

# **Analysis of the Prescription Data of Cancer Patients from a Specialized Cancer Hospital in Dhaka**

By

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20146075

A thesis submitted to the School of Pharmacy in partial fulfillment of the requirements for  
the degree of Bachelor of Pharmacy (B. Pharm.)

School of Pharmacy  
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## **Declaration**

It is hereby declared that

1. The thesis submitted is my own original work while completing degree at Brac University.
2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The thesis does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I have acknowledged all main sources of help.

**Student's Full Name & Signature:**

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## Approval

The thesis titled “Analysis of the Prescription Data of Cancer Patients from a Specialized Cancer Hospital in Dhaka” submitted by Prianka Saha Peu (20146075), of Spring, 2020 has been accepted as satisfactory in partial fulfillment of the requirement for the degree of Bachelor of Pharmacy.

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## **Ethics Statement**

This study does not include any form of animal or human trial.

## **Abstract**

Cancer is the 3<sup>rd</sup> most common cause of death across the world. Prescription analysis of cancer patients is particularly significant because prescription errors during cancer treatment can produce severe side effects and can significantly reduce the treatment response of cancer patients. The current study involved the analysis of data collected from the prescription of 35 cancer patients during a questionnaire survey conducted previously in a cancer-specific hospital. From this study, it was found that 5-fluorouracil was the most commonly prescribed anticancer medication. It was administered to 14 patients with different types of cancer. In addition, anticancer drugs like cisplatin, paclitaxel, docetaxel, oxaliplatin, carboplatin, vinblastine, dacarbazine, vincristine, etoposide, bendamustine, rituximab, and ifosfamide are also prescribed to various cancer patients. The study didn't identify any drug-drug interactions.

**Keywords:** Cancer; Prescription analysis; 5FU; anticancer medication; breast cancer.

## **Dedication**

This project is dedicated to my beloved parents and my two wonderful sisters for their unwavering love and support.

## **Acknowledgement**

To begin with, I would like to express my gratitude to my supervisor, Dr Nishat Zareen Khair, an assistant professor at BRAC University's School of Pharmacy, for her continuous guidance and immense support throughout my project work.

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## **List of Acronyms**

|       |                                             |
|-------|---------------------------------------------|
| WHO   | World Health Organization                   |
| GCO   | Global Cancer Observatory                   |
| WM    | Waldenstrom Macroglobulinemia               |
| ICSOL | Intra - Carnial Space Occupying Lesion      |
| 5FU   | 5 Fluorouracil                              |
| AMCGH | Ahsania Mission Cancer and General Hospital |
| DPD   | Dihydropyrimidine Dehydrogenase             |
| HPV   | Human Papilloma Virus                       |

# **Chapter 1**

## **Introduction**

### **1.1 Overview on Cancer**

There was a time when Cancer was less common, but in the past few decades, it has set a milestone and increased sharply. One of the most feared diseases of the 20<sup>th</sup> century, cancer has increased at a sharp rate, and in the 21<sup>st</sup> century this is the most common issue. The fact that one in four people will develop cancer in their lifetime speaks volumes about the dire circumstances. So, what is cancer? Cancer is simply the result of abnormal cell growth. Any organ or bodily structure can develop cancer, which is composed of microscopic cells that have an insatiable need for growth (Roy & Saikia, 2016). Sometimes a regular radiological examination or laboratory test may "incidentally" detect cancer or some other issue. Normally, for identification of cancer, it must grow to a size of 1 cm or contain 1 million cells. In this case, it could be addressed as growth, mass, or lump. Lymphomas and leukemias, malignancies of the bone marrow and blood that constantly don't generate a "mass," are the exceptions to this rule. However, they will show up on laboratory tests. The most significant factor in the development of cancer than the transformation of an ordinary cell into a malignant one is probably the immune system's inability to detect and eradicate newly generated cancer cells even though they are still few. A person's risk of developing cancer is increased if their immune system is compromised by any of the following: long-term stress, aging, chronic illnesses that impair function, prior chemotherapy, and misuse of medications such as corticosteroids, antibiotics, and analgesics (Roy & Saikia, 2016).

