancer mortality during the past decade (Ward et al., 2004). Hispanics living in the United States have a lower frequency of the most common tumors seen in the white non-Hispanic population but a higher incidence of tumors of the stomach, liver, uterine cervix, and gallbladder, as well as certain leukemias. One study by Smigal et al., (2006) shows the incidences of breast cancer among females to be highest among white Caucasians, followed by African Americans, Hispanics, Asian Americans and finally native Americans (Smigal et al., 2006). Thus, it is clear that race is an important factor for frequency of specific types of cancers

2.5.1. Environmental Factors Contributing To Cancer:

Although both genetic and environmental factors contribute to the development of cancer, environmental influences seems to be the dominant risk factors for most cancers. Evidence supporting a central role for environmental factors can be found in the wide geographic variation that exists in the incidence of specific forms of cancer. While racial predispositions cannot be completely ruled out, environmental influences are believed to be the underlying factors for most of these cancers. This has been

proved time and again in cancer studies conducted among migrant workers. Almost all of these studies suggest that the risk of cancer increases drastically among people who migrate to other geographical locations as compared to their host country (McCredie, 1998) (Zahm and Blair, 1993). Among the well- established environmental factors affecting cancer risk are the following:

2.5.1.1. Infectious agents: Infectious agents are an important preventable cause of cancer. Anong the various agents, viruses are the most common cause of cancer in humans causing around 20% of all cancers. Most of these micro-organisms are capable of integrating into the host genome and have the ability to prevent apoptosis of the host cell in order to allow their own replication. The infected cell then starts to express the viral genes, inducing cell growth & proliferation and prevent programmed cell death. In the past decades, it has been observed that viruses have played an important role in cancer biology, contributing significantly in our understanding of cell signaling and growth control pathways that give rise to cancer. Studies of viral transforming properties have contributed to this insight. As a result, viruses have been suggested as a causative agent for neoplasia in humans. According to an article by Carrillo-Infante, et al., (2007), an estimate 17.8% of cancer cases are attributable to infectious agents and of these, 12.1% are due to viral infections. (Carrillo-Infante et al., 2007)

There are two major concepts that describes the way viral tumor genesis occurs. These are expressed as provirus and oncogene. In the provirus model, a viral genome enters the cell at the time of infection and is integrated in to the host cell DNA. In the oncogene model, the genes for malignancy are already present in all cells of the body as they were present in the initial sperm and egg. These oncogenes encode proteins that encourage cell growth (e.g., fibroblast growth factor). In the oncogene model, carcinogens such as chemicals, radiation, and tumor viruses activate these cellular oncogenes to overproduce these growth factors. This initiates inappropriate cell growth and malignant transformation.

Effect of cellular oncogenes and tumor suppressor genes on the cell cycle:

The oncoproteins encoded by cellular oncogenes activate the cell cycle by allowing passage from the G1 phase into the S phase. The proteins encoded by tumor

suppressor genes, notably p53 and RB, inhibit the cell cycle in the G1 phase. Inactivation of these proteins activates the cell cycle by allowing passage from the G1 phase into the S phase. G1, gap 1; G2, gap 2; M, mitosis; S, synthesis of DNA. (Murray RK et al.,2012.) Both proviruses and oncogenes could play a crucial role in malignant transformation. Evidence for the provirus theory consists of finding copies of viral DNA integrated into cell DNA only in cells that have been infected with the tumor virus. The corresponding uninfected cells have no copies of the viral DNA. Cellular oncogenes and viral oncogenes, although similar, are not identical. They differ in base sequence at various points; and cellular oncogenes have exons and introns, whereas viral oncogenes do not. (Carrillo-Infante et al., 2007)

2.5.1.2 Functions of cellular oncoproteins: Cellular oncogenes encode proteins with a variety of functions that are shown in the figure. These oncoproteins activate the cell cycle and cause cell to grow in an unregulated manner. Used with permission from Murray et al., 2012.

2.5.1.3 Examples of Cellular Oncogenes Involved in Human Cancer

Abl oncogenes work by signaling tyrosine kinase and causes Chronic myelogenous leukemia (Greuber et al., 2013). Erb B-2 oncogenes functions by Receptor tyrosine kinase and causes Carcinoma breast, ovary and neuroblastoma cancer (Zhang et al., 2007). Ras works through G protein and causes carcinoma of colon, lung, thyroid and melanoma cancer (Thompson, 1998). Myc uses transcription factor and causes Burkett's lymphoma; carcinoma of breast and ovary. Jun/fos uses transcription regulator causing carcinoma of breast and lung. src uses signaling tyrosine kinase causing carcinoma of colon (Steelman et al.,2008). Pi3k uses signaling lipid kinase causing carcinoma of colon. There is another mechanism of carcinogenesis involving cellular genes, namely, mutation of a tumor suppressor gene. One example is the retinoblastoma susceptibility gene, which normally acts as a suppressor of retinoblastoma formation. When mutation occurs in both alleles of this anti-oncogene**,** retinoblastoma occurs (Riley et al., 1994). Human papillomavirus and SV40 virus produce a protein that binds to and inactivates the protein encoded by the retinoblastoma gene. Human papillomavirus also produces a protein that inactivates the protein encoded by the p53 gene, another tumor suppressor gene in human cells (Taghizadeh et al., 2009). Micro-RNA genes do not encode proteins but rather exert

their regulatory effect by being transcribed into micro-RNA that can bind to sequences in mRNA and prevent that mRNA from being translated into proteins. For example, there are micro-RNAs that bind to ("silence") mRNA transcribed from a tumor suppressor gene. As a result, the tumor suppressor protein is not synthesized, which enhances the likelihood of tumorigenesis. (Catallanotto et al., 2016) There are several tumor suppressor genes which cause important human cancers Tumor Suppressor Genes Involved. such as –

- Rb gene causes betinoblastoma; carcinoma of breast, bladder, and lung.
- p53 causes carcinoma of breast, colon, and lung astrocytoma.
- WT1 causes Wilm's tumor of kidney.
- DCC causes carcinoma of colon. (Cooper, 2000)

2.5.1.4 Human Tumor Viruses

There are six known human tumor viruses. Two are RNA viruses, namely human T-cell lymphotropic virus and hepatitis C virus. The other five are DNA viruses, namely human papilloma virus, Epstein–Barr virus, human herpes virus 8 (Kaposi's sarcoma virus) and hepatitis B virus (Joan et al., 1996).

- EBV causes BL, NPC, NHL, PTD cancer through saliva.
- HPV uses sexual route and causes cervical cancer.
- HCV spreads through sexual and post-transfusion/IV drug-user and causes Hepatocarcinoma.
- HBV spreads through Perinatal/sexual route and causes Hepatocarcinoma.
- HHV-8 uses sexual route and causes Kaposi's sarcoma.
- HTLV-1 spreads through sexual/perinatal/parenteral route and causes ATL, HAM.

Here, virus associated with malignancy- BL, Burkitt's lymphoma; NPC, nasopharyngeal carcinoma; NHL, non-Hodgkin's lymphoma; PTD, post-transplant-disease; ATL, adult T-cell leukemiap, progressive myelopathy. (Carrillo-Infante et al., 2007)

2.5.1.5 DNA Tumor Viruses

a) EBV

The Epstein-Barr virus was originally isolated from biopsy tissue samples of the childhood malignancy, African Burkitt's lymphoma. This unusual cancer occurs with high incidence in an endemic region that is also holoendemic for malaria. An association with EBV was subsequently discovered in nasopharyngeal carcinoma, a cancer that develops with extraordinarily high incidence among the Cantonese Chinese and with elevated incidence among Alaskan Inuits and in Mediterranean Africa. EBV is accepted as cause of post-transplant lymphomas and is linked to a subset of Hodgkin's lymphomas, gastric carcinoma, and rare examples of T-cell lymphoma, especially in Japan, Taiwan and Korea, and rare smooth muscle sarcomas in children with AIDS (Brady et al., 2008).

b) Human Herpesvirus 8

Human herpes virus 8 (HHV-8), also referred to as Kaposi's sarcoma-associated herpes virus (KHSV), is a double-stranded DNA virus classified in the Rhadinovirus genus, which belongs to the γ-2 herpes viridae sub-family. KHSV/HHV-8 is the etiological cause of Kaposi's sarcoma (KS). It is sexually transmitted remaining latent with the possibility of reactivation in immunocompromised individuals. KHSV/HHV-8 is a multifocal angioproliferative disease, commonly manifested as a cutaneous lesion. It is also associated with other proliferative disorders such as primary effusion lymphoma (PEL), and multicentric Castleman's disease (MCD). There are four major forms of KS: the first type is the classic form, which is present in Mediterranean individuals. The second form consists in the association between KS and AIDS, where patients commonly present with disseminated KS. The third form is the endemic type and the fourth is the iatrogenic type, which occurs in individuals receiving immunosuppressive therapy. KHSV/HHV-8 establishes latent infection in the host, persisting episomally in B-lymphocytes. KSHV has a latent and a lytic phase. During the latent phase, it evades the immune system, persisting in the host cell having a restricted expression of genes (83). During lytic replication, viral proteins are produced unrestrictedly. KSHV produces a variety of immunomodulatory proteins with paracrine properties (84). KSHV contains several gene products with

transforming properties among the most important are the viral G-protein coupled receptor (vGPCR), which is an IL-8 receptor analog and vIL-6, which modulates cell growth (Rewane and Tadi, 2022).

c) Human papilloma virus (HPV)

HPV is a small non-enveloped double-stranded DNA tumor virus. It causes a diverse range of epithelial lesions that transform from benign lesions such as anogenital warts, mild cervical dysplasia and recurrent respiratory papillomatosis, to pre-malignant and malignant lesions. Over 100 different types of HPV have been identified, but only some strains have demonstrated sufficient evidence to be designated as definitive human carcinogens. These strains are HPV-16 and HPV-18, which are considered 'high-risk' types. HPV-16 and HPV-18 account for approximately 70% of cervical and anal cancers worldwide. 'Low-risk' types are HPV-6 and HPV-11, accounting for approximately 90% of genital warts. Cervical cancer is the 9th most common cancer in world, and the 6th most common and 3rd most deadly cancer among women. In Bangladesh, cervical cancer is the second most common cancer among females with an estimated 11,956 new cases and 6,582 deaths in 2012 (GLOBOCAN, 2012). Bangladesh's social sector, such as rising educational levels, particularly in women, and increased economic opportunities, especially in urban areas. In a Journal of 2014 named "Genital Human Papillomavirus Infection among Women in Bangladesh: Findings from a Population-Based Survey" it was mentioned that the garment industry accounts for approximately 80% of the country's total exports and roughly 85% of the workers in the garment industry are women (Nahar et al., 2014). For women, this has led to increased employment and empowerment but also exposure to changing social dynamics and environments that may increase their engagement in intimate relationships and sexual exploitation, thereby increasing their likelihood of HPV infection. This may explain the significant effect of women's occupation on HPV infection in the urban setting of this study. Occupation was also a significant predictor for HPV infection in the rural study site. In this case however, it was the risk posed by the occupation of women's husbands. Economic opportunities outside of Bangladesh draw rural men to leave their families for long periods of time for work overseas. This may increase their opportunity for

engaging in risky sexual behaviors, thus increasing their wives vulnerability to HPV infection (Nahar et al., 2014).

d) Hepatitis B Virus

HBV infection is significantly more common in patients with primary hepatocellular carcinoma (hepatoma) than in control subjects. This relationship is striking in areas of Africa and Asia, where the incidence of both HBV infection and hepatoma is high. Chronic HBV infection commonly causes cirrhosis of the liver; these two events are the main predisposing factors to hepatoma. Part of the HBV genome is integrated into cellular DNA in malignant cells. However, no HBV gene has been definitely implicated in oncogenesis. The integration of HBV DNA may cause insertional mutagenesis, resulting in the activation of a cellular oncogene. In addition, the HBx protein may play a role because it inhibits the p53 tumor suppressor protein (Gomaa et al., 2008).

e) Human T-Cell Lymphotropic Virus

There are two human T-cell lymphotropic virus (HTLV) isolates so far, HTLV-1 and HTLV-2, both of which are associated with leukemias and lymphomas. HTLV-1 was isolated in 1980 from the cells of a patient with a cutaneous T-cell lymphoma. Its RNA and proteins are different from those of all other retroviruses. In addition to cancer, HTLV is the cause of tropical spastic paraparesis, an autoimmune disease in which progressive weakness of the legs occurs. Transmission occurs primarily by breast feeding, by sexual contact, and by exchange of contaminated blood (Martinez, 2019).

f) Hepatitis C Virus

Chronic infection with hepatitis C virus (HCV), like hepatitis B virus (HBV), also predisposes to hepatocellular carcinoma. HCV is an RNA virus that has no oncogene and forms no DNA intermediate during replication. It does cause chronic hepatitis, which seems likely to be the main predisposing event. HCV cannot be transmitted via casual contact, coughing, sneezing, hugging, food or water sharing eating utensils rather it is transmitted by sexual contact, blood transfusion, IV drug usage etc. In an observational study conducted in Department of Medicine and gastroenterology of

Rangpur medical college hospital from July 2012 to June 2013, the majority (43.33%) of the patients had multiple risk factors exposure, transfusion (53.4), and infusion history (60%) was the commonest along with other factors like surgical procedure (43.3%), hemodialysis (23.3%), dental procedure (20%), & risky sexual exposure (16.7%). 6.7% had a history of only sharing razors and 6.7% had only a history of contamination with a surgical instrument. 23.3% of my study people had CKD having hemodialysis.(Sutradhar et al., 2022)

2.5.1.6 Toxins from Fungi

Aflatoxins are cancer-causing substances produced by certain types of fungi growing on food. Grains and peanuts are the most common foods on which these fungi grow. Meat, eggs, and milk from animals that eat aflatoxin contaminated feed are other sources of exposure. Agricultural workers are potentially at risk if they inhale contaminated airborne grain dust. Exposure to high levels of aflatoxins increases the risk of liver cancer. Peanuts are screened for aflatoxin in most countries, including the United States, before processing. The risk of aflatoxin exposure is higher in developing countries where there is no screening for the fungus (Kumar et al., 2017).

2.5.1.7 Tobacco Use

Smoke, the gaseous products of burning materials especially of organic origin made visible by the presence of small particles of carbon, not only means cigarette or tobacco but also means chemical particles like asbestos, vinyl chloride, pesticides, outdoor air pollutant like motor vehicle emission ,municipal waste, indoor air pollutants etc. These exposures have been associated with a variety of neoplasms, but most important among these is lung cancer (Walser et al., 2018). Lung cancer is a leading cause of morbidity and mortality globally, accounting for 2,094 million cases and 1.8 million deaths per year (Shankar et al., 2019)

Cigarette smoking has been called the single most important environmental factor contributing to premature death in the United States. Smoking, particularly of cigarettes, has been implicated in cancer of the mouth, pharynx, larynx, esophagus, pancreas, bladder, and most significantly, about 90% of lung cancer deaths (Malhortra et al., 2016).

Consumption of tobacco products increased dramatically as a result of the mass production of cigarettes, starting in the second half of the 19th century. Consumption of cigarettes was still low at the beginning of the 20th century. Cigarette consumption by men increased rapidly in the United Kingdom, the USA and several other industrialized countries, followed decades later by women, and later again by men in developing countries. At present, cigarette consumption among women in developing countries is still relatively low. Over the past few decades, cigarette consumption has decreased by half in the USA and some European countries. However, one billion men and a quarter of a billion women smoke worldwide, and about 30 million young adults start smoking each year (CDC, 2012).

A study was done in Bangladesh named "Predictors of tobacco smoking and smokeless tobacco use among adults in Bangladesh" which was published in Indian Journal of Cancer. In the study the prevalence of tobacco smoking was higher among males. The prevalence of smoking by age group among adults aged 15+ ranged from 12.0% (15-24 years) to 32.9% (45-54 years). There was no significant variation by place of residence for prevalence of tobacco smoking. In contrast, there was a strong gradient in smoking prevalence by educational level. Among adults, the rate of smoking was highest among those with no formal education and lowest among those with a secondary education or more. In addition, the prevalence of smoking was highest among those in the lowest quintile of the wealth index (29.2%) and lowest among those in the highest quintile (13.6%). Tobacco smoking was more prevalent among self-employed (46.7%) and employed (43.3%) adults than in the other occupational categories. The use of smokeless tobacco by age was highest among older adults (≥65 years), and the age gradient was significant ($P < 0.05$). The proportion of adults consuming smokeless tobacco was higher among rural adults than among urban adults of both genders ($P < 0.05$). Among adults, only 10.2% of those at the highest educational level used smokeless tobacco as compared to 42.3% of those with no formal education (Palipudi et al., 2012).

2.5.1.6 Solvents

Several solvents used in paint thinners, paint and grease removers, and in the dry-cleaning, industry is known or suspected of being cancer-causing in animal studies. These include benzene, carbon tetrachloride, chloroform, dichloromethane (methylene

chloride), tetrachloroethylene, and trichloroethylene. Human studies are suggestive, but not conclusive, except for benzene. Therefore, with the exception of benzene, these substances are listed as likely to be cancer-causing in humans (Wernke and Schell, 2004).

Benzene is known to cause leukemia in humans. It has widespread use as a solvent in the chemical and drug industries and as a gasoline component. After 1997, its use as an ingredient in pesticides was banned. Workers employed in the petrochemical industry, pharmaceutical industry, leather industry, rubber industry, gas stations, and in the transportation, industry are exposed to benzene. Inhaling contaminated air is the primary method of exposure. Because benzene is present in gasoline, air contamination occurs around gas stations and in congested areas with automobile exhaust. It is also present in cigarette smoke (Huff, 2007).

2.5.1.7 Metals

Arsenic compounds are associated with many forms of skin, lung, bladder, kidney, and liver cancers, particularly when high levels are consumed in drinking water. In addition, occupational exposure to inhaled arsenic, especially in mining and copper smelting, has been consistently associated with an increased risk of lung cancer. Arsenic is also used in wood preservatives, glass, herbicides, insecticides and pesticides, and it is a general environmental contaminant of air, food, and water.

In Bangladesh drinking arsenic contaminated groundwater is the main pathway of arsenic exposure. Additionally, the use of arsenic-contaminated groundwater for irrigation purpose in crop fields in Bangladesh has elevated arsenic concentration in surface soil and in the plants (Sandhi et al., 2022)

Beryllium compounds are known to cause lung cancer based primarily on studies of workers in beryllium production facilities. These compounds are used as metals for aerospace and defense industries; for electrical components, X-ray tubes, nuclear weapons, aircraft brakes, rocket fuel additives, light aircraft construction, and the manufacture of ceramics; and as an additive to glass and plastics, dental applications, and golf clubs. Industry is also increasingly using beryllium for fiber optics and cellular network communication systems. Workers can be exposed through jobs related to the above activities, as well as through recycling of computers, cell phones,

and other high-tech products. Outside of these industries, beryllium exposure occurs primarily through the burning of coal and fuel oil. The general population can be exposed to trace amounts of beryllium by inhaling air and consuming food contaminated with beryllium residues. Small concentrations have been reported in drinking water, food, and tobacco (Willis and Florig., 2002). Studies of groups of workers show that cadmium metal and cadmium compounds are associated with an increased risk of lung cancer. Workers with the highest exposures are those involved in removing zinc and lead from minerals, producing cadmium powders, welding cadmium-coated steel. Cadmium metal is primarily used to coat metals to prevent corrosion. Other uses are in plastic and synthetic products, in batteries, as stabilizers for polyvinyl chloride, and in fungicides (Genchi et al., 2020).

Vinyl chloride, a colorless gas, is a human carcinogen associated with lung cancers and angiosarcomas (blood vessel tumors) of the liver and brain. It is used almost exclusively by the plastics industry in manufacturing many consumer products, including containers, wrapping film, electrical insulation, water and drain pipes, hosing, flooring, windows, and credit cards. Human exposure can occur primarily in workers in the plastic industry, not by using the end products such as vinyl siding or hosing. The major source of releases of vinyl chloride into the environment is believed to be from the plastics industries. People living near a plastics plant are exposed by breathing contaminated air, but the exposure of the general population away from the plant is essentially zero (Heldaas et al., 1984).

Benzidine was one of the first chemicals recognized as being associated with increased cancer risk in humans. As early as 1921, increased cases of bladder cancer were reported to be associated with benzidine, a compound used in the production of more than 250 benzidine-based dyes for textiles, paper, and leather products. Human exposure to either benzidine or benzidine-based dyes is now known to be carcinogenic. The dyes break down into benzidine once inside the body. In most cases, dyes that metabolize to benzidine are hazards only in the vicinity of dye and pigment plants where wastes may escape or be discharged (Choudhary, 1996).

Nickel and nickel compounds are associated with several kinds of cancers. Studies in human populations link nickel exposure to cancers of the nasal cavity, lung, and

possibly the larynx (voice box). Nickel is used in steel, dental fillings, copper and brass, permanent magnets, storage batteries, and glazes (Cameron et al., 2011).

2.5.1.8 Alcohol

Heavy drinkers (more than two drinks/day) have an increased risk of cancer, particularly among those who also smoke. Alcohol consumption is the third major, modifiable cancer risk factor after tobacco use and excess body weight, and it is an established cause of at least 7 types of cancer. Cancers associated with heavy drinking include cancers of the mouth, throat, larynx, liver, esophagus, colon and rectum. There is also some evidence linking alcohol and cancer of the breast (Boffetta and Hashibe, 2006)

2.5.1.9 Diet

It has been estimated that 30–40 percent of all cancers can be prevented by lifestyle and dietary measures alone. Obesity, nutrient sparse foods such as concentrated sugars and refined flour products that contribute to impaired glucose metabolism (which leads to diabetes), low fiber intake, consumption of red meat, and imbalance of omega 3 and omega 6 fats all contribute to excess cancer risk. There is also evidence that a diet rich in fruits and vegetables may decrease the risks of esophageal, stomach, and colorectal cancers. Allium and cruciferous vegetables are especially beneficial, with broccoli sprouts being the densest source of sulforophane. Protective elements in a cancer prevention diet include selenium, folic acid, vitamin B-12, vitamin D, chlorophyll, and antioxidants such as the carotenoids (α-carotene, β-carotene, lycopene, lutein, cryptoxanthin). Ascorbic acid has limited benefits orally, but could be very beneficial intravenously. Supplementary use of oral digestive enzymes and probiotics also has merit as anticancer dietary measures. When a diet is compiled according to the guidelines here it is likely that there would be at least a 60–70 percent decrease in breast, colorectal, and prostate cancers, and even a 40–50 percent decrease in lung cancer, along with similar reductions in cancers at other sites. Such a diet would be conducive to preventing cancer and would favor recovery from cancer as well (Willet, 2020).

In Bangladesh, most of the foodstuffs, whether harvested, manufactured, or processed, are unsafe for consumption or adulterated to varying degrees. Rapidly increasing urbanization and industrialization of Bangladesh have been continuously emitting metal-contaminated fumes from industries and vehicles, have contributed to the contamination of agricultural soils, and consequently in food chain by depositing heavy metals on the fruit and vegetable surfaces during their production, transportation, and retailing. Further, application of wastewater to irrigate agricultural land and the use of agrochemicals such as metal-based fertilizers and pesticides play an important role in the contamination of agricultural products, where the use of agrochemicals is not well controlled. Regular monitoring and assessment of heavy metal concentration in food crops near industrial and mining areas has been carried out in some developed and developing countries, but limited published data are available on heavy metal concentrations and dietary intake of these pollutants in the vegetables and fruits in the industrials areas of Bangladesh (Sultana et al., 2017).

2.5.1.10 Obesity

Being overweight or obese appears to be one of the most important modifiable causes of cancer, after tobacco. Large population studies show a consistent association between obesity and certain kinds of cancer. Some studies report that nearly 40% of all cancers can be attributed to overweight and obesity. The strongest links are with breast cancer in older women, and cancers of the endometrium, kidney, colon, and esophagus that account for over 60% of cancers attributed to obesity. In 2018 the World Cancer Research Fund/American Institute of Cancer Research (WCRF/AICR) published a large systematic review showing that, in addition to those cancer sites, there is also strong evidence associating obesity with esophageal, liver, pancreatic, gallbladder, ovarian, thyroid, multiple myeloma, and renal cancers (Berger, 2014).
There is strong evidence that physical inactivity increases the risk for colon and breast cancer. The beneficial effect of exercise is greatest among very active people. Together, it is estimated that inactivity and obesity account for 25 to 30 percent of the cases of several major cancers—colon, breast (postmenopausal), endometrial, kidney, and cancer of the esophagus. (Jurdana, 2021)

It was estimated in a study (in 2003), from a prospective cancer prevention cohort, that overweight and obesity accounted for 14 percent of all cancer deaths in men and

20 percent of those in women. Significant positive associations were found between obesity and higher death rates for the following cancers: esophagus, colon and rectum, liver, gallbladder, pancreas, kidney, stomach (in men), prostate, breast, uterus, cervix, and ovary. The authors estimated that over 90,000 cancer deaths per year could be avoided if the adult population all maintained a normal weight (BMI < 25.0) (Michael S Donaldson, 2004). Clearly, obesity is a major risk factor for cancer.

As early as 1932, scientists proposed a possible association between diabetes and cancer. It was not until much later, aided by large-scale registries and administrative health databases, that evidence emerged supporting a strong and consistent link between diabetes and higher risks of certain cancers. Cancers most commonly associated with diabetes are those of the pancreas, liver, endometrium, breast, colon, and bladder, while notably, prostate cancer has an inverse association with diabetes. The magnitude of risk between diabetes and cancer varies across cancer sites. For hepatocellular, pancreatic, and endometrial cancers, the increased risk associated with diabetes may be up to two-fold, whereas for other cancers, such as colon and breast, the relative risk increases are closer to 20% to 40%. Diabetes has also been associated with higher mortality after cancer, and survivors of some cancers have a higher incidence of developing subsequent diabetes. Finally, both cancer and diabetes treatments have been shown to influence associations between diabetes and cancer-associated outcomes (Habib and Rojna, 2013).

The inflammatory and endocrine effects of obesity, a major risk factor for type 2 diabetes Type 2 DM (T2DM), have been proposed as central mechanisms explaining associations between diabetes and cancer. Indeed, epidemiological trends in diabetes closely follow those of obesity. Other factors specific to diabetes, such as hyperglycemia, insulin resistance, and hyperinsulinemia, have also been linked to cancer growth in vitro and in animal and human studies (Kamal et al., 2022).

.Adipose tissue, particularly visceral adiposity, is increasingly recognized as an important endocrine organ that secretes adipokines, inflammatory cytokines, and estrogen through peripheral aromatization of androgens. Excess visceral adiposity leads to increased lipid intermediates, increased leptin, and leptin resistance, impaired

insulin signaling, insuln resistance, and higher levels of circulating IGFs due to reduction in IGF-binding binding globulin levels.

IGF-I and IGF-II are strong mitogens for a wide variety of cancer cell lines, including sarcoma, leukemia, and cancers of the prostate, breast, lung, colon, stomach, esophagus, liver, pancreas, kidney, thyroid, brain, ovary, and uterus (both cervical and endometrial). IGFs are also overexpressed in certain cancers (NCI 2022). Increased adiposity also leads to reduced circulating adiponectin, an important adipokine that reduces levels of free fatty acids, improves lipid profiles, and decrease inflammatory cytokines. These metabolic disturbances have all been linked to oncogenic mechanisms, including cell proliferation and migration, angiogenesis, and reduced cellular apoptosis. There is also evidence of increased inflammatory markers, in particular tumor necrosis factor-alpha, interleukin-6, interleukin-1, and C-reactive protein, which may also promote carcinogenesis. In addition to these mechanisms, shared risk factors, such as sedentary lifestyle and excess caloric intake, may also contribute to increased mitogenesis through the production of reactive oxygen species (Kamal et al., 2022).

2.5.1.11 The anti-cancer diet:

A presumable ‘anti-cancer diet’ has been extensively discussed in the last years. The topic crossed the boundary of the scientific environment and reached the lay community, fostered by the publication of several books. A few examples are Foods that fight cancer (Béliveau and Gingras, 2007), Beating cancer with nutrition (Head, 2001), The cancer-fighting kitchen (Katz and Wallace, 2009), The everything cancer-fighting cookbook (Katzin, 2010), Beyond the magic bullet – the anti-cancer cocktail (Chang, 2012) and many more. Diets rich in fruits, vegetables, whole grains, and spices have been linked to reduced risks of cancers of the colon, rectum, stomach, liver, oral cavity, pharynx, and other sites, including breast and prostate.. A list of 100 fruits, vegetables, cereals, and spices with the potential to prevent cancer is provided in an expert review by Anand., et al., 2008 from the Cytokine Research Laboratory of the University of Texas, USA. According to this review, the protective role of fruits and vegetables against cancers that occur in various anatomical sites is now well supported, with more than 25 000 different phytochemicals identified that may have

anti-cancer activity. They include beta-carotene, lycopene, resveratrol, quercetin, silymarin, indole- 3-carbinol, and sulphoraphane from fruits and vegetables, as well as catechins, curcumin, diallyl disulphide, capsaicin, gingerol, anethol, and eugenol from spices and teas. Although most of the evidence of the chemopreventive efficacy of these compounds has come from cell and animal studies, they have advantages in comparison with synthetic drugs because they are regarded as safe and usually target multiple cell signalling pathways. For instance, catechins interact with more than 10 genes involved in the cellular response to oxidative stress. They are 100 times more powerful than vitamin C and 25 times more powerful than vitamin E in their antioxidant/growth inhibitor potential. Not only tea drinkers but also coffee lovers may enjoy the hot cup. Coffee has been reported to inversely correlate with liver cancer. Another important source of anti-carcinogens is whole grains. Besides being rich in dietary fibres, they contain chemopreventive antioxidants such as tocotrienols, phenolic acids, lignans, and phytic acid. Whole-grain intake was found to reduce the risk of several cancers, including carcinomas from different sites, lymphomas, and leukaemias, by 30–70%.. The most evident correlation between dietary fibre intake and reduced cancer risk has been observed for colorectal cancer. A metaanalysis involving 25 prospective cohort and case–control studies published in November 2011 confirmed the protective effect of dietary fibre on colorectal cancer incidence but also revealed that the risk reduction varies among different types of fibres, with the greatest benefits seen for legume fibre (relative risk/RR = 0.62) and cereal fibre (RR = 0.90). Whole grains contain less antioxidants than some berries, but more than common fruits or vegetables(Masrul and Nindrea, 2019). However, the refining process used in most industrialized countries reduces their content of nutrients by removing the outer layers. Some isoflavones (genistein, daidzein, equol) have been linked to a lower incidence of breast cancer. However, there is also controversy on whether isoflavones, as phytoestrogens, might rather contribute to hormone-dependent cancers. The effects of isoflavones on early breast cancer markers differ between pre- and post-menopausal women. Human and animal studies have yielded conflicting results with regard to the effect of soy isoflavones on breast cancer risk. As recently shown, this may be due to differences in isoflavone metabolism between humans and rodents. The most important class of phytoestrogens in the Western diet are lignans (found in flaxseeds, sesame seeds, rye bran). They are transformed by the

intestinal microflora into enterodiol, and enterolactone. Lignans are capable of binding to oestrogen receptors and interfering with the cancer-promoting effects of oestrogen on breast tissue (Setchell et al., 2014). In a meta-analysis, high lignan intake was shown to be associated with a significantly reduced risk of breast cancer in post-menopausal women (Katharina et al., 2010), but this finding was not confirmed in an epidemiological study. Among women (but not men), colorectal cancer risk was inversely associated with enterolactone and total enterolignans (Ward et al., 2009). On the other hand, enterolignan intake positively correlated with prostate cancer risk, but this correlation was attenuated after adjustment for dairy intake((Masrul and Nindrea, 2019).

2.5.1.12 Ionizing Radiation

Ionizing radiation is invisible, high-frequency radiation that can damage the DNA or genes inside the body. Everyone is exposed to very small doses of ionizing radiation from cosmic rays (rays that enter the earth's atmosphere from outer space). Radiation from this source may account for a very small percentage (about 1 percent) of our total cancer risk. Some homes have elevated levels of radon, a naturally occurring radioactive gas found at low levels in most soil. Radon is produced by the breakdown of uranium, which naturally releases low levels of ionizing radiation. Higher levels of radon can be found in certain types of rocky soil. The health effects of radon were first seen in the elevated levels of lung cancer found in underground uranium miners around the world. Radon gas seeps into homes from the surrounding soil through cracks and other openings in the foundation. About 1 out of 20 homes has elevated levels of radon. Even though the cancer risks for radon exposure in the home are much lower than for radon-exposed miners, it is estimated that about 20,000 lung cancer deaths every year are caused by radon exposure in homes. There are various strategies for reducing residential radon exposure. Another source of ionizing radiation is the radioactive substances released by atomic bombs or nuclear weapons known as "fallout." The doses of ionizing radiation received by the atomic bomb survivors in Japan resulted in increased risks of leukemia and cancers of the breast, thyroid, lung, stomach, and other organs. Radioactive substances were also released in the aboveground atomic bomb testing conducted by the U.S. Government in the late 1950s and early 1960s in Nevada. People exposed, especially as children, to one

radioactive form of iodine, called Iodine-131 or I-131, which collects in the thyroid gland, may have an increased risk of thyroid disease, including thyroid cancer. People are also exposed to ionizing radiation during certain medical procedures. Some patients who receive radiation to treat cancer or other conditions may be at increased cancer risk. For example, persons treated with radiation in childhood to treat acne, ringworm, and other head and neck conditions have been shown to be at increased risk for thyroid cancer and other tumors of the head and neck. X-rays used to diagnose or screen for a disease are also forms of ionizing radiation. The dose of radiation from procedures used to diagnose or screen for a disease is much lower than the dose received to treat a disease. Most studies on the long-term effects of exposure to radiation used to diagnose or screen for cancers or other diseases have not shown an elevated cancer risk, but it is possible that there is a small risk associated with this exposure. One exception is children whose mothers received diagnostic X-rays during pregnancy. These children were found to have increased risks of childhood leukemia and other types of cancer, which led to the current ban on diagnostic X-rays in pregnant women. Several other studies of women who received small weekly X-ray doses to the chest over extended periods to monitor treatment for tuberculosis showed a radiation-related increased risk of breast cancer. (Ron, 1998)

2.5.1.13 Role of Pesticides

Studies of people with high exposures to pesticides, such as farmers, pesticide applicators, crop duster pilots, and manufacturers, have found high rates of blood and lymphatic system cancers, cancers of the lip, stomach, lung, brain, and prostate, as well as melanoma and other skin cancers. So far, human studies do not allow researchers to sort out exactly which pesticides are linked to which cancers. Therefore, most of the pesticides (ethylene oxide, amitrole, some chlorophenoxy herbicides, DDT,dimethyl hydrazine, hexachlorobenzene, hexamethylphosphoramide, chlordecone, lead acetate, lindane, mirex, nitrofen, and toxaphene) are still listed in the Report on Carcinogens as likely to be cancer-causing, rather than as known carcinogens(Alavanja and Bonner, 2012). It has been reported that 20 insecticides, 18 fungicides and 2 rodenticides, are being used in Bangladesh. The major pesticides used by the farmers are Cypermethrin, Dichlorvos, Malathion, Carbofuran, Mancozeb and Diazinon depending upon the invading pests in Bangladesh. Besides, many

pesticides used in Bangladesh are in the banned or restricted list under international agreements. Most farmers particularly in the developing countries like Bangladesh apply pesticide without knowing its actual requirements and/or effectiveness, and thus there are very high frequencies of pesticides application, for example, 150 sprays in a crop season in brinjal in Bangladesh. More than 90% farmers of Bangladesh use pesticide unnecessarily, indiscriminately and excessively due to their ignorance and unconsciousness about the use. There have been many studies on farmers intended to establish cancer-pesticides linkages and indicate that maternal employment in agriculture has a link with leukemia and populations living around the active agricultural regions are highly prone to cancer. Beginning in the late 1970s, there have been reports linking pesticides to leukemia in children and exposure to non-Hodgkin lymphoma and leukemia. Thyroid and bone cancers are prevalent in agricultural regions where fungicides are extensively used. Moreover, organophosphate pesticides used in the vegetable gradually gets deposit into the human body and has a link with cancer. (Weichenthal et al., 2010)

2.5.1.14 Medical drugs:

Some drugs used to treat cancer (e.g., cyclophosphamide, chlorambucil, melphalan) have been shown to increase the occurrence of second cancers, including leukemia. Others that are used as immunosuppressant, such as cyclosporine and azathioprine for patients having organ transplants, also are associated with increased cancer risks, especially lymphoma. However, the Food and Drug Administration has determined that the life-saving benefits of these drugs outweigh the additional cancer risks years later. It is recommended that people weigh the risks and benefits concerning the use of a drug with the help of a physician or other health care specialist. Some medicines have been linked to reduced risk of cancer. For example, some studies find a reduced risk of colon cancer in persons who regularly take aspirin or other non-steroidal anti-inflammatory medicines. Evidence for protection of other cancers such as breast cancer or prostate cancer is inconsistent. (Gallagher et al., 2010)

Estrogens used to treat symptoms of menopause and other gynecological conditions have been shown to increase the incidence of endometrial cancer. In addition, some studies have shown an increased risk of breast cancer with estrogen use, but a reduced

risk of colon cancer. Progesterone, another hormone now taken in combination with estrogen for hormone replacement therapy in older women, helps to protect against the increased endometrial cancer risk with estrogen alone. However, increased risks of breast cancer, heart disease, stroke, and blood clots have recently been shown to be associated with the use of estrogen plus progestin, a synthetic form of progesterone. Long-term users of combination oral contraceptives have substantially reduced risks of endometrial and ovarian cancers, but may experience increases in early-onset breast cancers and liver cancer. The amount of estrogen and progesterone in oral contraceptives is substantially less than in previous years, which means that the risk of the current formulations is likely to be less than those used in the past (D'Alonzo et al., 2019).

Increased risks of endometrial cancer as well as increased risks of stroke and blood clots are also associated with tamoxifen use. Tamoxifen is a synthetic hormone used to prevent the recurrence of breast cancer after breast cancer surgery. It is also used to prevent breast cancer in women at high risk for the disease because of family history or other factors. Again, it is recommended that people weigh the risks and benefits concerning the use of a drug with the help of a physician or other health care specialist.

Diethylstilbestrol (DES) is a synthetic form of estrogen prescribed to pregnant women from the early 1940s to 1971. It was found that their daughters who were exposed to DES before birth have an increased chance of developing a rare type of cervical and vaginal cancer. In addition, women who took DES during pregnancy may have a slightly higher risk for developing breast cancer. Based on these findings, DES is no longer prescribed, and its use as a cattle feed additive has been banned (Palmer et al., 2006).

.2.5.2. Age

Age has an important influence on the likelihood of being affected with cancer. Most carcinomas occur in the later years of life (>55 years). Cancer is the main cause of death among women aged 40 to 79 and among men aged 60 to 79; the decline in deaths after age 80 is due to the lower number of individuals who reach this age. The rising incidence of cancer with age is likely explained by the accumulation of somatic

mutations associated with the emergence of malignant neoplasms. The decline in immune competence that accompanies aging may also be a factor (DePinho, 2000)

2.5.3. Acquired Predisposing Conditions

Acquired conditions that predispose to cancer can be divided into chronic inflammations, precursor lesions and immunodeficiency states**.** Chronic inflammatory disorders and precursor lesions span a diverse set of conditions that are all associated with increased cellular replication, which appears to create a "fertile" soil for the development of malignant tumors. Indeed, repeated rounds of cell division may be required for neoplastic transformation, in that proliferating cells are the most at risk for accumulating the genetic lesions that lead to carcinogenesis. Tumors arising in the context of chronic inflammation are mostly carcinomas, but also include mesothelioma and several kinds of lymphoma. Immunodeficiency states predispose to virus-induced cancers. Each of these acquired predisposing conditions is described next.

2.5.3.1. Chronic Inflammation and Cancer

"Pathological inflammation", i.e., acute phase response of moderate intensity (chronic inflammation) is involved in neoplastic transformation and stimulation of cancer growth. Already in 1828, Jean Nicholas Marjolin, a French surgeon, provided evidence for the involvement of chronic inflammation in the development of cancer. He observed the growth of squamous cancer around the open chronically inflamed wound. It is currently estimated that approximately 25 % of cancers are associated with chronic inflammation caused by infection or physicochemical agents. Persistent gastritis induced by Helicobacter pylori increases the risk of stomach cancer even by 75 %, whereas types B and C hepatitis promote the formation of hepatocellular carcinoma. Also noninfectious diseases may increase the risk of cancer (Korniluk et al.,2017). Cancers of the pancreas and prostate often follow chronic inflammation in these organs. The closest relationship between chronic inflammation and cancer can be observed in chronic ulcerating colitis and Crohn's disease, which increase the risk of colorectal cancer even tenfold. Moreover, inflammation-based tumors are characterized by the presence of cells and inflammatory mediators, thus indicating that inflammation and cancer can be combined by the extrinsic and intrinsic

pathways. In the former, cancer growth is associated with an ongoing inflammatory state. The latter is stimulated by genetic changes leading to the activation of oncogenes and inactivation of suppressor genes. Cells with an altered phenotype produce inflammatory mediators thus leading to the activation of immune response and development of inflammation (Korniluk et al., 2017).

In both models, carcinogenesis is a two-stage process. Cancer development is initiated when the DNA sequence in somatic cells undergoes genetic mutations that can be present in healthy tissues and remain occult for many years until another stimulus pushes the cells into the "promotion" stage. This process may occur when the transformed cells are exposed to chemical irritants, such as phorbol esters, substances released at the site of injury, partial resection of the organ, hormones or chronic irritation and inflammation. Functionally, many "promoters" may directly or indirectly induce cell proliferation, recruitment of inflammatory cells, may increase production of reactive oxygen species, leading to oxidative DNA damage and decreasing its repair.

- Asbestos fibers, silica particles cause pathologic conditions like Asbestosis, silicosis which transforms into Mesothelioma, lung carcinoma.
- Inflammatory bowel disease causes Colorectal carcinoma.
- Lichen sclerosis causes Vulvar squamous cell carcinoma.
- Alcoholism, germline mutations cause Pancreatitis which further transforms into Pancreatic carcinoma.
- Bile acids, bacteria, gallbladder stones cause Chronic cholecystitis which further turns into Gallbladder cancer.
- Gastric acid causes Reflux esophagitis, Barrett esophagus which further turns into Esophageal carcinoma.
- Sjögren syndrome, Hashimoto thyroiditis transforms into MALT lymphoma.
- Liver flukes (O viverrini) cause Opisthorchis, cholangitis which later on

turns into Cholangio carcinoma, colon carcinoma.

- Helicobacter pylori causes Gastritis/ulcers which in time turns into Gastric adenocarcinoma, MALT lymphoma.
- Hepatitis B and/or C virus causes Hepatitis which in time turns into Hepatocellular carcinoma.
- Bacterial infection causes Osteomyelitis which in time turns into Carcinoma in draining sinuses.
- Human papillomavirus causes Chronic cervicitis which further turns into Cervical carcinoma.

- Schistosomiasis causes Chronic cystitis which further transforms into Bladder carcinoma (Coussens and Werb, 2002).

2.5.3.2 Precursor Lesions and Cancer

Precursor lesions can be defined as localized morphologic changes that are associated with a high risk of cancer. Virtually all precursor lesions arise in epithelial surfaces and are associated with an increased risk of various forms of carcinoma. Precursor lesions do not inevitably progress to cancer; nevertheless, they are important to recognize because some precursor lesions can be detected by screening procedures and treated, thereby reducing the risk of developing cancer.
Many precursor lesions arise in the setting of chronic inflammation and can be recognized by the presence of metaplasia: examples include Barrett esophagus (gastric and colonic metaplasia of the esophageal mucosa in the setting of gastric reflux); squamous metaplasia of the bronchial mucosa (in response to smoking) and the bladder mucosa (in response to schistosomiasis infection); and colonic metaplasia of the stomach (in the setting of pernicious anemia and chronic atrophic gastritis). The final group of precursor lesions is benign neoplasms that are at risk for malignant transformation. The classic example of a neoplastic precursor lesion is the colonic villous adenoma, which if left untreated progresses to cancer in about 50% of cases.(Cohen et al 2002)

2.5.3.3 Immunodeficiency States and Cancer.

Patients who are immunodeficient, and particularly those who have deficits in T-cell immunity, are at increased risk for cancers, especially those caused by oncogenic viruses. These virally associated tumors include mainly lymphomas, but also certain carcinomas and even some sarcomas and sarcoma-like proliferation. (Gallagher et al., 2010)

2.5.4. Genetic Instability and Cancer

Each cell of the organism has several genes (and epigenes) that control growth. Some of these genes may be defective by birth. Others accumulate errors through wear and tear, i.e. intrinsic replication errors and environmental mutagens. Accordingly, as time passes, growth control deteriorates and cells acquire neoplastic phenotypes. The origin of cancer is thereby explained by a linear model, which over the last two decades has served as the standard model of carcinogenesis.