## **1.2 Comparison of Global Cancer Scenario with Bangladesh**

In Bangladesh, cancer ranks among the main reasons for death. Cancer is expected to be the biggest cause of death in Bangladesh by 2040, making up 12% of all fatalities (Chowdhury et al., 2024). Recent World Health Organization research evaluates that 1.5 million people in Bangladesh suffer from cancer, with 100,000 of them losing their lives to the disease annually (World Health Organization: WHO & World Health Organization: WHO, 2022). Based on GCO (Global Cancer Observatory) data, Bangladesh experienced 116,598 documented losses and 167,256 new cases of cancer in 2022, signifying growth of 11% and 8%, respectively, over 2018 (Bray et al, 2024). With 5214 fatalities, cervical cancer ranks as the 2nd most common disease among Bangladeshi women (Roney & Aluwi, 2024). In Bangladesh, the most frequently diagnosed cancers in men are stomach and lung cancers, accounting for 37.04% of all cases (Alam et al., 2020).

On the other hand, it is predicted that in 2022, there will be 9.7 million cancer-related deaths worldwide along with 20.0 million new cases for both sexes combined. The majority of cancer fatalities worldwide (56.1%) and 49.2% of all cases, over half, were predicted to take place in Asia in 2022, a region that is home to 59.2% of the global population. In Asia and Africa, the burden of cancer mortality is disproportionately higher than the burden of incidence. With less than 10% of the world's population (9.6%) and one-fifth of all cancer cases (22.4%) and deaths (20.4%) occurring there, Europe has a disproportionately high cancer incidence and burden of mortality. Furthermore, lung cancer is the most prevalent cancer diagnosed globally (overall cases of 12.4%), with stomach (4.9%), prostate (7.3%), colorectum (9.6%), and female breast (11.6%) cancers following closely behind (Bray et al, 2024).

Lung cancer is the main cause of cancer death (all cancer fatalities of 18.7%), then liver at 7.8%, colorectal at 9.3%, female breast cancer with 6.9%, and stomach cancer with 6.8%. According to

Statistics of Global Cancer 2022, prostate is the most often diagnosed cancer in men in 118 nations, then lung cancer in 33 countries. Furthermore, breast cancer (157 countries) and cervical cancer (25 out of 28 countries) are the two most frequently occurring cancers diagnosed in women (Bray et al., 2024).

## 1.2 Most Prevalent Types of Cancer

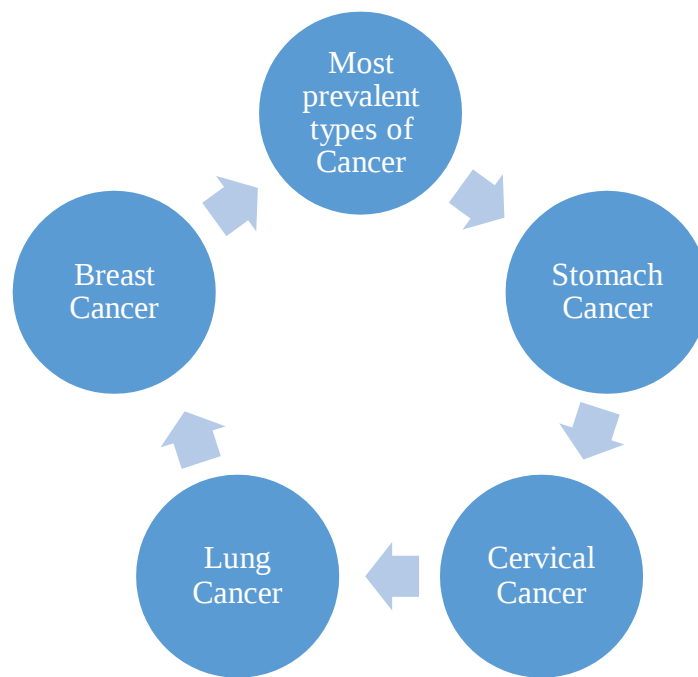


Figure 1- Most prevalent types of Cancer

Cancer comes in over 100 varieties, some of which are more prevalent than others. However, as illustrated in Figure 1, the most prevalent types are stomach, breast, lung, and cervical cancers. For women, breast cancer is the leading cause of death and a potentially lethal condition (Akram et al., 2017). Breast cancer occurs when abnormal cells in the breast grow and expand uncontrollably and turn into tumors. If untreated, these tumors tend to expand to other parts of the body and demonstrate fatality. The cancer cells of the breast begin in the milk ducts or the lobules that