The standard model of carcinogenesis indicates early version: mutations accumulates thorough environmental agents, spontaneous errors and inheritance. Mutations lead to activation of oncogenes and inactivation of tumor suppressor genes, which results in uncontrolled proliferation and eventually cancer. Current version: mutations accumulate thorough environmental agents, spontaneous errors and inheritance. Mutations in caretakers (DNA control and repair genes) produce genetic instability. The elevated mutation rate leads to mutations in gatekeepers (oncogens and tumors suppressor genes), which as before leads to breakdown of growth control and cancer. The sequential timing of specific mutations remains somewhat unclear. From the discussion, conclusion can be made that genes cannot alone cause cancer, rather environment and timing influence genetic alterations to cause cancer **(**Charames and Bapat, 2003).

2.6. Prevalence of Cancer in Bangladesh

The rate of cancer deaths in less-developed countries such as Bangladesh has significantly increased day by day, making it a major health issue. The main common factors are smoking, use of tobacco leaves, bacterial or viral infection, hereditary disorders, food adulterations, and environmental factors, which are highly responsible

for the development of carcinoma in the young to adult population in this region. The most predominant diseases are prostate, colorectal, lung, breast, stomach, and liver cancers. Statistically, the ratios differ between males and females; in Bangladesh, lung carcinomas are prevalent in males and breast and cervical cancer are prevalent in females. Each year many people die due to prostate, liver, breast, lung, gastric, and hepatocellular carcinoma, which predominate over other cancers. In Bangladesh, lung, cervical, and breast cancers account for almost 38% of all cancers. Since most cases of cervical carcinoma in Bangladesh are diagnosed and treated at late stages, the survival rate is low. In 2010, 55% of people were affected and by 2030, 9 million may die from this disease. The number of cancer patients is drastically increasing day by day. (Hussain and Sullivan, 2013)

In 2008, there were 1.61 million deaths from lung cancer, 1.38 million from breast cancer, and 1.38 million from colon cancer. Smoking, hepatitis B and C virus, Helicobacter pylori bacterial infection, water contamination by arsenic, the use of carcinogenic chemicals, and additives in food items are the major elements causing cancer in less-developed countries such as Bangladesh. The rising number of prostate cancer cases among the Bangladeshi population is due to gene polymorphism, age, and genetic heredity, even though the genetic relation is controversial. In 2018, more than 750 people died due to prostate cancer in Bangladesh. This investigation focused on the causes mentioned above for the rising cancer rate among Bangladeshi people. Healthcare items are the major elements causing cancer in less-developed countries such as Bangladesh. The rising number of prostate cancer cases among the Bangladeshi population is due to gene polymorphism, age, and genetic heredity, even though the genetic relation is controversial. In 2018, more than 750 people died due to prostate cancer in Bangladesh. This investigation focused on the causes mentioned above for the rising cancer rate among Bangladeshi people. (Hussain and Sullivan , 2013).

Table 2.1: Demographic profile of Chittagong Division.

Characteristics		**Frequency**	**Percentage %**
Total Population		33,202,326	
Age			
Gender	Male	16,024,572	48.26
	Female	17,160,140	51.68
	Hijra	17,614	0.06
Location	Urban	11,175,026	33.66
	Rural	22,027, 300	66.34
Marital Status (%)	Never Married	10,813,997.58	32.57
	Currently Married	20,475,874	61.67
	Widow/ Widower	1,706,599.56	5.14
	Divorced	99,606.98	0.30
	Separated	106,247.44	0.32
Religion (%)	Muslim	29,918,615.96	90.11
	Hindu	2,194,673.7486	6.61
	Buddhist	969,507.92	2.92
	Christian	73,045.12	0.22
	Others	46,483.26	0.14
Number of Households		5,626,310	

Source: Population & Housing Census 2022: Preliminary Report, Bangladesh Bureau of Statistics, Statistics and Informatics Division, Ministry of Planning.

The table above depicts the current scenario of the demographic profile of people living in Chattogram district. Majority of the population live in rural areas and are currently married. Islam is the most prominent religion and females make up the greater proportion of gender.

2.6.1 Prevalence of Lung Cancer in Bangladesh

Smoking, tobacco use, previous history of lung disease such as asthma or tuberculosis, and genetic factors are the key factors in the development of lung cancer. Polymorphic changes in the MDM2 gene have been identified as another reason for lung cancer, based on data collected from more than 11,638 patients. Age is another important parameter. People older than 65 years of age are significantly affected compared to younger people in less-developed countries. It was reported that about 5887 lung cancer patients were admitted to the hospital in 2020, especially the National Institute of Cancer Research and Hospital (NICRH). Experts have suggested

that smoking and air pollution are the main reasons for lung carcinoma. Family income, area of residence, education status, and marital status are the four most common contributing factors in lung cancer, mainly for men older than 55.

In 2012, an estimated 14.1 million people were affected by cancer and about 8.2 million died. Among them, 17.8% died due to lung cancer. This rate was comparatively higher than stomach and liver cancers. A study was conducted of 104 male and female individuals (about 94.20 and 5.80%, respectively) in different areas of Bangladesh. Important risk factors for developing lung cancer in Bangladesh were identified. Here, risk factors from lower to higher, based on the data are shown. The following order was shown for males—smoking > previous history of lung disease > highly cooked food > genetic inheritance > tobacco leaf intake > alcohol consumption; while the following order was shown for females—genetic inheritance < highly cooked food < previous history of lung disease < tobacco leaf intake.

Every year, more than 190,000 people are affected by lung cancer in Bangladesh. Approximately 30,000 patients are expected to die from this cancer. A report published in 2020 indicated that among 400 cancer patients in 2016, 11 patients were affected by lung cancer, with a male-to-female ratio of 10:1. According to the report, the highest-selling lung cancer drugs, including cisplatin, gefitinib, and osimertinib, are being produced by top-ranked pharmaceutical companies in Bangladesh. (Reza et al., 2020)

2.6.2 Prevalence of Liver Cancer in Bangladesh

Hepatocellular carcinoma (HCC), i.e., liver cancer, is the third most common cancer, behind lung and gastric carcinoma. About 8 million people in Bangladesh are infected with chronic hepatitis B or C virus. This can proceed to HCC, and recently nonalcoholic fatty liver disease (NAFLD) has been shown to increase the trend toward liver cancer. For the manufacturing and processing of sutki (the local name for dried fish), dichlorodiphenyltrichloroethane (DDT) is commonly used, although it is banned by the government. This is also responsible for liver cancer.

Hepatocellular carcinoma is usually a male-predominant disease in Bangladesh, affecting men between the ages of 41–92 years. A study was conducted by Karim et

al. at Dhaka Medical College of 79 patients with hepatocellular carcinoma, based on age, sex, and HbsAg. Another study found a male predominance for this disease and concluded that HBV was responsible for 61.5% of cases of HCC in Bangladesh. The average age of hepatocellular carcinoma patients in Bangladesh is 41–92 years. According to a WHO report in 2018, the number of hepatocellular carcinoma cases was 3112 and the mortality rate was 2.68%. Current treatment includes the use of sorafenib and pegylated interferon alpha, as most liver cancer is related to hepatitis infection. The hepatitis B core antigen-based vaccine is gaining popularity for prevention of liver carcinoma.

Data shows that chronic liver disease incidents are the highest in Rajshahi division which is 69% . Chittagong holds a 50% rate of incidents. Khulna, Barisal, Dhaka,Sylhet respectively hold rates of 39%, 38%, 37% 22.8%.

Female gender, age, obesity, menarche (under 12 years of age), and radiation therapy to the chest or breasts are the main factors for breast cancer (BC) development. One prevalent major risk factor among women was found to be overweight. In addition, menarche, contact with radiation to the chest or face, and age under 40 years were identified as major risk factors among Bangladeshi women (Noor-E-Alam, 2018).

2.6.3 Prevalence of Breast Cancer In Bangladesh

For breast cancer their general risk factors which are age and sex, socioeconomic condition, residence, food habit, alcohol consumption. Reproductive and hormonal factors include age at menarche, age at menopause, parity, breastfeeding, at the age of childbirth. Anthropometric indicators include family history, height, weight, ionizing radiation, benign breast disease. Family history is also a predominant factor in breast cancer. The tendency to avoid breastfeeding and the changing reproductive system may increase the risk of breast cancer. With the lack of accessibility to a hospital and the cost of diagnosis, many women are unwilling to seek a diagnosis due to their socio-economic status. Improper treatment, poverty, and late diagnosis are also contributing factors. A report published by NICRH indicated that illiterate housewives were highly prone to be affected by breast cancer. Women living in urban areas are different from women in rural areas in their reproductive behavior; they are reluctant to marry, have children, or breastfeed. The use of chemicals in

dermatological products and crop production and bisphenol A in plastic materials is changing the secretion of estrogen, also leading to breast cancer development.

The incidence of breast cancer in developing countries is increasing significantly day by day. It has been estimated that more than 1.67 million people were identified as breast cancer patients, especially premenopausal women. One of the biggest cancer-based hospitals in Bangladesh is the National Institute of Cancer Research and Hospital (NICRH). The hospital conducted a study from 2005–2010 among 5255 breast cancer patients in different age groups, from 15 to 94 years. More than 56% of women were affected at reproductive age, between 15 and 44 years. The incidence is higher due to a lack of awareness, and in most cases, women are affected at a young age. The most common anti-cancer drugs prescribed for breast cancer are carboplatin, 5-fluorouracil, docetaxel, and doxorubicin, according to data obtained from different pharmacies in Dhaka city (Hossain et al., 2020).

2.6.4 Prevalence of Cervical Cancer in Bangladesh

In less-developed countries, the most common gynecological cancer is cervical cancer, which is one of the leading causes of cancer death of women in Bangladesh. More than 50 million women are at risk for cervical cancer, with 17,686 cases diagnosed and 10,362 deaths each year. Factors related to sex and reproduction are directly associated with cervical cancer, such as young age at the time of first sexual intercourse, multiple sexual partners, and unhygienic sex. Human papillomavirus (HPV) was also reported to be responsible for cervical cancer. The prevalence of cervical cancer in Bangladesh has been reported to be 25–30 per 100,000 women. Prevalence of Cervical Cancer A study was conducted at the Delta Medical College and Hospital in Bangladesh among 2264 female cancer patients. A total of 23% of patients (523 out of 2264) were diagnosed with cervical carcinoma. Based on incidence, the majority (39.38%) of cervical cancer patients were in the 41-to-50-year-old age group. In most cases, the diagnosis was squamous cell carcinoma, followed by adenocarcinoma and adenosquamous cell carcinoma; the squamous cell carcinoma was the more predominant type. According to the report, nearly 500 people were affected by squamous cell carcinoma. Figure2.8.3 shows the different types of cervical carcinoma with their percentages. For the treatment of cervical carcinoma,

surgery, radiotherapy, ifosfamide, paclitaxel, and cisplatin are commonly using in Bangladesh (Ansink et al., 2008).

2.6.5 Prevalence of Gastric Cancer in Bangladesh

In less-developed countries, Helicobacter pylori (H. pylori) infection is high due to poor socioeconomic conditions compared to Europe and the United States. H.pylori causes non cardiac gastric carcinoma and low-grade B-cell mucosa-associated lymphoid tissue lymphoma (MALT), but the vast majority is non-cardiac gastric carcinoma.H. pylori infection affects people based on age and sex, as well as salt intake, smoking, education, family income, and drinking water. H. pylori is an important contributing factor in increasing gastric carcinoma and other gastric malignancies in Bangladesh.The H. pylori infection rate in Bangladesh is comparatively high (92%) compared to India, Thailand, and Vietnam, which have been reported to be especially high at 81, 74, and 75%, respectively. From January to December 2007, a study was carried out with 1546 patients, and among them, different carcinomas were detected in 636 patients, with a prevalence of gastric adenocarcinoma in 625 of the 636 patients (Islam et al., 2014).

2.6.6 Prevalence of Prostate Cancer in Bangladesh

According to the report, age as the main cause of prostate cancer applies to the 46-to-70-year-old group. The rate of prostate cancer is higher for smokers than non-smokers in less-developed countries, especially in Bangladesh. While it has been difficult to identify the genetic causes of prostate cancer due to the lack of an accurate database, it is also difficult to obtain family histories due to illiteracy and the lack of proper screening in rural areas. However, it has been identified that family history plays a role in this cancer. Polymorphic changes among two genes CDH1 (-160C/A) and Exo1 (K589E), have been identified as a crucial parameter for the development of prostate carcinoma, as reported in a study of 100 patients. The highest rate of cancer among less-developed countries such as Bangladesh is in the male population 46 to 70 years old, and over the age of 70, it decreases, based on a survey conducted from 2012 to 2015. Benign prostate cancer is more common than malignant prostate cancer. The rate of prostate cancer-related deaths in Bangladesh increased to 1.5%, and the total number of deaths was 773 in 2018. For prostate

cancer detected early, surgery is the most common treatment. Most patients were hospitalized due to urinary tract infection. Common symptoms included blood in the urine, enlarged prostate, frequent urination, and changes in the color of urine. A study conducted in 2012, 2013, and 2015 indicated there were more than 130 patients in different hospitals in Bangladesh, with frequency based on age. Susceptibility to prostate cancer is high at age 46–50; after this age range, the incidence is about 20% from age 51 to 65 (Imtiaz et al., 2019).

2.7. Economic Impact of Cancer in Bangladesh

The economic impact of cancer affects individual households and the public health economy. Two Hospital-based Cancer Registries in Bangladesh showed that 66% of the cancer patients are in the age group 30–65 years, the main workforce structure of a country. A WHO study revealed the annual cost of illnesses in Bangladesh attributable to tobacco usage to be 50.9 billion taka (US$ 500 million considering that only a quarter of the patients with tobacco-related illnesses receive hospital care). On the other hand, the total annual benefit from the tobacco sector is estimated to be 24.8 billion taka (US$ 305 million) as tax revenue on the domestic consumption of tobacco (20.3 billion taka) (US$ 244 million) and wages in tobacco production (4.5 billion taka) (US$ 55 million). The expenditure on tobacco-related illnesses thus outweighs the benefit from revenue and wages. Bangladesh is not able to provide the latest treatment facilities for cancer management and hence government's support is inadequate. Every year Bangladesh is losing a huge amount of foreign currency for this purpose. The overall cancer management could reach the South-East Asian regional level if the government would invest one quarter of this amount for the next 4 years (Hussain and Sullivan, 2013).

2.8. Primary Prevention Activities

Health Promotion: Primary Preventive Measures are being carried out for health promotion through following actions:

(i) Community cancer support group formation at district level, local level and utilization community clinic

(ii) Education on early warning signals, motivation for physical examination

(iii) Propagation of warning signals, breast selfexamination, mouth self-examination

(iv) Involvement of scouts and girl guides in cancer prevention activities
(v) Introduction of lesson on cancer warning signal in secondary and higher secondary school curriculum
(vi) Media personnel training on appropriate publicity for the National Cancer Control Program
(vii) Poster, video, flip chart, radio spot preparation
(viii) Development of cancer prevention training module for facilitators and health professionals
(ix) Development of training module on cytology and palliative care.

Vaccination program: following vaccination programs are going on:

(i) Hepatitis B immunization for preventing liver cancer

(ii) Cervical cancer vaccination program to prevent cervical cancer\

(iii) Scaling up of cervical cancer vaccination program to prevent cervical cancer

(iv) Hepatitis C control for preventing liver cancer.

Tobacco control interventions:

(i) Enforcement of tobacco control legislation
(ii) Enforcement of Tobacco smoking ban at public places, work places, public transport
(iii) Increased tax on tobacco products
(iv) Campaign for tobacco-Free homes
(v) Opinion leaders workshop on tobacco and Cancer program
(vi) Consultative meeting for collaboration with reproductive health, NASP and other related programs
(vii) Doctors against tobacco activities
(viii) Tobacco Cessation clinic-establishment
(ix) Introduction of lesson on the harmful effect of tobacco in the secondary school curriculum.

Alcohol Control Intervention: Prevention of alcohol intake program is going on by increasing Tax Level and Coverage.

Physical activity promotion: To prevent cancer regular physical activity is very important. Thus, physical activity promotion is being carried out by promoting bicycles, footways for walking and public transport.

Preventing occupational cancers:

(i) Including sun protection interventions
(ii) Arsenic-induced cancer.

Nutrition interventions: promoting fruits and vegetables Anti-food adulteration campaign and Law updating are also going on. Formation of Cancer Survivor's Forum is another preventive measure. (Hussain & Sullivan, 2013).

2.9. Cancer Programs

In Bangladesh, there are several organizations that are consistently working to fight against cancer for the optimum well-being of the morbidly ill cancer patients. Some of these programs are as follows:

(i) Breast Cancer Identifying and Treating Project
(ii) Cervical and breast cancer screening program in Bangladesh- A joint venture by the government of Bangladesh and UNFPA.
(iii) International Childhood Cancer Forum
(iv) Every Women Every Child is the motto used to raise awareness of cervical cancer by the Bangladesh Women Chamber of Commerce and Industry
(v) Cancer Support Society (CANSUP) is a Chattogram based non-governmental organization conducting screening for cervical cancer and promoting self-breast examination for screening of breast cancer. Technical assistance is provided by the world health organization.
(vi) Gonoshasthaya Kendra has a plan to establish a cancer hospital for the poor. Government already has acquired a land and Gonoshasthaya Kendra has started to mobilize resources and is requesting the philanthropists and donors to come forward in establishing the cancer hospital for the poor adjacent to Savar campus.
(vii) ASHIC Foundation is Bangladesh's first ever NGO dedicated to childhood

cancer. It helps raise awareness for early detection, improved treatment and social acceptance and has been functional since 1994 (Hussain & Sullivan, 2013).

2.9.1. Cancer Control Strategy in Bangladesh

The burden of non-communicable diseases (NCD) such as diabetes, cardiovascular diseases, chronic obstructive pulmonary disease and cancer are affecting different countries worldwide, however, its trend is growing in developing countries (Boutayeb and Boutayeb, 2005). Although such diseases have been considered as a problem of the affluent, most of this burden is tolerated by low to middle-income countries like Bangladesh (Hussain and Sullivan, 2013). Since risk factors associated with NCDS can be largely modified (WHO, 2010), the government of Bangladesh had made a strategy to disseminate information of the various aspects of NCDs and their risk factors. For this purpose, an important source of data is the NCD risk factor survey in Bangladesh-2010 (WHO, 2010). According to this survey, about 99% of the populations in Bangladesh have at least one risk factor for developing NCDs. Thus, information on key indicators of NCD risk factors have been obtained from this survey so as to create an opportunity for policy makers, program managers and researchers so that innovative interventions can be adopted. In fact, hardly any population in the survey existed without a risk factor. While 98.7% of the survey population has at least one risk factor, 77% had two or more risk factors and around 28.3% had three or more risk factors with women having more risk factors than men (Hussain and Sullivan, 2013). The cancer control strategy is the first step in the development and implementation of a comprehensive cancer control program in Bangladesh. This strategy has been designed to be consistent with the needs and expectations of the people of Bangladesh, and to enable the achievable goals of improving health and development.

CHAPTER III: Materials and Methods

3.1 Study design

The study was a descriptive type of cross-sectional study that was conducted using primary data from patients attending the oncology outpatient departments of the above-mentioned hospitals. A semi-structured questionnaire was used to collect data. The questionnaire was prepared in English and was then translated in to Bangla during the interview (Annex 1).

3.2 Place of data collection

The district of Chattogram is an administrative region of the Chattogram Division that is located in southeastern Bangladesh. Being a large port city and is considered as the commercial capital of Bangladesh. The geographical diversity of Chattogram is very different from other districts in the country owing to its mountains, valleys, seas and forests. The district is bounded in the north by Feni district as well as the Indian state of Tripura, in the south by Cox's Bazar district, on the east by Bandarban, Rangamati and Khagrachhari districts; and on the west by Noakhali district and the Bay of Bengal.

Figure 3.1: Map of Chattogram

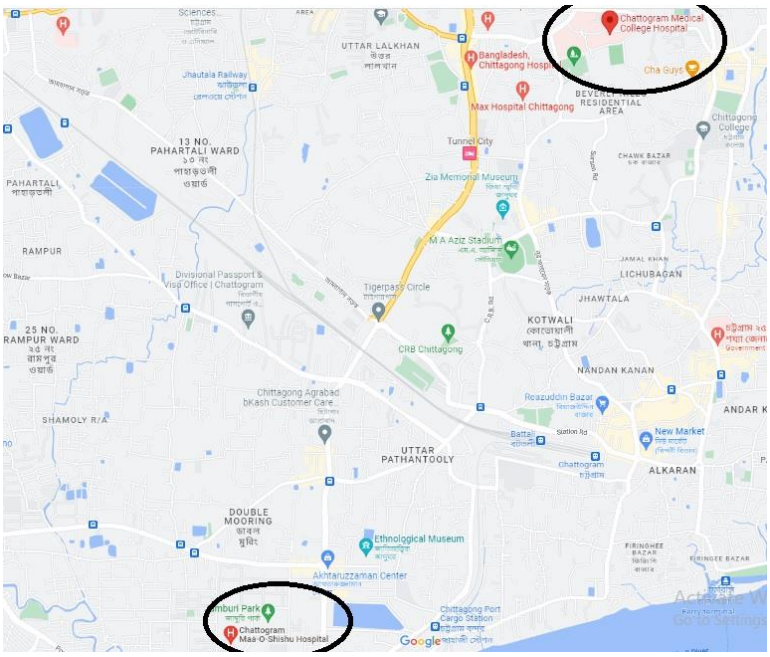

Fig: Chattogram Medical College Hospital(left) and Chattogram Maa-O-Shishu Hospital(right)

Data collected from two well-known tertiary care hospitals in the city were used for this study. These were Chattogram Medical College Hospital (CMCH) in Panchlaish and Chattogram Maa Shishu O General Hospital (CMSOGH) in Agrabad area.

Chittagong Medical College Hospital (CMCH) is the oldest medical college in the south-eastern part of the country. It is affiliated with a tertiary level hospital where

clinical students are trained in medicine, surgery, obstetrics and gynaecology and other sub-specialties. It has a busy oncology department with facilities for both chemotherapy and radiotherapy. An average of 38 patients visits the outpatient department of this hospital every day. Recent data reports the top five malignancies among Out Patient Department Patients (OPD) in the hospital to be cancers of the lungs, head and neck, esophagus, colorectal and stomach in male patients. Among females, the top five common cancers were breast cancers, cervical cancer, cancer of head and neck, esophageal cancer and lung cancer.