generate milk. The initial type, known as in situ, can be detected early and is not harmful to human life. Invading cancerous cells can result in tumors that produce lumps in the breast tissue (World Health Organization: WHO & World Health Organization: WHO, 2024). A lump or many lumps in the breast or under the arm are common signs of this cancer (Malherbe et al., 2022).

Stomach cancer is a complicated cancer that occurs when aberrant cells grow in the stomach's inner lining. Multiple factors like smoking, excessive salt consumption, and occasionally a genetic component from the family are involved in the development of this cancer. This cancer is usually diagnosed in people between the ages of 55 and 80, and it usually progresses slowly over the years. Adenocarcinomas, which fall into two main histological categories intestinal and diffuse, account for almost 90% of stomach malignancies (Correa & Piazuelo, 2013). Diffuse stomach cancer is more frequently associated with abnormalities in genes, whereas the intestinal type is frequently associated with nutrition, lifestyle, and *Helicobacter pylori* infection (Hu et al., 2012).

Lung cancer is a form of cancer in which tumors form as a result of aberrant and unchecked cell proliferation in the lung tissues (World Health Organization: WHO & World Health Organization: WHO, 2023). The biggest risk factor for this cancer is smoking. Furthermore, weight loss, blood in the cough and breathlessness are the most usual indications of this cancer. The two primary categories of this cancer are non-small and small cell carcinoma, which consists of adenocarcinoma, large cell carcinoma and squamous cell carcinoma. These two types of lung cancer have different treatment options. Surgery is occasionally used to treat non-small cell cancer, but radiation and chemotherapy are typically more effective for small cell cancer (Baig & Yadav, 2021).

When cells in the region that connects the uterus and vagina, known as the cervix, experience aberrant alterations, cervical cancer occurs. Around 660,000 new instances of cervical cancer were

reported worldwide in 2022, making it the 4th most frequent malignancy in women. A persistent high-risk HPV infection can lead to the development of aberrant cells that eventually develop into cancer (World Health Organization: WHO, 2024). Ninety-five percent of cervical cancers are caused by this infection of the cervix, which is the lowest portion of the womb or uterus that enters into the vagina, if proper treatment is not received. It usually takes fifteen to twenty years for aberrant cells to develop into cancer, but in women with compromised immune systems, this time might be as short as five to ten years. Among other things, smoking cigarettes, using birth control pills for an extended period (particularly for more than five years), having several sexual partners, which raises the chance of HPV exposure, and having sexually transmitted diseases are risk factors for this cancer (World Health Organization: WHO, 2024).

### **1.3 Anticancer Medications**

Anti-cancer medications are a vital part of the cancer treatment plan. Bangladesh may face major public health issues as a result of inadequate availability of necessary anticancer medications. Anticancer or antineoplastic medications, commonly referred to as cancer-care medications, are essential for the management of malignant illnesses. These medications fall into several categories, including monoclonal antibodies, antimetabolites, alkylating agents, anthracyclines and other cytotoxic drugs, antiproliferates, immunosuppressants, and antilymphocytes. Cisplatin, 5-fluorouracil (5FU), Carboplatin, and Paclitaxel are the four most often recommended anti-cancer medications, according to Bangladesh Pharmaceutical Journal. These medications also rank among Bangladesh's best-selling anticancer medications (Reza et al., 2020).