Chattogram Maa Shishu O General Hospital (CMSOGH) was initially established as a 150 bedded hospital. With time it evolved and currently is a 650-bedded hospital and currently the average attendance of out-patients in the hospital overall is around 1500-1600 daily. Specialties include Paediatrics and allied, obstetrics and gynecology, Medicine & it's sub-specialists, and surgery. Medical oncology and radiology are also among the subspecialities. A total of 1,536 patients had attended the OPD in the year 2021. The top five common cancers reported in the OPD that year in CMSOGH were breast cancer, lung cancer, colon cancer, stomach cancer, breast cancer and cervical cancer.

3.3 Study period

Data was collected for this study over a period of two months from September 2022 to end of October 2022. Patients were approached at two different hospitals at the oncology Outpatient Department (OPD) and were asked to participate. Only patients who gave consent for the study were included.

3.4 Sample size calculation

Sample size was determined according to (Thrusfield & Brown, 2017), using the estimated prevalence of cancer. According to data from GLOBOCAN (2020) the number of new cases in 2020 was 1,56,775 and the number of previous cases was 2,70,866. So, the total number of patients with cancer in 2020 was 4,27,641. Total population at that time was 16,46,89,383. Hence p is (total no. of new and old cases/ population at risk)

The following formula was used.

$n= z^2pq/d^2$

where:

n = required sample size;

z=2.576 at 99% confidence level

p = prevalence

Here,

p= 0.0026

q= 1-p= 0.9974

d = 0.01

Substituting these values in the formula:

$$n = \frac{(1.96)^2 \text{x } 0.0026\ (1-0.0026)}{(0.01)^2} = 172$$

To avoid bias and other unwanted errors, 180 patients was included in this study.

3.5 Selection of study population

3.5.1 Inclusion criteria

In this section of the study, people aged 10 years and above have been shown. We included both genders to maintain the criteria. All of the people were Bangladeshi by nationality. On the basis of histopathological report, those who have been found to have confirmed diagnosis were added to the inclusion criteria.

3.5.2 Exclusion criteria

Here patients who are severely ill, patients with provisional diagnosis but no evidence of confirmation, mentally retarded individuals and those with unconfirmed diagnosis were added to the exclusion criteria.

3.6 Variables used

Some of the variables used are age, gender, occupation, educational status, location, marital history, socioeconomic status, family history diagnosis, lifestyle history (tobacco and food history), drug history, environmental exposure (arsenic, sunlight, mud stove, chemicals, pesticides, etc)

3.7 Procedure of data collection

All patients who attended the outpatient departments of the respective hospitals and met the inclusion criteria were approached for the study. Patients who gave their consents were then evaluated. Necessary exclusions were made based on the evaluation. The remaining patients were interviewed using pre-tested semi-structured questionnaire.

3.8 Ethical measures

Prior to conducting this study, the protocol was presented to the ethical review committee and permission was obtained from the ethical review board of Chattogram Maa O Shishu Hospital Medical College. A copy is attached in Annex 2. Following this, permission was obtained from both Chattogram Maa O Shishu Hospital Medical College and Chattogram Medical College Hospital to conduct the study at Oncology OPD. All patients were asked for their consent verbally. Only patients who gave consent were included in this study. The names of the individuals were kept confidential and each case was identified with a case identification number. All compiled data was kept in a cupboard under lock and key. No incentives were given to any patient for participation in the study. The patients were informed that they could withdraw from the study anytime they wanted. They were also informed that their treatment would not be hampered if they refused to participate or wanted to withdraw from the study.

3.9 Data analysis

The collected data was initially compiled on to a Microsoft excel spreadsheet. The data was then analyzed using STATA/IC 1 (StataCorp 4905, Lakeway Drive, College Station, Texas 77845, USA). Student's t-test was used to analyze quantitative data while chi-squared test was used to analyze qualitative data. A p value of <0.05 was considered to be significant.

3.10 Study plan

Following the objectives of the study, a specific study plan was formulated for conducting the study. The overall study plan is shown below:

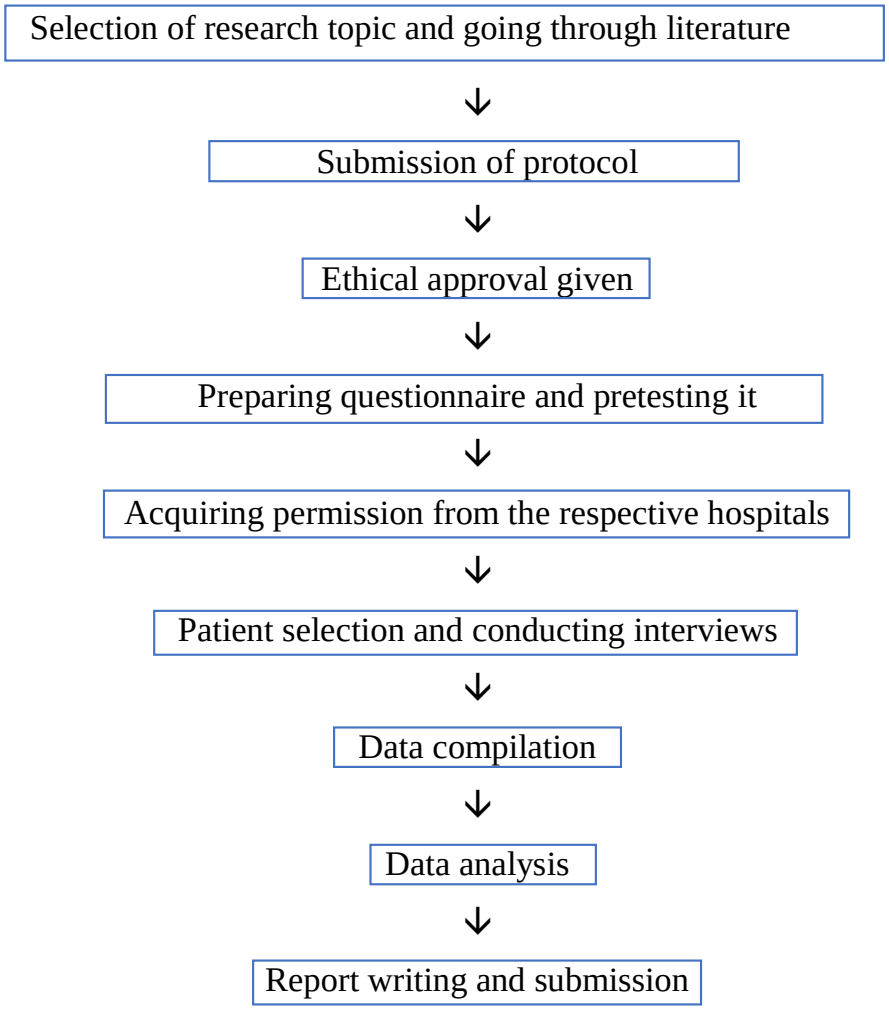

Fig: Study Plan

CHAPTER IV: Result

The main objective of the study was to explore the prevalence and demographic and other behavioral risk factors of cancers in the Chattogram Division. The data was collected from the largest two tertiary healthcare facilities from Chattogram that are equipped with cancer related treatment modalities. A total number of 200 data was collected from Chattogram Medical College and Hospital (CMCH) and Chattogram Maa O Shishu Hospital (CMOSH) within the sample collection time frame.

Table 4.1: Distribution of study participants according to study area (n=200)

Area	Frequency	Percentage (%)	Confidence Interval (CI)
Chittagong Medical College Hospital (CMCH)	115	57.50	50.33-64.44
Chittagong Maa O Shishu Hospital (CMOSH)	85	42.50	35.55-49.66

Table 4.1 depicts the variety of study participants according to their study site. The majority of patients—57.50%—were from CMC, while the remaining 42.50% were from the CMOSH.

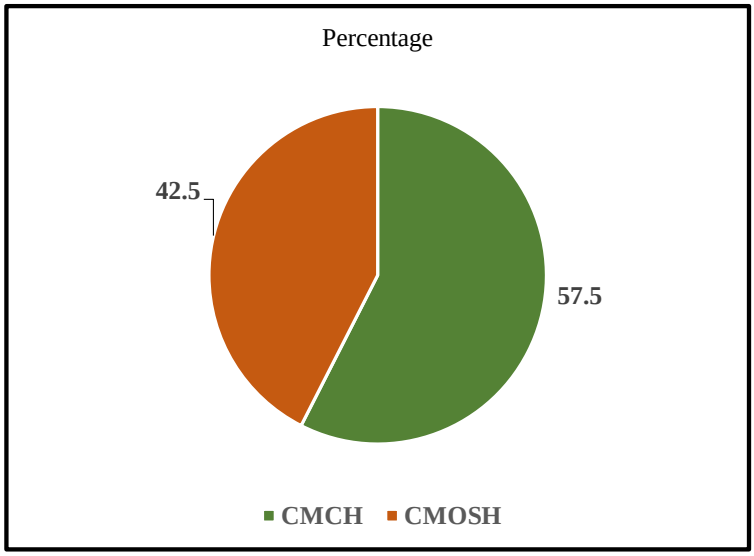

Fig 4.1: Pie-chart showing the percentage distribution of population from different hospitals

Table 4.2: Distribution of prevalence of different types of cancer in the study area (n=200)

Type	Frequency	Percentage (%)	Confidence Interval (CI)
Breast cancer	39	19.5	14.25-25.68
Lung cancer	30	15	10.35-20.71
Cervical cancer	15	7.5	4.25-12.06
Oral Cavity Cancer	18	9	5.42-13.85
Cancer Larynx	13	6.5	3.50-10.85
Rectal Cancer	11	5.5	2.77-9.63
Cancer ovary	10	5	2.42-9.003
Stomach cancer	8	4	1.74-7.72
Oesophageal cancer	8	4	1.74-7.72
Cancer pyriform fossa	6	3	1.11-6.41
Blood cancer	7	3.5	1.41-7.07
Colon cancer	6	3	1.10-6.41
Cancer prostate	4	2	0.54-5.04
Liver cancer	6	3	1.11-6.41
Muscle, soft tissue	4	2	0.54-5.04
Cancer Unknown primary	3	1.5	0.31-4.32
Intraabdominal Cancer	2	1	0.12-3.56
Gall bladder Cancer	2	1	0.12-3.56
Immature teratoma	2	1	0.12-3.56
Eye Cancer	1	0.5	0.01-2.75
Brain Cancer	1	0.5	0.01-2.75
Papillary urothelial Cancer	1	0.5	0.01-2.75
Endometrial Cancer	1	0.5	0.01-2.75
Anal Cancer	1	0.5	0.01-2.75
Sarcoma of left sole	1	0.5	0.01-2.75

Table 4.2 shows distribution of different type of cancers in two study areas. In the study, most of the population had breast cancer consisting of 19%. Moreover, 17.5% and 7.5% had lung cancer and cervical cancer respectively. Two category types of people consisting of 6.5% each had been diagnosed with head, neck cancer and Cancer larynx. 6% was diagnosed with Rectal Cancer, 4% had ovarian cancer. People diagnosed with stomach cancer, oesophagus cancer, blood cancer shared a percentage distribution of 3.5% each. 3% have been diagnosed with colon cancer and 2.5% with prostate cancer. People with liver Cancer, muscle soft tissue cancer, cancer of unknown primary origin had a percent distribution of 2% each. 1.5% were diagnosed with intraabdominal cancer. And people with gall bladder cancer, cancer of tonsil, immature teratoma occupied a percent distribution of 1% each. Lastly, people with eye cancer, brain cancer, papillary urothelial cancer, endometrial cancer, anal canal cancer, sarcoma of left sole had been diagnosed with a percentage of 0.5% in each category of cancer.

Table 4.3: Distribution of prevalence of cancer in patients of Chattogram Division (n=200)

Division	Frequency	Percentage (%)	Confidence Interval (CI)
Chattogram	137	68.50	61.57-74.87
Cox's Bazar	33	16.50	11.64-22.38
Comilla	8	4	1.74-7.73
Feni	8	4	1.74-7.73
Noakhali	7	3.5	1.42-7.08
Rangamati	5	2.5	0.82-5.74
Bandarban	1	0.5	0.01-2.75
Khagrachori	1	0.5	0.01-2.75

Table 4.3 shows the prevalence of different types of cancer in Chattogram Division. In the study,Chattogram district itself had the highest percentage of cancer patients which was 68.50% and the second highest was Cox's Bazar district (16.50%). Lowest

frequencies among the divisions were the Bandarban and Khagrachori districts consisting of 0.5% each.

Table 4.4: Distribution of different types of cancer in different upazillas of Chattogram District (n=137)

Subdivision	Frequency	Percentage (%)	Confidence Interval (CI)
Chattogram Metro	63	45.98	37.44-54.70
Mirsharai	6	4.38	1.62-9.28
Sitakunda	11	8.03	4.08-13.91
Hatazari	8	5.84	2.55-11.18
Raozan	3	2.19	0.45-6.27
Rangunia	7	5.11	2.08-10.24
Fatikchari	1	0.73	0.01-3.99
Boalkhali	5	3.65	1.19-8.31
Patiya	7	5.11	2.08-10.24
Anowara	4	2.92	0.80-7.31
Chandanaish	7	5.11	2.08-10.24
Bashkhali	8	5.84	2.55-11.18
Shatkania	3	2.19	0.45-6.27
Lohagara	3	2.19	0.45-6.27
Sandwip	1	0.73	0.01-3.99

Table 4.4 displays the prevalence of various cancer types within the metropolitan area and upazilla's of Chattogram district. With Chattogram metropolitan area shared the highest percentage of cancer patients at 45.98%, Sitakunda ranked second in terms of the number of cancer patients. Both Sandwip and Fatikchari ranked as having the lowest percentage (0.73%) of cancer patients.

Table: 4.5 Distribution of cancer patients from CMCH and CMOSH according to their diagnosis

Cancer Types	CMCH n (%)	CMOSH n (%)
Head, neck and oral cavity cancer	20 (17.39)	4 (4.71)
Breast Cancer	20 (17.39)	19 (22.35)
Lung Cancer	13 (11.30)	17 (20.00)
Cervical Cancer	12 (10.43)	3 (3.53)
Larynx Cancer	11 (9.57)	2 (2.35)
Rectal Cancer	6 (5.22)	5 (5.89)
Ovary Cancer	6 (5.22)	4 (4.71)
Esophageal Cancer	5 (4.35)	3 (3.53)
Stomach Cancer	4 (3.48)	5 (5.89)
Hepatic Cancer	2 (1.74)	4 (4.71)
Colon Cancer	2 (1.74)	4 (4.71)
Immature teratoma	2 (1.74)	0 (0.0)
Soft tissue muscle Cancer	2 (1.74)	0 (0.0)
Synovial sarcoma	1 (0.87)	0 (0.0)
Papillary urothelial Cancer	1 (0.87)	0 (0.0)
Ocular retinoblastoma	1 (0.87)	0 (0.0)
Prostate Cancer	1 (0.87)	3 (3.53)
Gall bladder Cancer	1 (0.87)	1 (1.18)
Blood Cancer	1 (0.87)	6 (7.06)
Endometrium Cancer	1 (0.87)	0 (0.0)
Duodenal Cancer	1 (0.87)	0 (0.0)
Cancer Astrocytoma	1 (0.87)	0 (0.0)
Anal Cancer	1 (0.87)	0 (0.0)
Sarcoma	0 (0.00)	2 (2.35)
Carcinoma of unknown origin	0 (0.00)	3 (3.53)
Total	115 (100)	85 (100)

Table 4.5 reveals the frequency of specific cancers among the 200 study respondents based on their study site (CMCH & CMOSH). Study revealed that the highest number of cancer patients in CMC was related to breast cancer (17.39%) and head, neck cancer (17.39%). There were 13 lung cancer, 12 cervical cancer and 11 laryngeal cancer patients. Other types of cancer cases were few in number.

Moreover, from CMOSH, the study revealed that the highest numbers of cancer patients were related to breast cancer with 19 people (22.35%) affected. The second highest number of cases came from the people affected by lung cancer with 20 people

(20%). The total number of CMOSH cancer patients during the study period was found to be 85. Other types of cancer cases were few in number.

Table 4.6: Distribution of different type of cancer patient according to demography Variation (n=200)

Traits	Category	Frequency	Confidence Interval (CI)
Sex	Male	88 (44)	37.00-51.17
	Female	112 (56)	48.82-62.99
Age (In years)	10-40	55 (27.5)	21.43-34.24
	41-60	88 (44)	37.00-51.17
	61-Above	57 (28.5)	22.35-35.29
Education	Uneducated	81 (41.5)	33.63-47.65
	Can read and write	90 (45)	37.97-52.17
	Educated	29 (14.5)	9.93-20.15
Occupation	Employed	101 (50.5)	43.35-57.62
	Unemployed	99 (49.5)	42.37-56.64
Marital status	Single	12 (6)	3.13-10.24
	Married	184 (92)	87.33-95.35
	Widowed	3 (1.5)	0.31-4.32
	Divorced	1 (0.5)	0.01-2.75
Socioeconomic status	Lower Class	107 (53.5)	46.32-60.56
	Middle Class	83 (41.5)	34.59-48.66
	Upper Class	10 (5)	2.42-9.00
Family History of Cancer	Yes	27 (13.5)	9.08-19.03
	No	173 (86.5)	80.96-90.91
Demographic area	Urban	69 (34.5)	27.93-41.53
	Rural	131 (65.5)	58.46-72.06

N.B: *Lower class indicates people of income below 10 thousand per month.*
Middle class indicates people of income of around 10-50 thousand per month.
Upper class indicates people of income of around 50 thousand per month.

Table 4.6 shows the socio-demographic distribution of the respondents based on gender, age, education, occupation, marital status, family history and demographic area. As the table shows, the highest number of participants was female which was 56% and the rest 44% was male. The age group of 40-60 had the highest percentage of cancer cases which was 44%. Age groups of 10-40 and 61 and above had almost similar percentages of 27.5% and 28.5% respectively. However, age group of above 40 to below 60 years of age was most frequent among the study participants with a percentage of 44%. On the basis of educational status, 45% of people could read and write, 41.5% were uneducated and the remaining 14% were educated. With respect to occupation, 50.5% were employed and 49.5% were unemployed. A majority of 92% were married with 53.50% and the rest of them being single, widowed or divorced. 53.50% were from lower class families and the remaining 41.50% and 5% came from middle and upper class respectively. Most of the respondents (84.5%) had no family history of cancer and only 13.5% with different types of cancer. Surprisingly from the study, the rural population had the majority of cancer cases standing at 65.5% and the rest were from urban areas.

Table 4.7: Distribution of cancer types amongst male and female population. (n=200)

Types of Cancer	Female Frequency (%)	Male Frequency (%)
Breast Cancer	38 (33.93)	1 (1.14)
Lung Cancer	3 (2.68)	26 (29.55)
Larynx Cancer	4 (3.57)	17 (19.32)
Cervical Cancer	15 (13.39)	0 (0.00)
Oral Cavity Cancer	5 (4.46)	9 (10.23)
Ovary Cancer	10 (8.93)	0 (0.00)
Rectal Cancer	6 (5.36)	4 (4.55)
Colon Cancer	7 (6.25)	2 (2.27)
Hepatic Cancer	2 (1.79)	6 (6.82)
Oesophageal Cancer	1 (0.89)	6 (6.82)
Stomach Cancer	5 (4.46)	2 (2.27)
Blood Cancer	3 (2.68)	2 (2.27)
Sarcoma	2 (1.79)	2 (2.27)
Cancer Unknown Primary	2 (1.79)	2 (2.27)
Lymphoma	1 (0.89)	2 (2.27)
Gallbladder Cancer	2 (1.79)	0 (0.00)
Prostate Cancer	0 (0.00)	2 (2.27)
Teratoma	2 (1.79)	0 (0.00)
Astrocytoma	0 (0.00)	1 (1.14)
Anal Cancer	0 (0.00)	1 (1.14)
Bladder Cancer	0 (0.00)	1 (1.14)
Face Cancer	1 (0.89)	0 (0.00)
Endometrial Cancer	1 (0.89)	0 (0.00)
Prostate Cancer	0 (0.00)	1 (1.14)
Rectum Cancer	1 (0.89)	0 (0.00)
Retinoblastoma	1 (0.89)	0 (0.00)
Rhabdomyosarcoma	0 (0.00)	1 (1.14)
Total	112 (100)	88 (100)

Table 4.7 depicts the distribution of cancer types based on their gender (Female and Male). From our study, Lung cancer was the most common (29.55%) cancer of male population followed by Laryngeal carcinoma (19.32%), Head-neck and oral cavity (10.23%), Oesophageal carcinoma (6.8%) and Hepatocellular carcinoma (6.8%).

On the contrary, in case of female, Breast cancer was the most common cancer. (33.93%) Breast cancer was followed by cervical carcinoma (13.39%), ovarian carcinoma (8.93%), colon cancer (6.25%) and rectal carcinoma (5.63%)

From this table above it is evident that female respondents have a high frequency of breast (33.93%), cervix (13.39%) and ovarian cancer (8.93%), where male are mostly affected with lungs (29.55%), larynx (19.32%) and oral cavity, head-neck cancer (10.23%). This can possibly stem from high frequency of smoking among male population.