### **1.4 Prescription and Prescription Errors**

A prescription is a medical program that a doctor implements in the form of guidelines that control

the course of treatment for a specific patient (Kumar et al., 2019). Writing prescriptions is an important task that implies the prescriber's duty to ensure clinical care and patient safety, which has legal ramifications. It is a formal prescription for a drug that a doctor has prescribed for a patient's diagnosis, prevention, and care. Not all prescribers are medical professionals. The authority to write a prescription is governed by either national or local (i.e., state or provincial) laws. The only people who can prescribe allopathic medications are licensed medical professionals, such as veterinarians, dentists, and allopathic doctors, who have registered with the appropriate State Council (Kumar et al., 2019).

Prescription errors can result from unclear or misinterpreted prescriptions, incorrect and illogical prescriptions, as well as from prescribing too many or too few medications. The patient's treatment may be hampered by prescription errors. The errors of prescription fall into two types of categories: errors of commission and errors of omission. Omission errors result in prescriptions that are not fully filled out, such as incomplete dosage, dosage form, refill time, and patient information (which must be on the prescription), as well as illegible prescriptions (prescriptions that are hard to read due to poor handwriting). Inaccurate information about the medicine or patient, such as the incorrect drug, route, dosage form, or strength, drug-drug interactions, and possibly even the patient's inaccurate name, which could result in the medication being given to the wrong patient, are all examples of errors of commission (Gul, 2014).

## **1.5 Objective**

The main objective of this study is to perform a thorough analysis of the prescriptions collected from cancer patients, with a particular emphasis on the kinds of anticancer drugs prescribed for different cancer types. The study also aims to look for any possible drug-drug interactions that might be present in these treatment plans.

## **Chapter 2**

### **Methodology**

In the current study, the data collected from the 35 cancer patients were analyzed in order to fulfill the objective that was mentioned in the previous section. During a three-month questionnaire-based study, Golam Morshid, a Bachelor of Pharmacy Student, collected data on 103 patients who were hospitalized with cancer at Ahsania Mission Cancer and General Hospital (AMCGH) in Dhaka city between November 22 and January 23. This current study focuses on the data collected from the prescriptions of 35 of the 103 patients. This study analyzes a subset of data from the prescriptions of 35 patients that have not been previously explored. For this analysis, we have listed down all the drugs that were prescribed for specific cancer types in a Microsoft Excel spreadsheet. Additionally, we have performed a manual checkup to determine which anticancer medications are most commonly prescribed for various cancer types. We have also manually reviewed and used software to search for any possible drug-drug interactions.

## Chapter 3

### Result and Discussion

A total of 35 prescription analyses are completed for this cancer survey. Here, we observed several aspects such as the various types of cancer that people are being diagnosed with, the variations in medications, and the prescribed treatments. Each of these aspects is further shown with multiple tables and figures, and a more thorough discussion is conducted below:

| Patient Number | Type of Cancer       | Medications                             |
|----------------|----------------------|-----------------------------------------|
| 1              | Adenocarcinoma sinus | Cisplatin                               |
| 2              | Vocal cord           | Docetaxel, 5FU                          |
| 3              | Rectum               | 5FU, Oxaliplatin                        |
| 4              | Breast               | Trastuzumab 380 mg,<br>Paclitaxel 280mg |
| 5              | Breast               | Zoledronic acid 4mg                     |
| 6              | Breast               | Carboplatin 450 ,<br>Paclitaxel 330mg   |
| 7              | Lymphoma hodgkin     | Vinblastine9mg,<br>Dacarbazine 800mg    |

|    |                             |                                                      |
|----|-----------------------------|------------------------------------------------------|
| 8  | Follicular lymphoma stage 4 | Bendamustine,<br>Rituximab                           |
| 9  | Esophageal                  | Dexamethasone<br>5mg, 5FU,<br>Oxaliplatin,<br>Plazen |
| 10 | Mouth                       | Sonexa, Sergel,<br>Vitabiolt,Prelin                  |
| 11 | Colon                       | Ropenem,<br>Moxivin                                  |
| 12 | Lymphoma                    | Ascason, V-plex,<br>1 vonon                          |
| 13 | Adenocarcinoma              | Humalog<br>kwikpen,Clopid                            |
| 14 | Acute pyelonephritis        | Prazopress,<br>Ridon                                 |
| 15 | Cholangiocarcinoma          | Tab papaya ,<br>Lubilax                              |
| 16 | Brain                       | Sucralfate,<br>Cisplatin ,<br>Etoposide              |
| 17 | Soft tissue                 | Cyclotox,<br>Ifosfamide,<br>Vincristine              |