4.8 Different types of occupational status in cancer patients

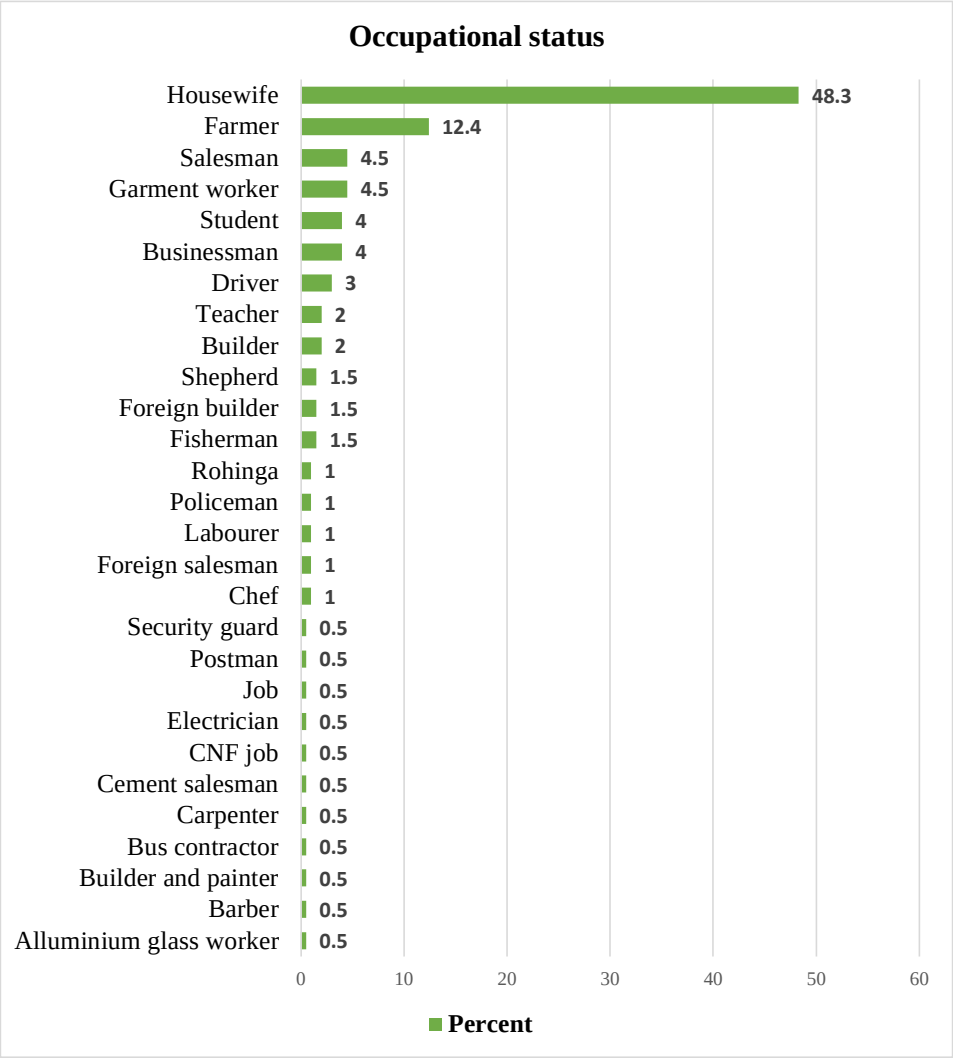

Fig 4.2: Distribution of different types of occupation of the study population

The bar chart above shows the number of cancer patients with respect to their occupation. Here, a surprising number of cancer patients were seen to be housewives with a majority of 97 people (4.8). Farmers had the second highest number of cases with 25 people.

4.9 Food Habits of Cancer Patients

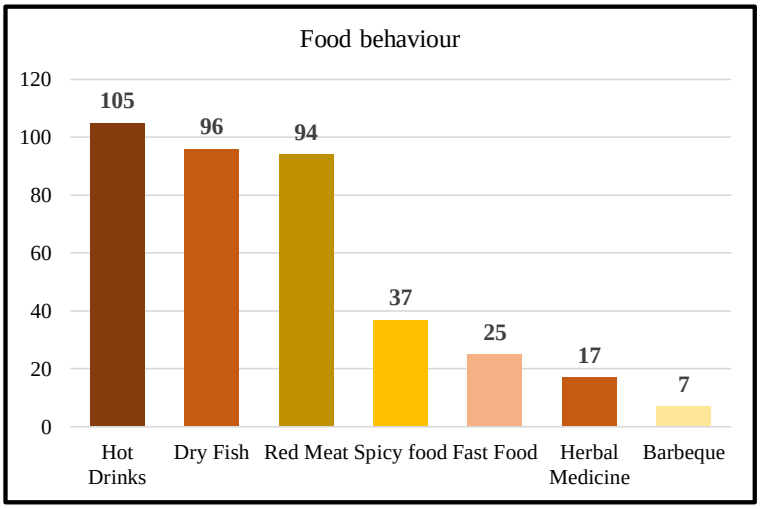

Fig 4.3: Distribution of food Habit of Study Population.

The various food behaviors of the study population are depicted in Fig. 4.3. In the study, 105 people (52.50%) primarily had taken hot beverages like tea. 96 (48%) of individuals ate dry fish, 94 (47%) ate red meat, 37 (18.50%) ate spicy food, 25 (12.50%) ate fast food, 17 (8.5%) used herbal remedies, and 7 (3.5%) ate barbecue-style food.

4.10 Personal habits of cancer patients

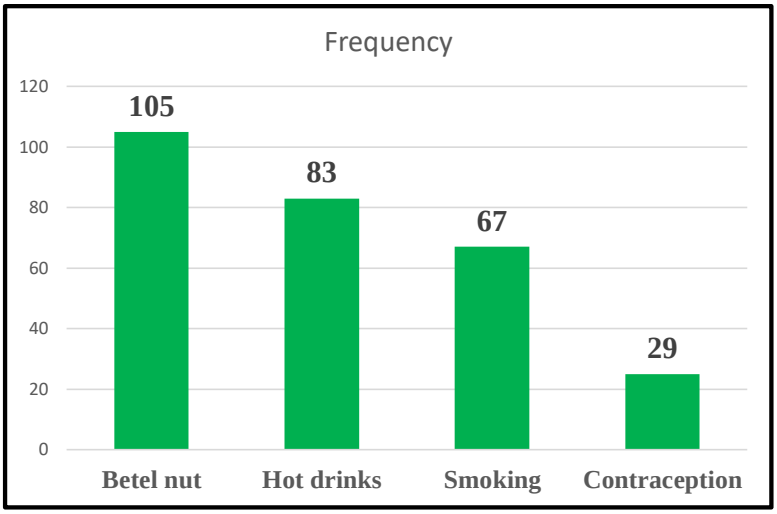

Fig 4.4: Distribution of Personal history in study population

Figure 4.4 portrays the variety of personal habits among the study participants including smoking, chewing betel nuts, drinking hot beverages—likely milk tea—and using injections or tablets for birth control are depicted on this picture. Here, 52.5% of patients were found chewing betel nuts, compared to 41.5% who used to drink tea, 33.5% who smoke, and 14.5% who used oral contraceptives or injections, all of which have been linked to an increased risk of cancer.

Table 4.8 Correlation between outdoor pollution and lung, hepatocellular carcinoma, laryngeal cancer, head neck and oral cavity cancer and other

Outdoor Pollution Status	Type of Cancers									
	Lung Cancer		Hepatocellular Cancer		Laryngeal cancer		Head, neck Cancer		Others Cancer	
	n (%)		n (%)		n (%)		n (%)		n (%)	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Exposed (n=19)	6 (31.58)	13 (68.42)	3 (15.79)	16 (84.21)	2 (10.53)	17 (89.47)	2 (10.53)	17 (89.47)	6 (31.58)	13 (68.42)
Unexposed (n=181)	24 (13.26)	157 (86.74)	3 (1.66)	178 (98.34)	11 (6.08)	170 (93.92)	16 (8.84)	165 (91.16)	127 (70.17)	54 (29.83)
p-value**	**0.03**		**0.00**		**0.45**		**0.80**		**0.00**	

Table 4.8 presents the relation between outdoor pollution and specific types of cancer prevalent among the exposed to outdoor pollution participants (Lung cancer, hepatocellular cancer, laryngeal cancer, head neck cancer). It is evident from the table that lung cancer and hepatocellular cancer were prevalent in people exposed to outdoor pollution with a percentage of 68.42% and 15.79% respectively. Moreover, the prevalence of lung cancer and hepatocellular cancer were less prevalent in population unexposed to outdoor pollution with a percentage of 13.26% and 1.66% respectively. Pearson chi square test for independence detected significant correlation between lung cancer and hepatocellular cancer and outdoor pollution. ($p<0.05$)

Table 4.9: Correlation between contraceptive usage and breast, cervical, ovarian and other cancers.

Contraception status	Types of Cancer							
	Breast Cancer (n=38)		Cervical Cancer (n=15)		Ovarian Cancer (n=8)		Other Cancer (n=139)	
	n (%)		n (%)		n (%)		n (%)	
	Yes	No	Yes	No	Yes	No	Yes	No
Contraceptive user (n=29)	19 (65.52)	10 (34.48)	6 (20.67)	23 (79.31)	3 (10.34)	26 (89.66)	1 (3.45)	28 (96.55)
Contraceptive non-user (n=171)	19 (11.11)	152 (88.89)	9 (5.27)	162 (94.74)	5 (2.92)	166 (97.08)	138 (80.71)	33 (19.29)
p-value**	**0.00**		**0.00**		**0.06**		**0.53**	

*n=frequency, %=percentage

** p-value obtained from Pearson Chi square test for independence.

Table 4.9 above presents the correlation between specific types of cancer and history of contraceptive usage. Amongst the 29 patients who had taken contraceptives orally or through injection, 19 of them have been affected by breast cancer, 6 people out of 15 by cervical cancer, 3 people out of 8 by ovarian cancer.

Breast cancer is most prevalent type of cancer among the contraceptive users. 19 out of 38 (65.52%) contraceptive users have reported Breast Cancer. The prevalence of breast cancer is lower in non-contraceptive users (11.11%) than contraceptive users (65.52%). Pearson Chi square test for independence revealed significant association between Breast cancer and contraception ($p<0.0001$)

Chi-square test for independence also indicated that there is significant association between contraceptive usage cervical and ovarian cancer. ($P<0.05$) Breast cancer, cervical cancer and ovarian cancer prevalence is higher in contraceptive using population.

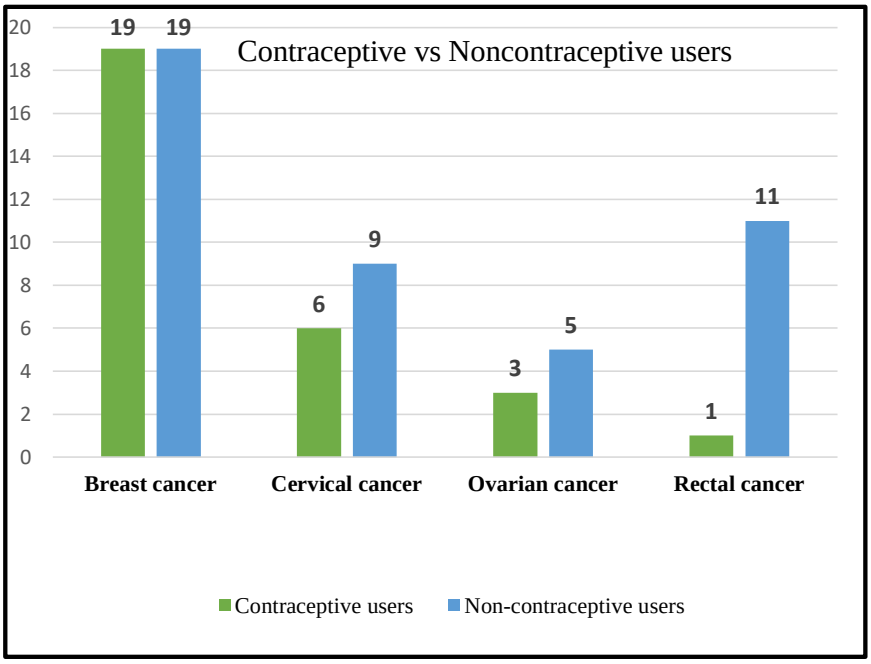

Fig :4.5 Correlation between contraceptive usage and breast, cervical, ovarian and rectal cancer.

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Table: 4.10 Prevalence of Lung, Larynx, Head-Neck and Oesophageal Cancer Among Smokers and Non-Smokers.

Smoking status	Type of Cancers									
	Lung Cancer (n=30)		Larynx Cancer (n=13)		Head, neck Cancer (n=18)		Oesophagus Cancer (n=8)		Others Cancer (n=131)	
	n (%)		n (%)		n (%)		n (%)		n (%)	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Smoker (n=67)	24 (35.82)	43 (64.18)	10 (14.92)	57 (85.08)	13 (19.40)	54 (80.60)	6 (8.95)	61 (91.05)	14 (20.89)	53 (79.11)
Non-smoker (n=133)	6 (4.51)	127 (95.49)	3 (2.26)	130 (97.74)	5 (3.76)	128 (96.24)	2 (1.50)	131 (98.50)	117 (87.97)	16 (18.03)
p-value**	**0.00**		**0.00**		**0.00**		**0.01**		**0.00**	

*n=frequency, %=percentage

** p-value obtained from Pearson Chi square test for independence

Table 4.10 presents the correlation between smoking habit and different types of cancers (Lung cancer, Laryngeal cancer, Head, neck cancer, Oesophageal cancer and other cancers). Among 67 smokers, 24 patients developed Lung cancer with a prevalence of 35.82% where only 4.51% of the nonsmokers developed lung cancer. On pearson chi square test for independence have pointed a significant correlation between smoking habit and lung cancer status ($p<0.001$). Similarly, smokers are at significant risk of developing laryngeal cancer with prevalence of 14.92% in smokers and 2.26% in nonsmokers. Moreover, Head neck cancer are prone to develop more in smoker patients comparing a prevalence of 19.40% in smoker and 3.76% in nonsmoker. However, Oesophageal cancer and other cancers didn't have any significant relation with smoking habit.

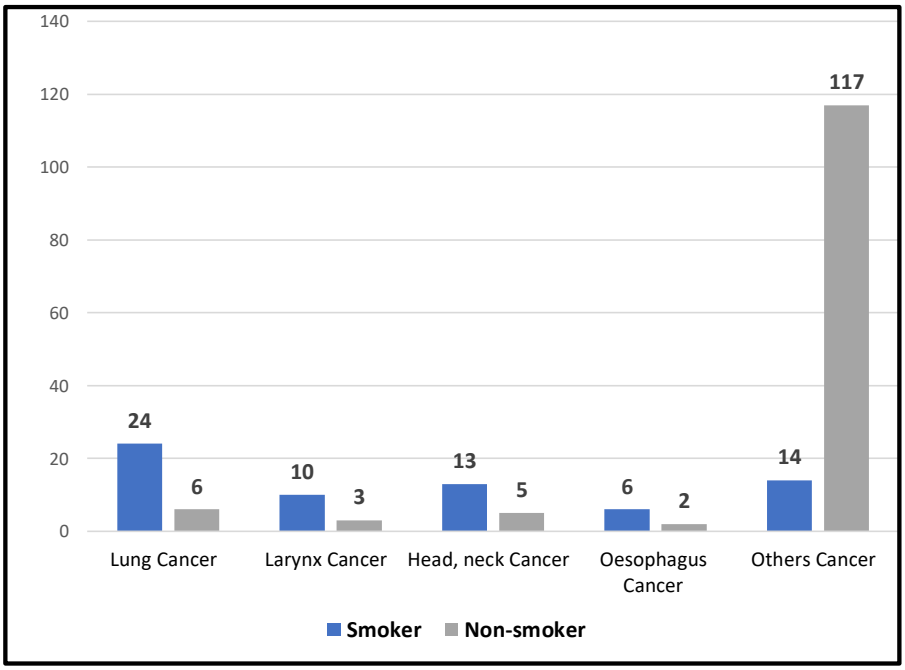

Figure 4.6: Prevalence of Lung, Larynx, Head-Neck and Oesophageal Cancer Among Smokers and Non-Smokers.

Table 4.11 : Top risk factors of cancer in the study sample. (n=200)

Risk factors	Frequency	Percentage
Dry Fish	96	48.00%
Smoking	67	33.50%
Contraception	29	14.50%
Fried Food (fast food)	25	12.50%
Exposure to chemical and Pesticides	21	10.50%
Spice Food	20	10.00%
Outdoor Pollution	19	9.50%
Herbal Medicines	17	8.50%
Red Meat	6	3.00%
Exposure to Smoke from Mud Stove	5	2.50%

Table 4.11 presents the prevalence of each of the top risk factors for cancer among residents of Chattogram. Intake of dry fish was the most common risk factor making up 48% of the entire study population. This was followed by smokers (33.5%), Users of contraception (14.5%), consumers of fried foods (12.5%), exposure to chemicals and pesticides (10.5%), intake of spicy foods (10.0%), exposure to outdoor pollution (9.5%) and intake of herbal medicine (8.5%). Rare causes were intake of red meat (3%) and exposure to smoke from mud stove (2.5%).

CHAPTER-V: Discussion

Frequency of different types of cancer occurring in Bangladeshi population is not similar with that of other population groups worldwide. Ethnicity, genetic predisposition, life style, socio-economic condition, environmental pollution and many other risk factors interplay for the different distribution which is also evident in a number of other study findings. This comprehensive study from Chattogram, Bangladesh describes the distribution of cancer cases observed in this region. It reveals significant epidemiological data for the conduct of clinical practices and scientific activities in cancer control planning.

5.1 Socio-demographic distribution of the respondents:

5.1.1 Age

The study revealed that maximum frequency (44%) observed in 41 to 60 years' age group. In a study on distribution of cancer patients in National Institute of Cancer Research of Bangladesh, 3.9% patients were of pediatric age group (0-15yrs) and 19.1% in older age group that is majority lied within the middle age group. (Talukder et al., 2008) Bangladesh Cancer Registry Report showed that maximum number of the cancer patients were in age group between 30-65 years, which is around 66%. (NICRH, 2007). According to Majhi et. al, 2018, the most affected age groups were 41-50 with 29.86% followed by 51- 60 with 27.98%. They reported the prevalence to be higher in the middle age groups. A female preponderance of cases most of them being either cervical or breast cancer which are usually diagnosed in the pre- or post-menopausal phases account for the higher prevalence rates in the middle age group.

5.1.2 Gender

In the present study, the proportion of female (56%) patients were more than male (44%). In another study done in Bangladesh, number of female patients was much higher than males, notably due to large numbers of cervical and breast carcinoma patients. Similar Bangladeshi studies have shown male: female ratio of 1.4-1.8:1.

(Talukder et al., 2008; Fokhrul et al., 2012)However, in a study on cancer patients in Madhya Pradesh and Uttar Pradesh of India, relative percent prevalence of all type of carcinomas in both states was considerably high in females. (Ganjewala, 2009). Several other studies from India have depicted greater female prevalence. (Majhi et al., 2018) In West Bengal the cancer prevalence rates were alarmingly higher in females as compared to males and trend analysis of cancer incidence data for the period showed that the overall rates of cancer are increasing with greater increase among females. (Chatterjee and Mukherjee, 2012)

5.2 Prevalence of cancer:

In our study, breast cancer remains the commonest (19.5%), followed by Lung cancer (15%), cervical cancer (7.5%) and head and neck cancer (9%). Study reveals that the highest number of cancer patients in CMC was related to breast cancer and head, neck cancer. It was seen that the number of lung cancer, cervix cancer and larynx cancer come as the second third and fourth highest respectively. It is predicted that in Bangladesh and other low- and middle-income countries, lung and breast cancers remain among the most common diagnoses and types of cancer-related deaths. Cancers of the cervix, stomach and liver are also among the leading types. (Hussain and Sullivan, 2013)

5.2.1 Breast Cancer:

According to world cancer report 2020, In 2020, there were 2.3 million women diagnosed with breast cancer and 685 000 deaths globally. As of the end of 2020, there were 7.8 million women alive who were diagnosed with breast cancer in the past 5 years, making it the world's most prevalent cancer. (CP et al., 2020) This is in line with the previous studies done in India where Carcinoma Breast with 23.51% prevalence was the most common cancer followed by uterine cervical cancer with 25.34% , followed by Head & Neck with 14.59%, followed by carcinoma stomach with 6.60%. (Majhi et al., 2018). Other studies showed that in the eastern Indian population the cancer of the breast and cervix forms a largest group. (Chatterjee and Mukherjee, 2011). This high frequency of breast cancer can be explained by the low level of knowledge, awareness and practice of Breast Cancer awareness and access to facilities. (Hossain et al., 2014) Since breast cancer is one of the cancers that can be

treated if detected early, the non-declining incidence of breast cancer in this study suggests that people are becoming more aware of getting diagnosed, that there are more cancer patients in the nation, and that there are insufficient or ineffective control measures to reduce its morbidity because the healthcare system. (Abate et al., 2018)

5.2.2 Lung Cancer:

In this study around one third proportion (29.55%) of all male cases were diagnosed as lung cancer and it was 2.68 percent in females. It ranked as a leading cancer site in males and third position in females. It was observed that males developed tobacco related cancers and females developed breast and cervical cancer in higher proportion in those age groups. (Hussain, 2013) Worldwide, lung cancer also remained as the most frequent cancer site which comprises more than 1.8 million new cases and almost 1.6 million deaths, as estimated in 2012.(Stewart and Wild, 2014) In India, it accounts for 3.9% of global new cases and 4% of estimated global death.(Stewart and Wild, 2014). The raise of Lung cancer can be explained by the increase in rates of adenocarcinoma related to changes in cigarette components and delivery systems and environmental factors, particularly in Asia. (McIntyre and Ganti, 2017; Cheng et al., 2016)According to our study, the second most common organ cancer among males was larynx (19.32%). Globally laryngeal cancer is the fourteenth most common cancer among men, but it is relatively rare in women. (Stewart and Wild, 2014)

5.2.3 Cancer of Head, Neck and Oral Cavity:

Head, Neck and Oral Cavity cancer is the third most common cancer (9%) reported in our study. However, in some part of India, this cancer is staggeringly prevalent, with a prevalence rate of 30-40%. (Bhattacharjee, et al., 2006). Oropharynx and oral cavity mostly constitute the major burden of total cancer. Tobacco use and alcohol consumption are the main risk factors associated with head and neck carcinoma development due to their cytotoxic and mutagenic effects (Pezzuto et al., 2015; Dhull et al., 2018).

5.2.4 Cervical and Ovarian Cancer:

Cervical and Ovarian cancer is the fourth (7.5%) and seventh (5%) commonest cancer in our study respectively. In female, these two are the second (13.39%) and third

(8.93%) most common cancer. In line with our findings, cervical cancer is the 4th most common cancer among women globally. (Vu et al., 2018). Already government and stakeholders have taken initiatives to tackle this condition. Among the actions,

5.3 Cancer and associated risk factors

5.3.1 Tobacco Usage:

The observed variations in lung cancer rates and trends across countries or between males and females within each country largely reflect differences in the stage and degree of the tobacco epidemic.(Bray and Weiderpass, 2010; Youlden et al., 2008) In a survey of tobacco use in Bangladesh, overall prevalence of smoking, chewing tobacco and gul (tobacco dust) usage were 20.5%, 20.6% and 1.8%, respectively. Current smoking and gul usage were significantly higher in males (42.2% and 2.2%, respectively) than females (2.3% and 1.5%, respectively). (Flora et al., 2009) These factors might be responsible for higher proportion of lung cancer in males. Globally, the tobacco epidemic in many developing parts of world is still evolving brining a rapid increase to the number of new lung cancer cases and death in addition to the increases cases seen from population aging in more developed countries. (McIntyre and Ganti, 2017) Tobacco control is the most effective and the least expensive way to decrease number of lung cancer patients worldwide. Research studies portrayed that tobacco use is the most common cause of cancer for both males and females (Hussain and Sullivan, 2013).

5.3.2 Food habits:

Regular consumption of certain foods is the second most common contributing factor in oral, stomach, esophagus, liver, and breast cancer. The favorite foods among the Bangladeshi population are rice, fish, red meat, and dried fish (known as sutki). The most important parameter leading to cancer is food adulteration, particularly of dried fish (sutki) (Mohammadi and Jafari, 2020). In accordance with our study findings, almost half of the respondents (95) regularly consume dry fish and a significant half were consuming hot drinks and red meat. The consumption of dry fish associated with hot drinks and red meats impose severe risk of developing cancer at different sites. According to a study by Rakib et al., 2021, the heavy metals, organic compounds are

mostly associated with stomach and colorectal cancer. countries should adopt an appropriate risk management policy that controls pesticides and heavy metals in dried fish to ensure safe food for consumers of home and abroad.

5.3.3 Use of Contraception:

From our study findings, contraceptive users are more prone to developing breast cancer. We found the prevalence of breast cancer in contraceptive users is almost 6 times more than the prevalence of breast cancer among the non-contraceptive users. Several studies have reported contraception or hormonal therapy as a risk factor for developing breast cancer. (Hossain et al., 2014) A cohort study done by Westhoff et. al., depicted that in the long term, hormonal contraception use has been found not to be associated with any increased total cancer risk. (Westhoff and Pike, 2018) The same result is also presented in other studies as well. (Marchbanks et al., 2002)

5.4 Outdoor pollution and its effects:

According to our findings, 19 respondents were victim to outdoor air pollution. Although a low number of populations are being affected with the conditions, air quality is poorer in other cities of this country. (Jubaer et al., 2022) Outdoor pollution is not only associated with increased risk of particular cancer such as Lung cancer, Breast cancer and Bladder Cancer, but also linked with poorer cancer survival. (Turner et al., 2020) However, regulatory authorities need to reduce community exposures to outdoor pollution as much as feasible.

5.5 Occupation:

Epidemiological researches have located specific occupation related risk factors for particular cancer such as bladder cancer in paint mechanics. (Reulen et al., 2008) As most of our respondents were female, our most frequent cancer was breast cancer and cervical cancer. According to Carpenter and Roman, 1999, in a group with female predominance, female cancers of the reproductive system (breast, uterus, cervix, ovary) are highly prevalent.

Chapter-VI: Conclusion

Bangladesh is one of the countries where cancer is a leading cause of mortality. The prevalence of various cancers is rising steadily in our nation. A lot of personal, social, and financial impact is caused by cancer. Worldwide, the expense of cancer treatment is still very high. All cancer-related studies have revealed that a significant portion of cancer victims are in the working age group. Both on a local and a global scale, these two elements have a negative impact on the economy. The establishment of a cancer registry in Bangladesh is crucial for assessing the current state of our country's cancer issue and for updating our national cancer control strategy. The study's findings can offer a valuable hint about significant data and numbers regarding various cancer forms in Bangladesh. This study is of great importance for the health system of the country since any prevention policy cannot be implemented without epidemiological studies and very comprehensive statistical analyses. However, it is also necessary to initiate the establishment of a regional cancer registry system in order to allow the monitoring of cancer trends and effectively plan cancer control.

Chapter-VII: Recommendations and Future Perspectives

This study has depicted the prevalence of specific types of cancer among the population of Chattogram Division. It clearly shows the areas where different types of cancers are more prevalent with their associated risk factors such smoking habit, contraceptive status, personal history of taking betel nut and betel leaves, dry fish, hot drinks, etc.

The findings will urge policymakers and stakeholders to plan according to the risk factors for the best possible outcome in this specific area. According to the prevalence of the cancer types, Lung cancer, Breast cancer, Cervical cancer may require more attention in each level of healthcare delivery sector. The knowledge, attitude and practice among the general population regarding specific types of cancer should be improved. Cancer screening programme should be implemented at the primary healthcare level. The curative and palliative treatment approaches should be affordable and accessible to the high-risk population.

7.1 Suggestion for further studies

Based on the understanding of the current research problems and considering the experience from this study, the following suggestions regarding further studies can be made –

1. Collect larger sample size to increase representation of race/ethnic populations in Cancer Epidemiology Cohort Studies.
2. Studies can include special population such as refugees (Rohingya population) in Cancer Epidemiological Research to exert multiplicative effects of cancer health outcomes.
3. Further studies can be done to evaluate the readiness and availability of the cancer care service delivery model at different healthcare delivery level.

This study can be replicated among the general population at national level with greater risk factors which are not being covered in our study.

Chapter-VIII: Limitations

This study has a few limitations to discuss. The most significant drawback of this study is that it only included patients who visited the desired two health facility (CMCH and CMOSH) during the specific period of data collection, despite the fact that these two facilities are the biggest and cancer treating institution in the region. Other restrictions include the elimination of cases without pathology confirmation, which may reduce the incidence of cancer. Another limitation is children under the age of 10 years are not being reported by this study which can limit the incidence of pediatric cancer. One of the study site, CMOSH, didn't have any radiotherapy facility which might limit the prevalence of head, neck and oral cavity cancer as these patients require radiotherapy most frequently.

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APPENDICES

Appendix I

Research Proposal And Ethical Approval

Comment [MRP1]: Is it ethical certificate?

Chittagong Veterinary and Animal Sciences University

Khulshi - 4225, Chittagong.

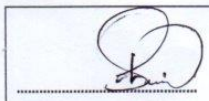
Website: www.cvasu.ac.bd

Research Proposal in the Fiscal Year: 2020-2021

1. Name of the Faculty: One Health Institute
2. Name of the Department: N/A
3. Title of the Project:
   a) In Bangla: চট্টগ্রামের সাধারণ জনগণের মধ্যে ক্যান্সারের প্রাদুর্ভাব এবং সংশ্লিষ্ট ঝুঁকির কারণ
   b) In English: Cancer prevalence and associated risk factors among the general population of Chattogram
4. Name and Address of the investigator(s):

Investigator	Name	Designation
Supervisor	**Dr. Mohammad Rashedul Alam**	**Professor**
MPH Student	**Dr. Sanjina Akter**	**Semester: Thesis**

5. Location of the Study Area: Chittagong.
6. Details of the Project Proposal:



Signature of the Department Head:

Professor Dr. Sharmin Chowdhury

Director, One Health Institute

Chittagong Veterinary and Animal Sciences University.

Khulshi, Chittagong -4225, Bangladesh

Tel: +88 031 659093 Ext: 306

E-mail: sharminchowdhury77@gmail.com

Signature of the Supervisor:

Professor **Dr. Mohammad Rashedul Alam**

Department of Physiology, Biochemistry and Pharmacology. Faculty of Veterinary Medicine

Chittagong Veterinary and Animal Sciences University
Khulshi, Chittagong -4225, Bangladesh

Tel: +88 031 659093 Ext: 371
E-mail: rashedul2000@yahoo.com

Sanjina

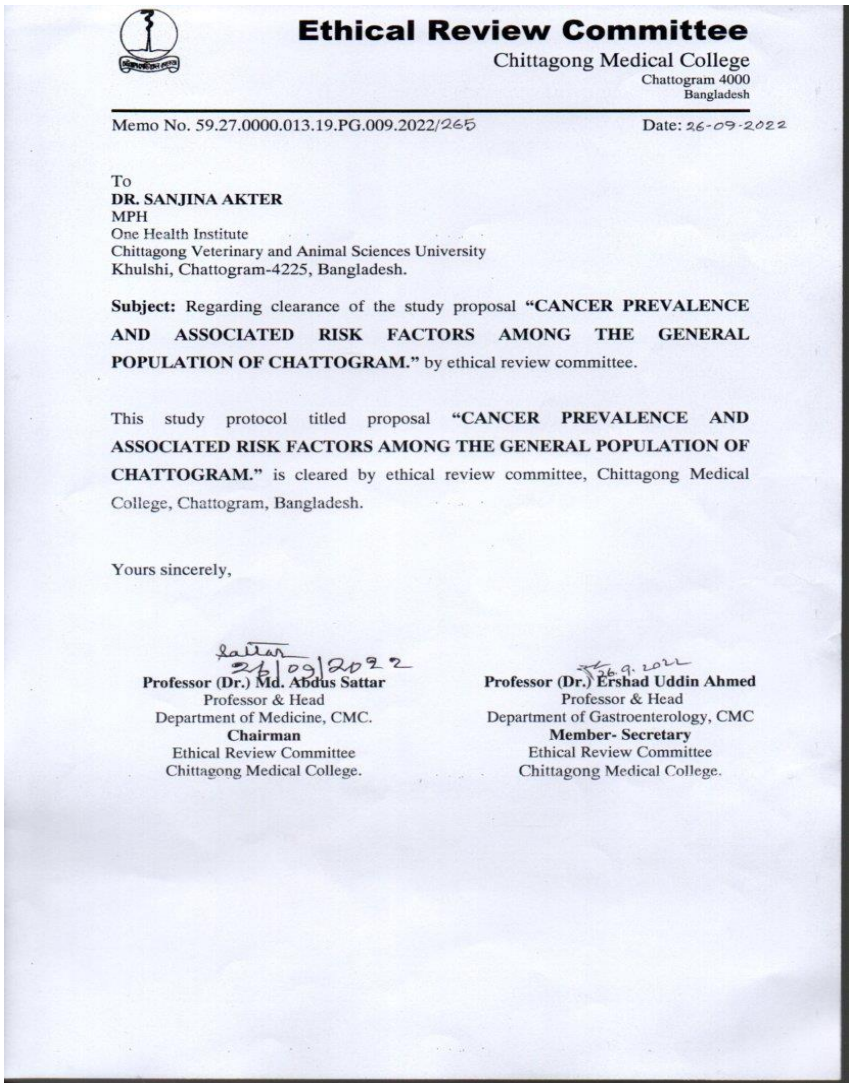
Signature of the MS student

Name: Dr Sanjina Akter

Roll No- 004

Reg. No - 886

Ethical Clearance Certificate by Chattogram Medical College



Ethical Review Committee

Chittagong Medical College
Chattogram 4000
Bangladesh

Memo No. 59.27.0000.013.19.PG.009.2022/265 Date: 26-09-2022

To
DR. SANJINA AKTER
MPH
One Health Institute
Chittagong Veterinary and Animal Sciences University
Khulshi, Chattogram-4225, Bangladesh.

Subject: Regarding clearance of the study proposal **"CANCER PREVALENCE AND ASSOCIATED RISK FACTORS AMONG THE GENERAL POPULATION OF CHATTOGRAM."** by ethical review committee.

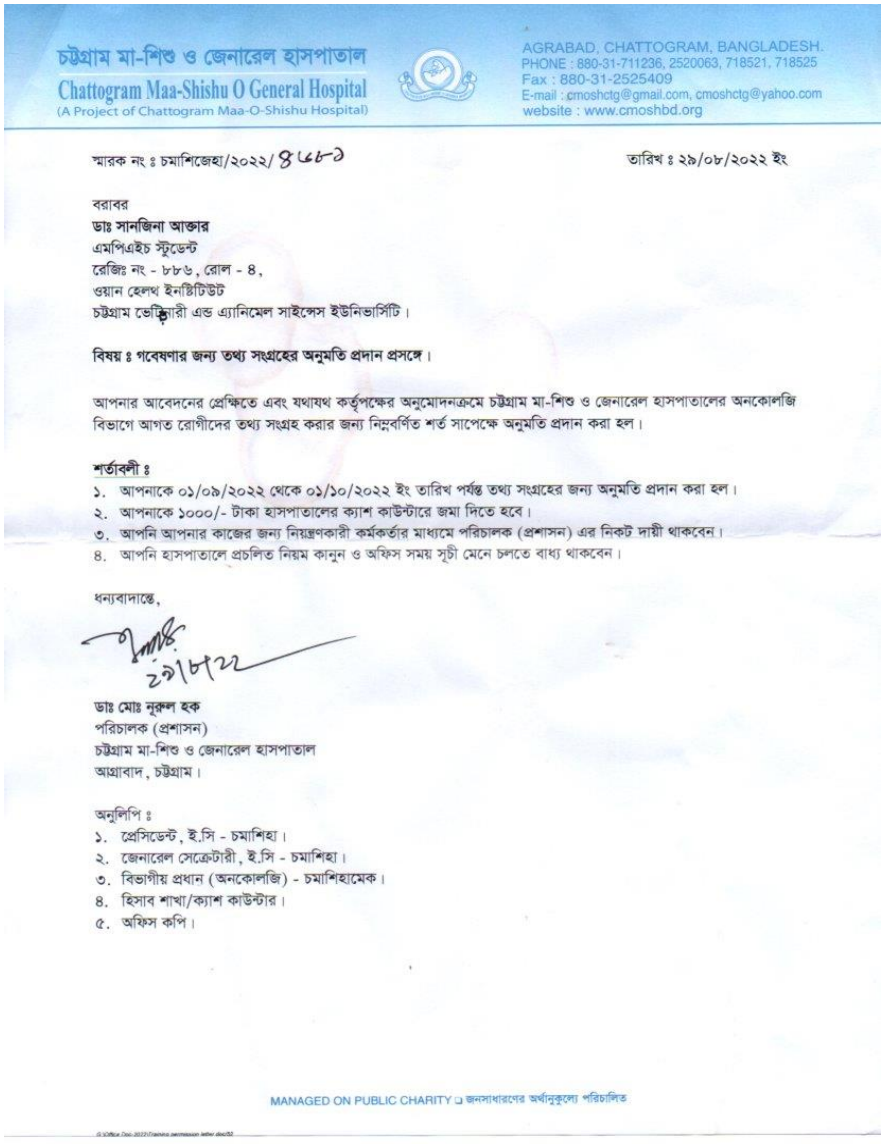
This study protocol titled proposal **"CANCER PREVALENCE AND ASSOCIATED RISK FACTORS AMONG THE GENERAL POPULATION OF CHATTOGRAM."** is cleared by ethical review committee, Chittagong Medical College, Chattogram, Bangladesh.

Yours sincerely,

Sattar 26/09/2022
Professor (Dr.) Md. Abdus Sattar
Professor & Head
Department of Medicine, CMC.
Chairman
Ethical Review Committee
Chittagong Medical College.

26.9.2022
Professor (Dr.) Ershad Uddin Ahmed
Professor & Head
Department of Gastroenterology, CMC
Member- Secretary
Ethical Review Committee
Chittagong Medical College.

Ethical Clearance Certificate by Chattogram Maa-Shishu O General Hospital



চট্টগ্রাম মা-শিশু ও জেনারেল হাসপাতাল
Chattogram Maa-Shishu O General Hospital
(A Project of Chattogram Maa-O-Shishu Hospital)

AGRABAD, CHATTOGRAM, BANGLADESH.
PHONE : 880-31-711236, 2520063, 718521, 718525
Fax : 880-31-2525409
E-mail : cmoshctg@gmail.com, cmoshctg@yahoo.com
website : www.cmoshbd.org

স্মারক নং ঃ চমাশিজেহা/২০২২/ ৪৬৮৩ তারিখ ঃ ২৯/০৮/২০২২ ইং

বরাবর
ডাঃ সানজিনা আক্তার
এমপিএইচ স্টুডেন্ট
রেজিঃ নং - ৮৮৬, রোল - ৪,
ওয়ান হেলথ ইনষ্টিটিউট
চট্টগ্রাম ভেটেরিনারী এন্ড এ্যানিমেল সাইন্সেস ইউনিভার্সিটি।

বিষয় ঃ গবেষণার জন্য তথ্য সংগ্রহের অনুমতি প্রদান প্রসঙ্গে।

আপনার আবেদনের প্রেক্ষিতে এবং যথাযথ কর্তৃপক্ষের অনুমোদনক্রমে চট্টগ্রাম মা-শিশু ও জেনারেল হাসপাতালের অনকোলজি বিভাগে আগত রোগীদের তথ্য সংগ্রহ করার জন্য নিম্নবর্ণিত শর্ত সাপেক্ষে অনুমতি প্রদান করা হল।

শর্তাবলী ঃ
১. আপনাকে ০১/০৯/২০২২ থেকে ০১/১০/২০২২ ইং তারিখ পর্যন্ত তথ্য সংগ্রহের জন্য অনুমতি প্রদান করা হল।
২. আপনাকে ১০০০/- টাকা হাসপাতালের ক্যাশ কাউন্টারে জমা দিতে হবে।
৩. আপনি আপনার কাজের জন্য নিয়ন্ত্রণকারী কর্মকর্তার মাধ্যমে পরিচালক (প্রশাসন) এর নিকট দায়ী থাকবেন।
৪. আপনি হাসপাতালে প্রচলিত নিয়ম কানুন ও অফিস সময় সূচী মেনে চলতে বাধ্য থাকবেন।

ধন্যবাদান্তে,

২৯/৮/২২

ডাঃ মোঃ নূরুল হক
পরিচালক (প্রশাসন)
চট্টগ্রাম মা-শিশু ও জেনারেল হাসপাতাল
আগ্রাবাদ, চট্টগ্রাম।

অনুলিপি ঃ
১. প্রেসিডেন্ট, ই.সি - চমাশিহা।
২. জেনারেল সেক্রেটারী, ই.সি - চমাশিহা।
৩. বিভাগীয় প্রধান (অনকোলজি) - চমাশিহামেক।
৪. হিসাব শাখা/ক্যাশ কাউন্টার।
৫. অফিস কপি।

MANAGED ON PUBLIC CHARITY ❑ জনসাধারণের অর্থানুকূল্যে পরিচালিত

Appendix II

Application For Data Collection Permission From The Chattogram Medical College

Date : 15/09/2022

To
Chairman
Ethics Review Committee
Chittagong Medical college,
Chattogram
Bangladesh

Subject: Submission of Protocol for Ethical Clearance.

.

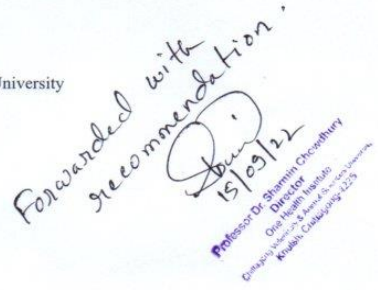
Dear Sir,

Please find herewith the protocol of the proposed study "Cancer prevalence and associated risk factors among the general population of Chattogram" for review by ethical committee.

I would be thankful if you kindly do the needful for ethical clearance of the submitted protocol.

Thanking you,

Name: Dr Sanjina Akter MBBS
One Health Institute
Chittagong Veterinary and Animal Sciences University
Khulshi, Chittagong -4225, Bangladesh
01911578342
sanjina323@gmail.com



Appendix III

Consent form (English)

Cancer Prevalence and Associated Risk Factors Among The General Population of Chattogram.

Date-

Name- Age-

I know all the activities that would be done in this research. I am well explained about the procedure and also informed about how much time it will need. I have understood the matter very well and also, I am satisfied with the way of explanation.

I have also clearly understood that by participating in this research not only myself but also the researcher will be benefited. I also know that my information will be kept secret and only the result, not the personal information will be published. I have read this paper explaining the research thoroughly and I am agreed to join the research.

Signature

Participants Investigator

সম্মতি পত্র

“Cancer prevalence and associated risk factors among the general population of Chattogram”

চট্টগ্রামের সাধারণ জনগণের মধ্যে ক্যান্সারের প্রাদুর্ভাব এবং সংশ্লিষ্ট ঝুঁকির কারণ

তারিখ-

নাম- বয়স:

এই গবেষণায় যে সমস্ত কার্যক্রম করা হবে তা আমি জানি। আমি পদ্ধতি সম্পর্কে ভালভাবে ব্যাখ্যা করেছি এবং কতটা সময় লাগবে সে সম্পর্কেও অবহিত করেছি। আমি বিষয়টি খুব ভালোভাবে বুঝতে পেরেছি এবং ব্যাখ্যার পদ্ধতিতেও আমি সন্তুষ্ট।

আমি এটাও পরিষ্কার বুঝতে পেরেছি যে এই গবেষণায় অংশ নিলে শুধু আমিই নয়, গবেষকরাও উপকৃত হবেন। আমি আরও জানি যে আমার তথ্য গোপন রাখা হবে এবং শুধুমাত্র ফলাফল, ব্যক্তিগত তথ্য প্রকাশ করা হবে না। আমি এই গবেষণাপত্রটি পুঙ্খানুপুঙ্খভাবে ব্যাখ্যা করে পড়েছি এবং আমি গবেষণায় যোগ দিতে রাজি হয়েছি।

স্বাক্ষর

অংশগ্রহণকারী গবেষক

Appendix IV

Data collection sheet

Case No: _____

Contact No. _____

Name: _____

Address:……

1) Age: _____ 2) Gender: ☐ M ☐ F Height: _____ Inc Weight: _____kg

3) Occupation:

4) Location: ☐Urban ☐ Rural

5) Marital history: ☐ Single ☐ Married ☐ divorced ☐ widowed.

6) Educational status: ☐ Illiterate ☐ Can read and write ☐ Class V ☐SSC ☐ HSC ☐ Graduation and above

7) Socioeconomic status: ☐ Lower class☐ Middle class ☐ Upper class

8) Family history of cancer:☐ Yes ☐ No

9) If yes to question 8,

a) Relation with patient: _____Type of cancer: _____
b) Relation with patient: _____Type of cancer: _____
c) Relation with patient: _____Type of cancer: _____

10) Patient's diagnosis: _____ diagnosed on: _____

11) Presenting symptoms: _____

12) Presenting signs: _____

13) Investigations: _____

Personal History

14) Tobacco: ☐ Smoking _____years ☐ Chewing _____years

15) Food history: ☐ Dry fish ☐ Peanuts ☐ Milk ☐ Herbal Medicines

☐ Sugar/sweet foods ☐ Red meat ☐ Roots ☐Leafy vegetables

☐ Spicy foods ☐ Barbecue ☐ hot drinks

16) Drug history

Current medications	For what condition	Dosage	Frequency	Datestarted
a)				
b)				
c)				
d)				
e)				

Environmental exposure:

17) Did you have any exposure to arsenic water/ was anyone affected by arsenic in your community? ☐ Yes ☐ No

18) Do you cook in a mud stove/ Have exposure to smoke from mud stove? ☐ Yes ☐ No

19) Are you exposed to sunlight during the day? ☐ Yes _____ hours ☐ No

20) Are you exposed to outdoor pollution? ☐ Yes _____ hours ☐ No

21) Are you exposed to chemicals at work? ☐ Yes _____ hours ☐ No

22) Are you exposed to pesticides? ☐ Yes _____ ☐ No

22) Does your job involve any of these?