|    |                             |                                     |
|----|-----------------------------|-------------------------------------|
| 18 | Stomach                     | Docetaxel, 5FU, Oxaliplatin         |
| 19 | ICSOL-adenocarcinoma        | Paclitaxel, Carboplatin             |
| 20 | Cervical                    | INJ Cisplatin 50mg , Clonotril, 5FU |
| 21 | Tongue                      | Ropenia, Carboplatin , Paclitaxel   |
| 22 | Penis cancer- squamous cell | 5FU                                 |
| 23 | Esophagus cancer            | Cisplatin, 5FU                      |
| 24 | Tonsil                      | Cisplatin, 5FU                      |
| 25 | Liver                       | Cisplatin, 5FU                      |
| 26 | Acute abdomen HTN           | No                                  |
| 27 | Prostate cancer             | Firmagon, Abiraterone               |
| 28 | Lung                        | Urso, Zofran, Famoloc               |
| 29 | Breast                      | Fluclox, Troxyl                     |

|    |         |                            |
|----|---------|----------------------------|
| 30 | Lung    | Cisplatin,5FU              |
| 31 | Stomach | Cisplatin,5FU              |
| 32 | Breast  | Cisplatin,5FU              |
| 33 | Breast  | Fluclox, Othera,<br>Anadol |
| 34 | Rectum  | Cisplatin,5FU              |
| 35 | Stomach | Cisplatin,5FU              |

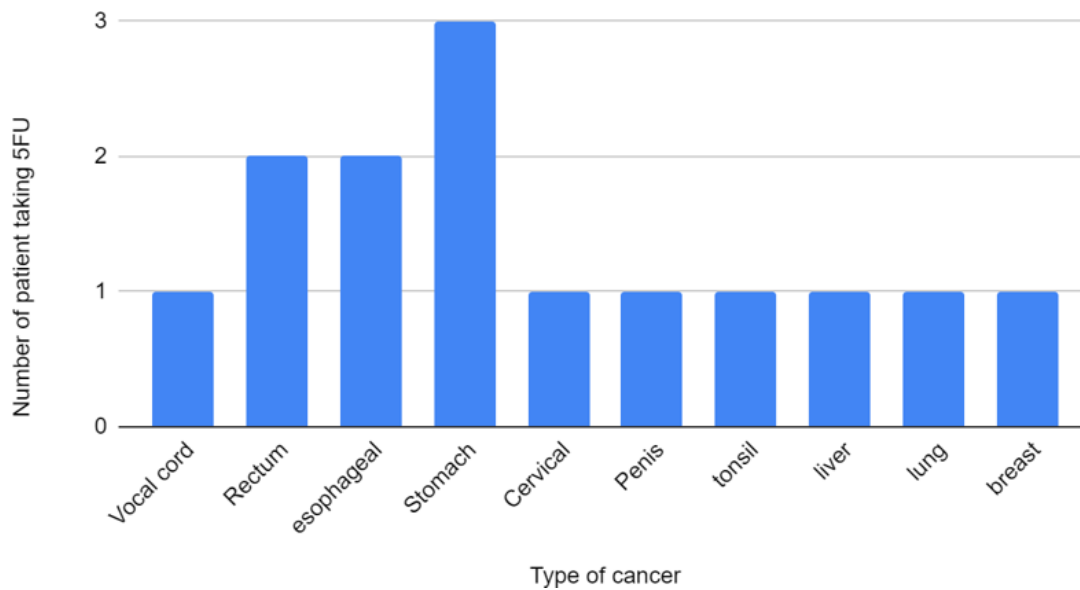
*Table 1: A dataset containing information on the cancer types of each of the 35 individuals and the specific drugs (the green color indicates anticancer drug) prescribed to them.*

From the above table: The anticancer drugs are highlighted in green color. Six of the 35 patients in this study were diagnosed with breast cancer, making it the most common diagnosis, as can be seen from the analysis of the above table. A variety of other cancer types were present in the remaining patients, including stomach cancer in 3 patients, lymphoma in 3 patients, adenocarcinoma in 3 patients, rectum in 2 patients, esophageal cancer in 2 patients, lung in 2 patients, vocal cord cancer in 1 patient, mouth in 1 patient, colon in 1 patient, acute pyelonephritis in 1 patient, cholangiocarcinoma in 1 patient, brain cancer in 1 patient, soft tissue in 1 patient, cervical cancer in 1 patient, tongue in 1 patient, tonsil cancer in 1 patient, liver in 1 patient, squamous cell penis cancer in 1 patient, acute abdomen HTN in 1 patient, and prostate cancer in 1 patient. According to the above table, there are 13 anticancer drugs in all, along with 4 antibiotics and 32 additional medications for pain, nutritional supplements,

gastrointestinal issues and other medical conditions. Between the 35 patients, 23 patients were taking anticancer drugs or chemotherapy drugs. Among these anticancer medications, fourteen patients were prescribed 5FU, ten patients cisplatin, four patients paclitaxel, three patients carboplatin, one patient docetaxel, one patient bendamustine, one patient ifosfamide, three patients oxaliplatin, and one patient each of etoposide, vinblastine, dacarbazine, rituximab and vincristine was prescribed.

Furthermore, it is evident from this that the anticancer medication 5FU was prescribed to the greatest number of patients. 5FU was commonly combined with other anticancer medications such as Docetaxel, Oxaliplatin, and Cisplatin to treat various cancer types. Additionally, patients were not as frequently prescribed anticancer medications like vinblastine, etoposide, dacarbazine, and vincristine.

Among chemotherapeutic medicines that are used to treat solid tumors worldwide, 5-fluorouracil is the 3rd most popular (Sara et al., 2018). This antimetabolite is among the best-selling medications that are available in Bangladeshi pharmacies (Reza et al., 2020). This drug is an analog of pyrimidine, consisting of a furan and pyrimidine ring (Kim et al., 2024). Through thymidylate synthase inhibition and metabolite incorporation into DNA and RNA, this drug produces its anticancer effects. The side effects of 5 FU that are most commonly linked to its use include pneumonia, nausea, decreased appetite, and mucosal inflammation (Kadoyama et al., 2012). 5FU is administered intravenously as a continuous or as a bolus infusion. Although the liver can quickly metabolize intravenous drug in fifteen to twenty minutes, continued infusion may raise the possibility of its toxicity (Jules et al., 2022).