☐ Painting ☐ Brick laying ☐ ceramics ☐ truck driving ☐ Rubber manufacturing

☐ traffic police ☐ Sand blasting ☐ Radiation ☐ PVC industry

23) Past History……

Appendix V : Master Table

	CaseNo	Hospital	Age	Gender	Weightkg	Occupation	Address	Location	Maritalhistory	Educationalstatus	Socioeconomicstatus	Familyhistcryo...	Pt_diagnosis
1	1	CMOSH	71	Male	65	Bus contractor	Hatazari	Rural	Married	Can read and write	Lower class	No	Ca Lung
2	2	CMOSH	46	Male	59	Diver	Chottogram Metro	Urban	Married	Can read and write	Lower class	No	Sarcoma
3	3	CMOSH	33	Female	98	Chef	Chottogram Metro	Urban	Married	HSC	Middle class	No	Ca Breast
4	4	CMOSH	40	Male	43	Builder and painter	Chandanaish	Urban	Married	SSC	Middle class	No	Ca Stomach
5	5	CMOSH	40	Female	56	Housewife	Comilla	Urban	Married	Class VI - X	Middle class	No	Ca Ovary
6	6	CMOSH	57	Female	53	Housewife	Hatazari	Rural	Married	Can read and write	Middle class	Yes	Ca Breast
7	7	CMOSH	32	Female	54	Housewife	Feni	Rural	Married	SSC	Middle class	No	Ca Colon
8	8	CMOSH	75	Female	40	Housewife	Hatazari	Rural	Married	Illiterate	Middle class	No	Ca Rectum
9	9	CMOSH	56	Female	56	Housewife	Patiya	Rural	Married	Illiterate	Middle class	No	Ca Rectum
10	10	CMOSH	57	Female	68	Housewife	Chottogram Metro	Urban	Married	Class I - V	Middle class	No	Ca Cervix
11	11	CMOSH	56	Male	45	Builder	Noakhali	Urban	Married	Class I - V	Middle class	No	Hepatocellular Carcinoma
12	12	CMOSH	65	Male	46	Labourer	Patiya	Rural	Married	Illiterate	Lower class	No	Ca Lung
13	13	CMOSH	25	Female	59	Housewife	Chottogram Metro	Urban	Married	SSC	Middle class	No	Ca Breast
14	14	CMOSH	54	Female	34	Housewife	Bashkhali	Urban	Married	Illiterate	Middle class	Yes	Hepatocellular Carcinoma
15	15	CMOSH	61	Female	54	Housewife	Chottogram Metro	Urban	Married	Illiterate	Middle class	No	Hepatocellular Carcinoma
16	16	CMOSH	48	Female	48	Housewife	Chandanaish	Urban	Married	Illiterate	Middle class	No	Ca Breast
17	17	CMC	18	Female	45	Student	Coxs Bazar	Rural	Single	Class VI - X	Lower class	No	Teratoma
18	18	CMOSH	63	Female	57	Housewife	Chottogram Metro	Urban	Married	Illiterate	Middle class	No	Ca Colon
19	19	CMOSH	54	Male	56	Postman	Chottogram Metro	Urban	Married	Graduation and above	Middle class	Yes	Ca Lung
20	20	CMOSH	45	Female	60	Housewife	Chottogram Metro	Urban	Married	SSC	Middle class	No	Ca Breast
21	21	CMOSH	32	Female	61	Housewife	Feni	Urban	Married	SSC	Middle class	No	Ca Colon
22	22	CMOSH	33	Male	56	Salesman	Chottogram Metro	Urban	Married	Illiterate	Middle class	No	Ca Lung
23	23	CMOSH	32	Female	50	Housewife	Chottogram Metro	Urban	Married	Illiterate	Lower class	No	Ca Cervix
24	24	CMOSH	72	Female	45	Housewife	Chottogram Metro	Urban	Married	Can read and write	Middle class	Yes	Ca Oral Cavity
25	25	CMOSH	68	Male	54	Salesman	Chottogram Metro	Urban	Married	Class I - V	Middle class	No	Unknown Ca
26	26	CMOSH	70	Female	56	Housewife	Chottogram Metro	Urban	Widowed	Illiterate	Middle class	No	Ca Breast
27	27	CMOSH	38	Female	55	Garment worker	Chottogram Metro	Urban	Married	HSC	Upper class	Yes	Ca Breast
28	28	CMOSH	40	Female	56	Housewife	Chottogram Metro	Urban	Married	Can read and write	Lower class	No	Ca Breast
29	29	CMOSH	55	Male	54	Salesman	Anowara	Rural	Married	SSC	Middle class	No	Ca Larynx
30	30	CMOSH	40	Female	40	Housewife	Chottogram Metro	Urban	Married	Can read and write	Middle class	No	Ca Colon
31	31	CMOSH	65	Male	56	Businessman	Chottogram Metro	Urban	Married	HSC	Middle class	Yes	Ca Lung
32	32	CMOSH	55	Female	55	Housewife	Coxs Bazar	Rural	Married	Illiterate	Lower class	No	Ca Stomach
33	33	CMOSH	52	Female	72	Housewife	Chottogram Metro	Urban	Married	Illiterate	Middle class	No	Ca Breast
34	34	CMOSH	51	Female	55	Housewife	Hatazari	Rural	Married	Illiterate	Lower class	Yes	Ca Rectum
35	35	CMOSH	53	Male	45	Builder	Chottogram Metro	Urban	Married	Illiterate	Lower class	No	Ca Lung

	CaseNo	Hospital	Age	Gender	Weightkg	Occupation	Address	Location	Maritalhistory	Educationalstatus	Socioeconomicstatus	Familyhistcryo...	Pt_diagnosis
36	36	CMOSH	75	Male	39	Fisherman	Noakhali	Rural	Married	Illiterate	Lower class	No	Ca Lung
37	37	CMOSH	38	Female	74	Housewife	Chottogram Metro	Urban	Married	Can read and write	Middle class	No	Ca Breast
38	38	CMC	65	Female	52	Housewife	Coxs Bazar	Rural	Married	Can read and write	Lower class	No	Ca Stomach
39	39	CMC	36	Male	48	Salesman	Hatazari	Rural	Single	Can read and write	Lower class	No	Ca Breast
40	40	CMC	49	Female	70	Housewife	Lohagara	Rural	Married	Illiterate	Lower class	No	Ca Breast
41	41	CMC	34	Female	54	Housewife	Coxs Bazar	Rural	Married	Can read and write	Lower class	No	Ca Breast
42	42	CMC	82	Female	72	Housewife	Rangamati	Rural	Widowed	Illiterate	Lower class	No	Ca Breast
43	43	CMC	60	Female	50	Housewife	Chottogram Metro	Urban	Married	Can read and write	Middle class	No	Ca Larynx
44	44	CMC	40	Female	52	Housewife	Rangunia	Rural	Married	Can read and write	Middle class	No	Ca Breast
45	45	CMC	60	Female	62	Housewife	Bashkhali	Rural	Married	Illiterate	Lower class	No	Ca Larynx
46	46	CMC	60	Male	70	Foreign builder	Boalkhali	Rural	Married	Can read and write	Middle class	No	Ca Colon
47	47	CMC	56	Male	75	Teacher	Boalkhali	Rural	Married	Graduation and above	Middle class	No	Ca Larynx
48	48	CMC	62	Male	57	Farmer	Chandanaish	Rural	Married	Illiterate	Lower class	Yes	Ca Lung
49	49	CMC	65	Male	65	Policeman	Feni	Rural	Married	Class VI - X	Middle class	No	Ca Larynx
50	50	CMC	52	Male	42	Diver	Feni	Urban	married	Can read and write	Lower class	No	Ca Oesophagus
51	51	CMC	60	Female	48	Housewife	Sitakunda	Rural	Married	Illiterate	Lower class	No	Ca Rectum
52	52	CMC	40	Female	54	Housewife	Noakhali	Rural	Married	Illiterate	Lower class	No	Ca Breast
53	53	CMC	10	Male	10	Student	Coxs Bazar	Rural	Single	Illiterate	Upper class	No	Rhamdomyosarcoma
54	54	CMC	40	Female	65	Housewife	Coxs Bazar	Rural	Married	Illiterate	Lower class	No	Ca Cervix
55	55	CMC	12	Female	15	Student	Comilla	Urban	Single	Can read and write	Middle class	No	Retinoblastoma
56	56	CMC	65	Female	43	Housewife	Rangunia	Rural	Married	Illiterate	Lower class	No	Ca Breast
57	57	CMC	39	Male	46	Foreign salesman	Raozan	Rural	Married	Class VI - X	Middle class	No	Ca Rectum
58	58	CMC	65	Male	73	Farmer	Anowara	Rural	Married	Illiterate	Lower class	No	Ca Lung
59	59	CMOSH	37	Male	54	Diver	Chandanaish	Urban	Married	Class VI - X	Middle class	No	Ca Rectum
60	60	CMOSH	43	Female	51	Garment worker	Chottogram Metro	Urban	Married	SSC	Middle class	Yes	Ca Breast
61	61	CMOSH	62	Male	55	Foreign salesman	Chottogram Metro	Urban	Married	HSC	Middle class	Yes	Ca Prostate
62	62	CMOSH	65	Female	65	Housewife	Chottogram Metro	Urban	Married	Illiterate	Middle class	No	Ca Colon
63	63	CMOSH	50	Female	58	Housewife	Sitakunda	Rural	Married	Can read and write	Lower class	No	Ca Oral Cavity
64	64	CMC	15	Female	30	Student	Chottogram Metro	Rural	Single	Class VI - X	Lower class	No	Ca Ovary
65	65	CMC	38	Female	55	Housewife	Chottogram Metro	Rural	Married	Can read and write	Middle class	No	Ca Breast
66	66	CMOSH	65	Female	65	Housewife	Chottogram Metro	Urban	Married	Can read and write	Middle class	No	Ca Colon
67	67	CMC	50	Female	60	Housewife	Chottogram Metro	Urban	Married	Can read and write	Middle class	No	Ca Breast
68	68	CMC	70	Female	60	Housewife	Sitakunda	Rural	Married	Illiterate	Lower class	No	Ca Oral Cavity
69	69	CMC	40	Female	58	Housewife	Rangamati	Rural	Married	Class VI - X	Middle class	No	Ca Gallbladder
70	70	CMC	36	Female	64	Teacher	Chottogram Metro	Urban	Married	HSC	Middle class	No	Sarcoma

	CaseNo	Hospital	Age	Gender	Weightkg	Occupation	Address	Location	Maritalhistory	Educationalstatus	Socioeconomicstatus	Familyhistoryo...	Pt_diagnosis
71	71	CMC	63	Female	60	Housewife	Rangamati	Rural	Married	Illiterate	Lower class	No	Ca Cervix
72	72	CMC	65	Male	58	Salesman	Shatkania	Urban	Married	Can read and write	Middle class	No	Ca Larynx
73	73	CMC	60	Male	54	Farmer	Comilla	Rural	Married	Illiterate	Lower class	No	Ca Lung
74	74	CMC	52	Male	50	Farmer	Rangamati	Rural	Married	Class VI - X	Middle class	No	Ca Oral Cavity
75	75	CMC	58	Male	46	Farmer	Shatkania	Rural	Married	Illiterate	Lower class	No	Ca Lung
76	76	CMC	68	Male	60	Policeman	Chottogram Metro	Urban	Married	Graduation and above	Upper class	No	Hepatocellular Carcinoma
77	77	CMC	65	Male	60	Businessman	Chottogram Metro	Urban	Married	HSC	Upper class	Yes	Ca Lung
78	78	CMOSH	40	Male	55	Alluminium glass worker	Lohagara	Rural	Married	Class VI - X	Middle class	No	Blood cancer
79	79	CMOSH	20	Male	46	Student	Chottogram Metro	Urban	Single	SSC	Middle class	No	Blood cancer
80	80	CMOSH	42	Male	63	Businessman	Chottogram Metro	Urban	Married	Class I - V	Middle class	No	Lymphoma
81	81	CMOSH	70	Female	60	Housewife	Chottogram Metro	Urban	Married	Can read and write	Middle class	No	Blood cancer
82	82	CMOSH	72	Female	60	Housewife	Chottogram Metro	Urban	Married	Illiterate	Middle class	No	Ca Breast
83	83	CMOSH	75	Female	56	Housewife	Chottogram Metro	Rural	Married		Middle class	No	Unknown Ca
84	84	CMOSH	52	Female	65	Housewife	Chottogram Metro	Urban	Married	Can read and write	Middle class	No	Ca Breast
85	85	CMC	75	Male	70	Carpenter	Rangamati	Rural	Married	SSC	Lower class	No	Ca Larynx
86	86	CMC	38	Male	49	Electrician	Patiya	Rural	Single	Class VI - X	Lower class	Yes	Ca Larynx
87	87	CMC	80	Male	45	Farmer	Coxs Bazar	Rural	Married	Can read and write	Lower class	No	Ca Bladder
88	88	CMC	72	Male	50	Farmer	Coxs Bazar	Rural	Married	Illiterate	Lower class	Yes	Ca Larynx
89	89	CMC	50	Male	48	Salesman	Comilla	Rural	Married	Illiterate	Lower class	No	Ca Lung
90	90	CMC	50	Male	52	Farmer	Coxs Bazar	Rural	Married	Illiterate	Lower class	No	Ca Colon
91	91	CMC	55	Female	58	Housewife	Chottogram Metro	Urban	Divorced		Middle class	No	Ca Breast
92	92	CMC	58	Male	50	Farmer	Rangunia	Rural	Married	Illiterate	Lower class	No	Ca Oesophagus
93	93	CMC	15	Female	38	Student	Mirshorai	Rural	Single	SSC	Middle class	Yes	Ca Ovary
94	94	CMC	51	Female	35	Housewife	Coxs Bazar	Rural	Married		Lower class	No	Ca Lung
95	95	CMC	45	Female	42	Housewife	Khagrachori	Rural	Married	Illiterate	Lower class	No	Ca Cervix
96	96	CMC	46	Female	50	Housewife	Feni	Rural	Married	Illiterate	Lower class	No	Ca Stomach
97	97	CMC	65	Female	38	Housewife	Sitakunda	Rural	Married	Illiterate	Lower class	No	Ca Stomach
98	98	CMC	50	Female	60	Housewife	Coxs Bazar	Rural	Married	Illiterate	Lower class	No	Ca Cervix
99	99	CMC	30	Female	50	Housewife	Coxs Bazar	Rural	Married	Illiterate	Middle class	No	Rectum Ca
100	100	CMC	32	Female	55	Housewife	Chottogram Metro	Rural	Married	Class I - V	Middle class	Yes	Ca Breast
101	101	CMC	53	Male	49	Farmer	Mirshorai	Rural	Married	Illiterate	Lower class	No	Hepatocellular Carcinoma
102	102	CMC	56	Male	50	Farmer	Rangunia	Rural	Married	Illiterate	Upper class	No	Ca Lung
103	103	CMC	56	Female	70	Housewife	Chottogram Metro	Urban	Married	Can read and write	Middle class	Yes	Ca Breast
104	104	CMC	28	Male	53	Teacher	Raozan	Rural	Married	Graduation and above	Middle class	No	Ca Rectum
105	105	CMC	46	Female	68	Housewife	Chottogram Metro	Urban	Married	Class I - V	Middle class	No	Ca Breast

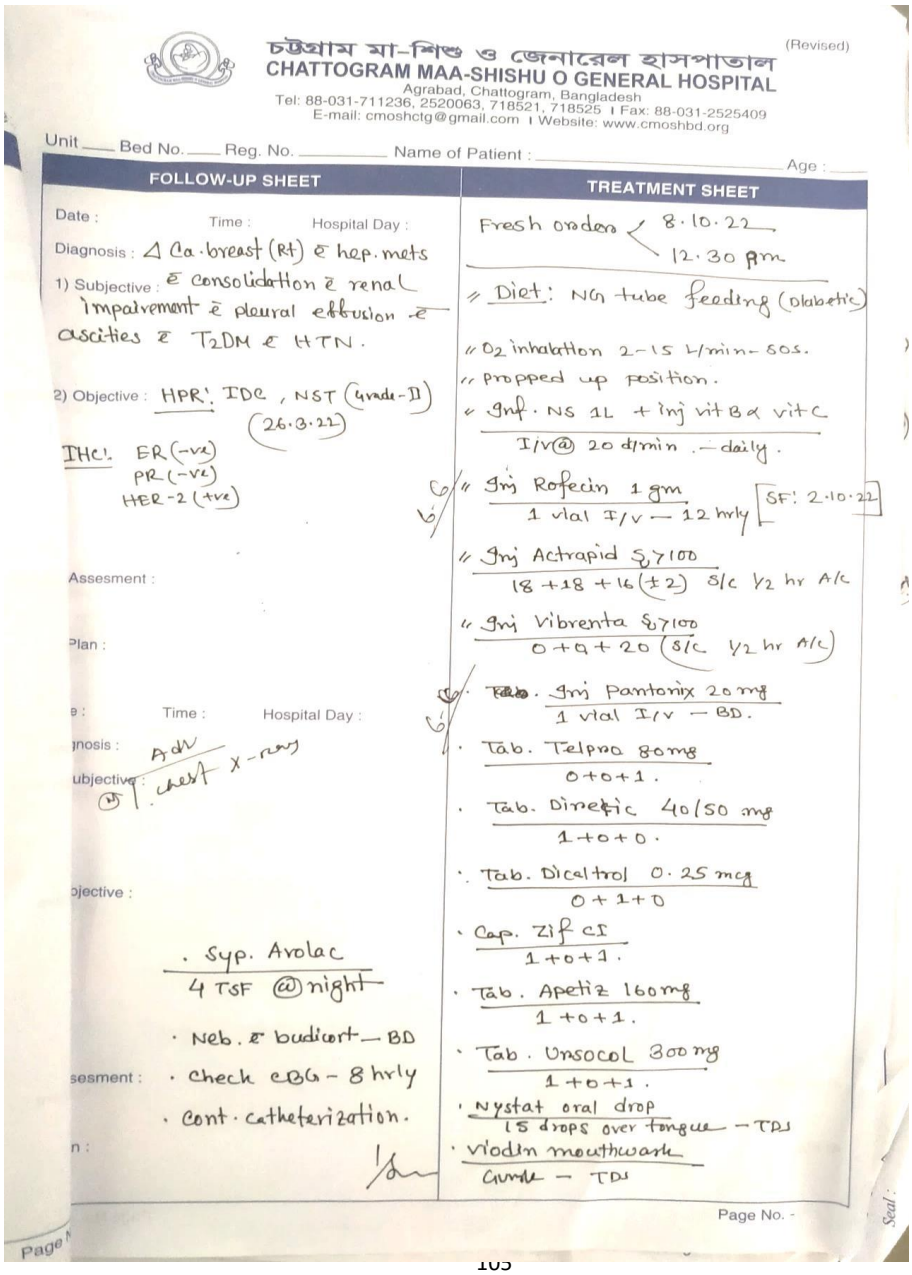
	CaseNo	Hospital	Age	Gender	Weightkg	Occupation	Address	Location	Maritalhistory	Educationalstatus	Socioeconomicstatus	Familyhistoryo...	Pt_diagnosis
106	106	CMC	55	Male	48	Builder	Chottogram Metro	Urban	Married	Can read and write	Middle class	No	Hepatocellular Carcinoma
107	107	CMC	50	Male	55	Salesman	Comilla	Rural	Married	Class I - V	Middle class	No	Ca Lung
108	108	CMC	31	Male	60	Job	Shatkania	Rural	Married	SSC	Middle class	No	Lymphoma
109	109	CMC	62	Male	52	Farmer	Mirshorai	Rural	Married	Can read and write	Lower class	No	Ca Larynx
110	110	CMOSH	35	Female	64	Housewife	Chottogram Metro	Urban	Married	SSC	Middle class	No	Sarcoma
111	111	CMOSH	38	Female	43	Housewife	Chottogram Metro	Rural	Married	Illiterate	Middle class	No	Unknown Ca
112	112	CMOSH	68	Female	65	Housewife	Chottogram Metro	Urban	Married	Class VI - X	Middle class	No	Ca Breast
113	113	CMOSH	45	Female	60	Housewife	Chottogram Metro	Urban	Married	Can read and write	Middle class	No	Ca Breast
114	114	CMOSH	60	Female	40	Housewife	Chottogram Metro	Urban	Married	Illiterate	Middle class	Yes	Ca Breast
115	115	CMOSH	70	Male	61	CNF job	Chottogram Metro	Urban	Married	SSC	Middle class	Yes	Hepatocellular Carcinoma
116	116	CMC	42	Male	40	Builder	Coxs Bazar	Rural	Married	Illiterate	Lower class	No	Ca Oral Cavity
117	117	CMC	52	Male	49	Farmer	Chandanaish	Rural	Married	Illiterate	Lower class	No	Ca Lung
118	118	CMC	60	Male	55	Farmer	Chottogram Metro	Rural	Married	Illiterate	Lower class	Yes	Ca Oesophagus
119	119	CMC	48	Male	52	Driver	Coxs Bazar	Rural	Married	Can read and write	Lower class	No	Ca Oral Cavity
120	120	CMC	65	Male	50	Rohinga	Coxs Bazar	Rural	Married	HSC	Middle class	No	Ca Anal
121	121	CMC	45	Female	48	Housewife	Coxs Bazar	Rural	Married	Illiterate	Lower class	No	Ca Ovary
122	122	CMC	61	Female	40	Housewife	Boalkhali	Rural	Married	Class VI - X	Middle class	Yes	Ca Oesophagus
123	123	CMC	48	Female	48	Garment worker	Chottogram Metro	Urban	Married	Class I - V	Lower class	No	Ca Ovary
124	124	CMC	61	Female	40	Housewife	Lohagara	Rural	Married	Illiterate	Lower class	Yes	Endometrial Ca
125	125	CMC	50	Female	58	Housewife	Banderban	Rural	Married	Can read and write	Lower class	No	Ca Breast
126	126	CMC	45	Male	38	Barber	Coxs Bazar	Rural	Married	Illiterate	Lower class	Yes	Unknown Ca
127	127	CMC	60	Female	42	Housewife	Mirshorai	Rural	Married	Can read and write	Middle class	No	Ca Larynx
128	128	CMC	30	Male	60	Garment worker	Hatazari	Rural	Single	Class I - V	Lower class	No	Sarcoma
129	129	CMC	63	Male	42	Shepherd	Feni	Rural	Married	Illiterate	Lower class	No	Ca Larynx
130	130	CMC	63	Male	60	Fisherman	Coxs Bazar	Rural	Married	Illiterate	Lower class	No	Ca Larynx
131	131	CMC	75	Male	52	Farmer	Bashkhali	Rural	Married	Can read and write	Lower class	No	Ca Larynx
132	132	CMC	35	Male	58	Businessman	Patenga	Urban	Married	Class I - V	Middle class	No	Astrocytoma
133	133	CMC	70	Male	60	Farmer	Coxs Bazar	Rural	Married	Illiterate	Lower class	No	Ca Lung
134	134	CMC	45	Male	50	Driver	Rangunia	Urban	Married	Can read and write	Lower class	No	Ca Oral Cavity
135	135	CMC	61	Female	55	Housewife	Fatikchari	Rural	Married	Illiterate	Lower class	No	Ca Colon
136	136	CMC	45	Female	33	Housewife	Noakhali	Rural	Married	Illiterate	Lower class	No	Ca Rectum
137	137	CMC	60	Female	57	Housewife	Boalkhali	Rural	Married	Illiterate	Lower class	No	Ca Breast
138	138	CMC	65	Male	48	Farmer	Mirshorai	Rural	Married	Class I - V	Lower class	No	Ca Lung
139	139	CMC	27	Female	57	Housewife	Hatazari	Urban	Married	Can read and write	Middle class	No	Ca Breast
140	140	CMC	55	Female	58	Housewife	Comilla	Rural	Married	Can read and write	Lower class	No	Ca Cervix