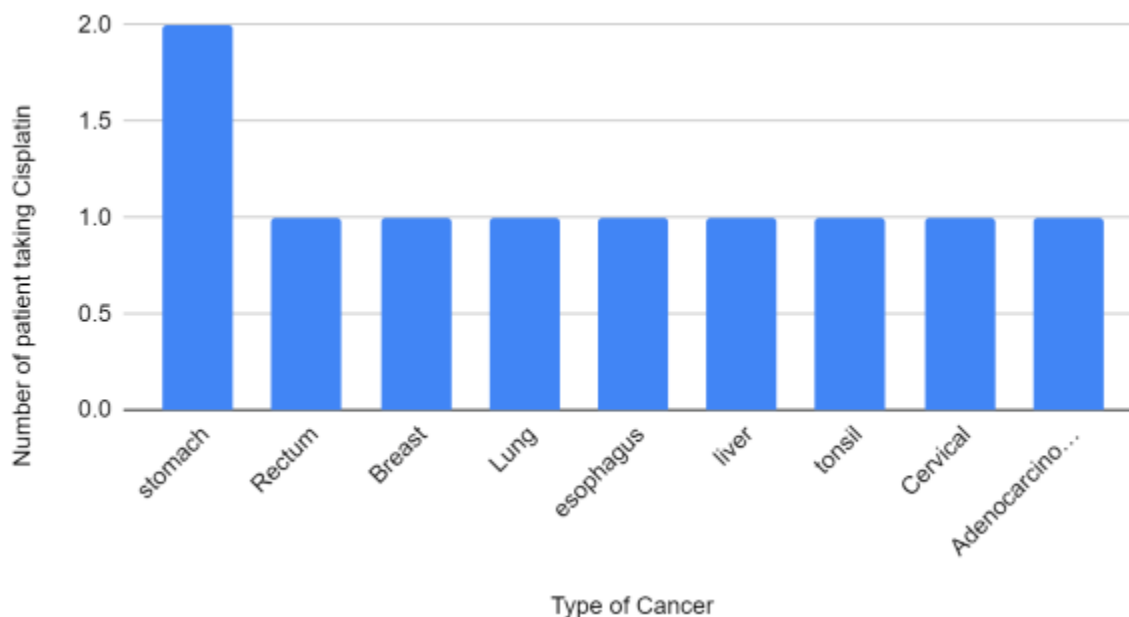


*Figure 2: The number of patients receiving 5FU for their particular cancer type*

The number of patients taking 5FU is shown on the y-axis of the above bar chart (Figure 2), while the type of cancer for which the patients were prescribed 5FU is shown on the x-axis. Furthermore, every single patient with cancers of the breast, liver, lung, penis, tonsils, cervical, and vocal cord used 5FU. Additionally, two patients were receiving 5FU for rectum cancer and another two patients were receiving 5FU for esophageal cancer. Also, three patients were receiving 5FU for stomach cancer. 5FU shouldn't be administered to people who lack the enzyme dihydropyrimidine dehydrogenase (DPD). A lack of DPD might have potentially fatal consequences since it aids in the body's breakdown of 5FU. Additionally, women who are nursing or pregnant, have a known allergy to 5FU, have decreased bone marrow function, or suffer from liver or renal problems shouldn't take 5FU (Yoshida et al., 2015).

Based on our prescriptions, cisplatin is the second most commonly used anticancer medication among patients. It is an antineoplastic agent in the alkylating agent class. One of the most commonly used chemotherapeutic medicines for solid tumors and hematologic malignancies is cisplatin. It can be applied as a neoadjuvant or induction treatment alone or in combination (Gold & Raja,

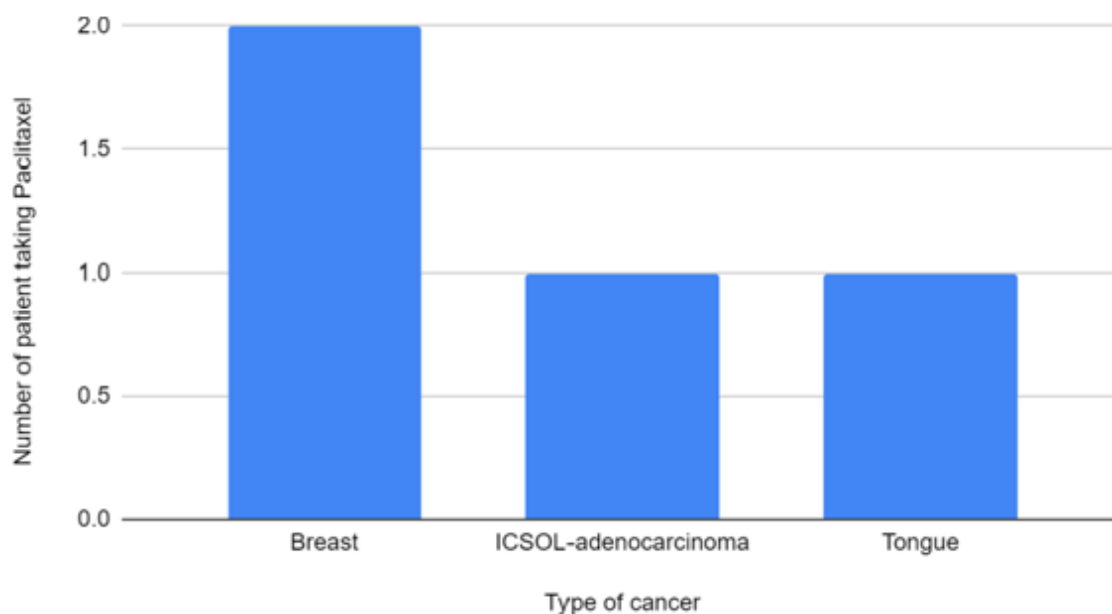
2023).