	CaseNo	Hospital	Age	Gender	Weightkg	Occupation	Address	Location	Maritalhistory	Educationalstatus	Socioeconomicstatus	Familyhistoryo...	Pt_diagnosis
141	141	CMC	30	Female	50	Housewife	Coxs Bazar	Rural	Married	Illiterate	Lower class	No	Ca Breast
142	142	CMC	35	Female	42	Housewife	Sitakunda	Rural	Married	Class I - V	Lower class	No	Ca Breast
143	143	CMOSH	35	Female	61	Garment worker	Chottogram Metro	Urban	Married	SSC	Lower class	No	Ca Rectum
144	144	CMOSH	45	Female	55	Housewife	Noakhali	Rural	Married	Illiterate	Lower class	No	Ca Breast
145	145	CMOSH	50	Female	45	Housewife	Patiya	Rural	Married	Can read and write	Lower class	No	Blood cancer
146	146	CMOSH	56	Male	56	Foreign builder	Chottogram Metro	Urban	Married	Class VI - X	Middle class	No	Hepatocellular Carcinoma
147	147	CMOSH	64	Female	48	Housewife	Chottogram Metro	Urban	married	Class VI - X	Middle class	Yes	Ca Gallbladder
148	148	CMOSH	59	Female	60	Housewife	Coxs Bazar	Rural	Married	Can read and write	Middle class	No	Blood cancer
149	149	CMOSH	40	Female	45	Housewife	Chottogram Metro	Urban	Married	Can read and write	Lower class	No	Lymphoma
150	150	CMOSH	70	Male	60	Farmer	Noakhali	Rural	Married	SSC	Lower class	No	Prostate
151	151	CMOSH	62	Male	55	Chef	Patiya	Rural	Married	Can read and write	Lower class	Yes	Ca Oesophagus
152	152	CMOSH	60	Male	45	Foreign builder	Coxs Bazar	Rural	Married	SSC	Lower class	Yes	Ca Stomach
153	153	CMOSH	60	Male	50	Farmer	Chottogram Metro	Urban	Married	Illiterate	Lower class	No	Ca Oesophagus
154	154	CMOSH	38	Male	60	Cement salesman	Coxs Bazar	Rural	Married	Illiterate	Upper class	No	Ca Larynx
155	155	CMOSH	60	Male	55	Farmer	Sitakunda	Rural	Married	Illiterate	Lower class	No	Ca Lung
156	156	CMOSH	55	Male	55	Labourer	Coxs Bazar	Rural	Married	Illiterate	Upper class	No	Ca Lung
157	157	CMOSH	40	Male	44	Shepherd	Comilla	Rural	Married	Illiterate	Lower class	No	Ca Lung
158	158	CMC	35	Male	42	Farmer	Feni	Rural	Married	Illiterate	Lower class	No	Ca Oral Cavity
159	159	CMC	72	Female	42	Housewife	Chottogram Metro	Rural	Married	Illiterate	Lower class	Yes	Ca Oral Cavity
160	160	CMC	46	Female	50	Housewife	Coxs Bazar	Rural	Married	Illiterate	Lower class	No	Ca Cervix
161	161	CMC	40	Female	38	Housewife	Bashkhali	Rural	Married	Illiterate	Lower class	No	Ca Ovary
162	162	CMC	26	Female	40	Student	Hatazari	Rural	Single	Class VI - X	Middle class	No	Teratoma
163	163	CMC	56	Female	48	Housewife	Coxs Bazar	Rural	Married	Illiterate	Lower class	No	Ca Larynx
164	164	CMC	40	Female	48	Housewife	Sandip	Rural	Married	Illiterate	Lower class	No	Ca Ovary
165	165	CMC	40	Female	50	Garment worker	Chottogram Metro	Urban	Married	Class I - V	Lower class	No	Ca Cervix
166	166	CMC	50	Female	40	Housewife	Coxs Bazar	Rural	Married	Illiterate	Lower class	No	Ca Stomach
167	167	CMC	51	Female	53	Housewife	Chottogram Metro	Urban	Married	Can read and write	Upper class	No	Ca Cervix
168	168	CMC	65	Female	55	Housewife	Feni	Rural	Married	Illiterate	Lower class	No	Ca Oral Cavity
169	169	CMC	45	Female	56	Housewife	Chandanaish	Rural	Married	Illiterate	Lower class	No	Ca Breast
170	170	CMC	75	Male	52	Salesman	Noakhali	Rural	Married	Can read and write	Lower class	No	Ca Larynx
171	171	CMC	60	Female	55	Housewife	Bashkhali	Rural	Married	Can read and write	Upper class	No	Ca Breast
172	172	CMOSH	66	Male	62	Businessman	Sitakunda	Rural	Married	Class VI - X	Middle class	No	Ca Lung
173	173	CMOSH	77	Male	58	Teacher	Rangunia	Rural	Married	HSC	Middle class	No	Ca Prostate
174	174	CMOSH	56	Male	49	Farmer	Sitakunda	Rural	Married	Illiterate	Lower class	No	Ca Lung
175	175	CMOSH	61	Male	50	Rohinga	Coxs Bazar	Rural	Married	Can read and write	Lower class	No	Ca Oesophagus

	CaseNo	Hospital	Age	Gender	Weightkg	Occupation	Address	Location	Maritalhistory	Educationalstatus	Socioeconomicstatus	Familyhistoryo...	Pt_diagnosis
176	176	CMC	60	Male	60	Security guard	Sitakunda	Rural	Married	Can read and write	Middle class	No	Ca Lung
177	177	CMOSH	42	Female	42	Housewife	Chottogram Metro	Urban	Married	Can read and write	Middle class	No	Ca Breast
178	178	CMOSH	59	Female	52	Housewife	Raozan	Rural	Married	Can read and write	Lower class	No	Ca Ovary
179	179	CMOSH	42	Female	45	Farmer	Comilla	Rural	Married	Illiterate	Lower class	No	Ca Lung
180	180	CMOSH	57	Female	45	Housewife	Chottogram Metro	Urban	Married	Can read and write	Middle class	No	Ca Cervix
181	181	CMOSH	50	Male	55	Businessman	Chottogram Metro	Rural	Single	SSC	Middle class	Yes	Ca Oral Cavity
182	182	CMOSH	70	Male	50	Housewife	Patiya	Rural	Widowed	Illiterate	Lower class	No	Ca Lung
183	183	CMOSH	50	Female	50	Garment worker	Chottogram Metro	Urban	Married	Can read and write	Lower class	No	Ca Ovary
184	184	CMOSH	70	Male	52	Driver	Patiya	Rural	Married	Can read and write	Lower class	No	Ca Lung
185	185	CMC	65	Male	48	Shepherd	Sitakunda	Rural	Married	Can read and write	Lower class	No	Ca Oral Cavity
186	186	CMC	62	Male	55	Businessman	Mirshorai	Rural	Married	Class VI - X	Middle class	No	Ca Larynx
187	187	CMC	55	Male	62	Farmer	Chandanaish	Rural	Married	Can read and write	Lower class	No	Ca Larynx
188	188	CMC	60	Male	52	Fisherman	Coxs Bazar	Rural	Married	Illiterate	Lower class	No	Ca Larynx
189	189	CMC	40	Male	38	Salesman	Coxs Bazar	Rural	Married	Illiterate	Lower class	No	Ca Larynx
190	190	CMC	60	Female	53	Housewife	Bashkhali	Rural	Married	Illiterate	Lower class	No	Ca Face
191	191	CMOSH	16	Female	35	Student	Bashkhali	Rural	Single	Class VI - X	Lower class	No	Ca Ovary
192	192	CMC	40	Female	52	Housewife	Coxs Bazar	Rural	Married	Illiterate	Lower class	No	Ca Cervix
193	193	CMC	51	Female	55	Housewife	Coxs Bazar	Rural	Married	Illiterate	Lower class	No	Ca Cervix
194	194	CMC	60	Male	53	Farmer	Bashkhali	Rural	Married	Can read and write	Lower class	No	Ca Oral Cavity
195	195	CMOSH	38	Female	45	Garment worker	Chottogram Metro	Urban	Married	Class I - V	Lower class	No	Ca Lung
196	196	CMOSH	46	Female	50	Housewife	Coxs Bazar	Rural	Married	Can read and write	Lower class	No	Ca Breast
197	197	CMC	66	Male	56	Housewife	Boalkhali	Rural	Married	Illiterate	Lower class	No	Ca Oral Cavity
198	198	CMC	40	Female	47	Garment worker	Chottogram Metro	Urban	Married	Class I - V	Lower class	No	Ca Cervix
199	199	CMC	47	Male	48	Businessman	Sitakunda	Rural	Married	Class I - V	Lower class	No	Ca Rectum
200	200	CMC	45	Female	48	Housewife	Rangunia	Rural	Married	Can read and write	Upper class	No	Ca Cervix

Appendix VI

Patient Data Reports and Prescription



চট্টগ্রাম মা-শিশু ও জেনারেল হাসপাতাল (Revised)
CHATTOGRAM MAA-SHISHU O GENERAL HOSPITAL
Agrabad, Chattogram, Bangladesh
Tel: 88-031-711236, 2520063, 718521, 718525 I Fax: 88-031-2525409
E-mail: cmoshctg@gmail.com I Website: www.cmoshbd.org

Unit ___ Bed No. ___ Reg. No. ___ Name of Patient : ___ Age : ___

FOLLOW-UP SHEET

Date : Time : Hospital Day :

Diagnosis : Δ Ca. breast (Rt) ε hep. mets

1) Subjective : ε consolidation ε renal impairement ε pleural effusion ε ascities ε T2DM ε HTN.

2) Objective : HPR: IDC, NST (Grade-II) (26.3.22)

IHC: ER (-ve)
PR (-ve)
HER-2 (+ve)

Assesment :

Plan :

e : Time : Hospital Day :

gnosis : AdV

ubjective : ① chest X-ray

bjective :

· Syp. Avolac
4 TSF @ night

· Neb. ε budicort — BD

sesment : · Check eBG - 8 hrly

· Cont. catheterization.

n :

TREATMENT SHEET

Fresh order ✓ 8.10.22 12.30 pm

// Diet: NG tube feeding (diabetic)

// O_2 inhalation 2-15 L/min - SOS.

// propped up position.

// Inf. NS 1L + inj vit B & vit C
I/V @ 20 d/min. — daily.

// Inj Rofecin 1 gm
1 vial I/V — 12 hrly [SF: 2.10.22]

// Inj Actrapid S/100
18 + 18 + 16 (±2) S/C ½ hr A/C

// Inj Vibrenta S/100
0 + 0 + 20 (S/C ½ hr A/C)

· Tab. Inj Pantonix 20 mg
1 vial I/V — BD.

· Tab. Telpro 80 mg
0+0+1.

· Tab. Direkic 40/50 mg
1+0+0.

· Tab. Dicaltrol 0.25 mcg
0+1+0

· Cap. Zif CI
1+0+1.

· Tab. Apetiz 160 mg
1+0+1.

· Tab. Unsocol 300 mg
1+0+1.

· Nystat oral drop
15 drops over tongue — TDS

· viodin mouthwash
Gurgle — TDS

Page No. -

Page

Seal :

সাইটোপ্যাথ
CYTOPATH
SPECIALISED CENTRE FOR CYTO-HISTOPATHOLOGY AND DIAGNOSTIC CARE

Patient Name: Mrs. Rokeya Begum. **Age:** 35years **Sex:** Female **Lab ID:**H-492/22
Name of the specimen: Tissue from right breast breast lump.
Referred by: CMCH.
Received on: 14.09.2022 **Reported on:** 21.09.2022

HISTOPATHOLOGY REPORT

Gross: A tiny pieces of tissue.
Blocks : Embedded as such.
Microscopic examination:
Sections from submitted breast tissue showed infiltration of anaplastic ductal epithelial cells with moderate pleomorphism and hyperchromatic nuclei invading the surrounding stromal tissue.

Impression: Breast lump (biopsy): **Invasive Duct Cell Carcinoma.**
Advice: Immunohistochemistry for ER, PR, HER2.

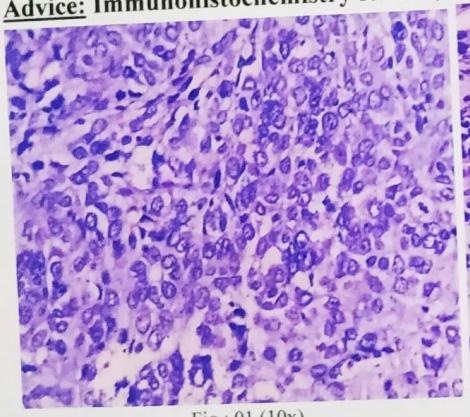


Fig.: 01 (10x)

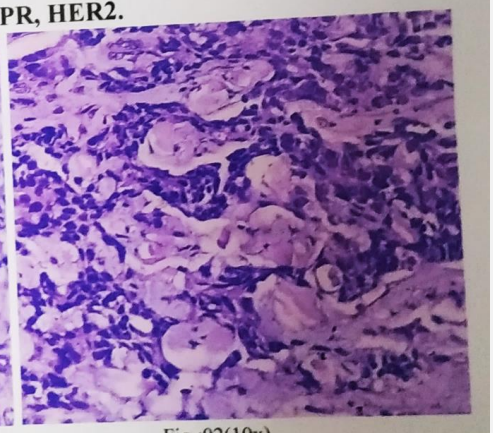


Fig.:02(10x)

[N.B: Specimen, blocks and slides will be preserved for 1 month. If needed collect within given period of time]
**This report is not valid for any medico-legal purpose.

Dr. Dipa Sarkar
MBBS, M.Phil(Path)
Associate professor and head
Department of Pathology
Institute of Applied Health Sciences
Bangabandhu Memorial Hospital

Dr. Ummeh Habiba
MBBS, M.Phil(Path)
Assistant professor
Department of Pathology
Comilla Medical College

১০৯, কে.বি ফজলুল কাদের রোড, পাঁচলাইশ আ/এ, চট্টগ্রাম
মোবাইল: ০১৮৬৫৩৫৫২০৩

CHEVRON
CLINICAL LABORATORY (PTE) LTD.

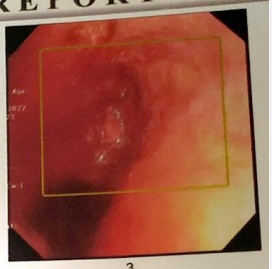
12/12 O.R.Nizam Road, Panchlaish, Chittagong, Bangladesh
Phone : 880-31-652963, 652860, 652533, 657863, 2550642-45
E-mail : chvrnlabctg@yahoo.com
Website : www.chevron-ctg.com

Identity No.	E-65	**Visit Date**	15 July, 2022
Patient Name	Mr.Mofiz Ahmed	**Age / Sex**	46 / Male
History	N/A	**Instrument**	N/A
Referrer	Dr.Jannatun Nisa.MBBS.FCPS.	**Bed**	OPD

BRONCHOSCOPY PROCEDURE REPORT


1


2


3

Procedure : BRONCHOSCOPY

Medication : N/A

Indication : N/A

Vocal Cord	Lt.palsy.
Adduction with phonation:	Lt.absent
Coarina	sharp

Bronchoscopic Findings

Left Lung

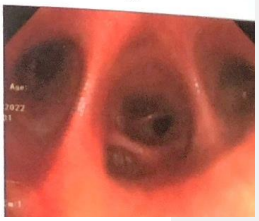
Upper Lobe	Malignant growth invading Lt.upper lobe. (pl.see pict. 3 & 4)	
Lower Lobe	normal	

Right Lung

Upper Lobe		
Middle Lobe	normal	(Pl. see the pict.5 & 6)
Lower Lobe		


4


5

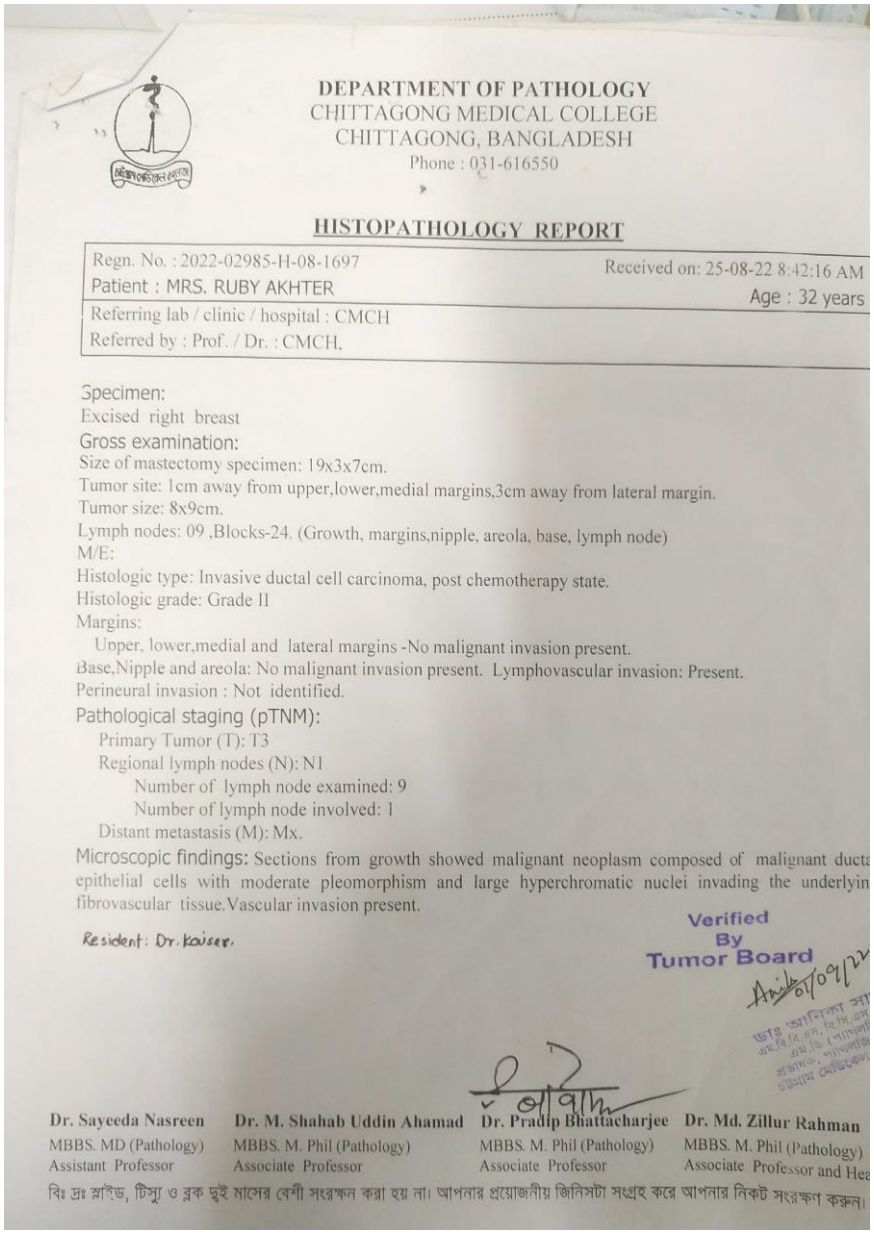


Specimen Taken	
washing	Taken.
Brushing	not taken.
	taken for malignant cells .

Comments 1.Lt.vocal cord palsy.
2.Lt.Upper lobe Bronchogenic carcinoma .

15 JUL 2022

Md Shahadat Hossain



DEPARTMENT OF PATHOLOGY
CHITTAGONG MEDICAL COLLEGE
CHITTAGONG, BANGLADESH
Phone : 031-616550

HISTOPATHOLOGY REPORT

Regn. No. : 2022-02985-H-08-1697 Received on: 25-08-22 8:42:16 AM
Patient : MRS. RUBY AKHTER Age : 32 years
Referring lab / clinic / hospital : CMCH
Referred by : Prof. / Dr. : CMCH,

Specimen:
Excised right breast
Gross examination:
Size of mastectomy specimen: 19x3x7cm.
Tumor site: 1cm away from upper,lower,medial margins,3cm away from lateral margin.
Tumor size: 8x9cm.
Lymph nodes: 09 ,Blocks-24. (Growth, margins,nipple, areola, base, lymph node)
M/E:
Histologic type: Invasive ductal cell carcinoma, post chemotherapy state.
Histologic grade: Grade II
Margins:
Upper, lower,medial and lateral margins -No malignant invasion present.
Base,Nipple and areola: No malignant invasion present. Lymphovascular invasion: Present.
Perineural invasion : Not identified.
Pathological staging (pTNM):
Primary Tumor (T): T3
Regional lymph nodes (N): N1
Number of lymph node examined: 9
Number of lymph node involved: 1
Distant metastasis (M): Mx.
Microscopic findings: Sections from growth showed malignant neoplasm composed of malignant ducta epithelial cells with moderate pleomorphism and large hyperchromatic nuclei invading the underlyin fibrovascular tissue.Vascular invasion present.

Resident: Dr. Kaiser.

Verified
By
Tumor Board
01/09/22

Dr. Sayeeda Nasreen	Dr. M. Shahab Uddin Ahamad	Dr. Pradip Bhattacharjee	Dr. Md. Zillur Rahman
MBBS. MD (Pathology)	MBBS. M. Phil (Pathology)	MBBS. M. Phil (Pathology)	MBBS. M. Phil (Pathology)
Assistant Professor	Associate Professor	Associate Professor	Associate Professor and Hea

বিঃ দ্রঃ স্লাইড, টিস্যু ও ব্লক দুই মাসের বেশী সংরক্ষন করা হয় না। আপনার প্রয়োজনীয় জিনিসটা সংগ্রহ করে আপনার নিকট সংরক্ষণ করুন।