*Figure 3: The number of patients receiving Cisplatin for their particular cancer type*

The number of patients taking Cisplatin is shown on the y-axis of the above bar chart (Figure 3), while the type of cancer for which the patients were prescribed Cisplatin is shown on the x-axis. Here, we can see that there were patients with cervical, adenocarcinoma sinus, tonsil, liver, esophagus, lung, rectum, and breast cancer who were all taking Cisplatin as their anticancer drug. In addition, two patients with stomach cancer were on cisplatin. Cisplatin works by causing cytotoxicity that is not specific to the cell cycle. This is accomplished by platinum covalently attaching to the purine bases adenine and guanine (Gold & Raja, 2023). Subsequent strand breaks are caused by intra-strand and inter-strand crosslinks created by this covalent interaction. Despite the presence of DNA repair processes, cells often die, either through apoptotic or non-apoptotic mechanisms, due to residual damaged proteins, RNA, and DNA. In particular, this anticancer drug is effective for rapidly dividing cells, which is why it performs well against fast-growing malignant

tumors. However, it may be less effective for tumors that grow more slowly. Cisplatin can be given as an injectable agent either intravenously or intra-arterially. Extravasation is a common adverse effect of cisplatin. The infusion should be discontinued right away if extravasation is suspected (Gold & Raja, 2023).



*Figure 4: The number of patients receiving Paclitaxel for their particular cancer type.*

In the bar chart (Figure 4) above, the y-axis shows the number of patients using Paclitaxel and the x-axis shows the type of cancer for which the patients were prescribed Paclitaxel. Additionally, Paclitaxel was used by 1 patient with tongue cancer and 1 patient with ICSOL adenocarcinoma. Furthermore, Paclitaxel was being taken by two breast cancer patients. It is a broadly recognized anticancer medication with a unique mechanism of action, making it one of the most effective natural anticancer treatments available. In contrast to other anticancer medications that bind tubulin, paclitaxel prevents the breakdown of microtubules and encourages tubulin to assemble into microtubules. This action blocks cell cycle progression, halts mitosis, and suppresses the growth of cancer cells (Zhu & Chen, 2019). A solubilizer called Cremophor EL is used in commercially available formulations of paclitaxel to improve solubility. The formulation's

inclusion of Cremophor EL causes peripheral neuropathy, hyperlipidemia, and hypersensitivity responses. Also, hypersensitivity, myopathy, hepatotoxicity, neurotoxicity, and exhaustion are among the typical toxicities linked to paclitaxel. Because of its toxicities, delivery systems that can lower systemic toxicity while boosting safety and effectiveness must be developed. Moreover, delivery systems such as pastes, liposomes, and nanospheres were examined to overcome the disadvantages of Cremophor EL in formulating paclitaxel without its use (Alqahtani et al., 2019). Additionally, the first table shows that anticancer medication like carboplatin were prescribed for tongue, breast, and ICSOL adenocarcinoma cancers. Carboplatin is an alkylating agent. This medication is part of a class known as platinum-containing compounds (Thornton, 2023). This medication functions similarly to cisplatin, yet its toxicity and structure are different. Carboplatin is distinguished by its capacity to create DNA lesions by forming adducts with platinum. This causes transcription and replication to be inhibited, which ultimately results in cell death. The toxicity of carboplatin in clinical treatment is minimal. Furthermore, certain patients may develop resistance to this medication throughout treatment, which might limit its full efficacy and cause significant inconvenience (De Sousa et al., 2014).

Moreover, oxaliplatin was prescribed for stomach, esophagus, and rectum cancer, while docetaxel was administered for vocal cord cancer.

Oxaliplatin is a platinum-based chemotherapy. These chemotherapies consist of heavy metal compounds that block the synthesis of protein, RNA, and DNA in cells, all of which are essential for cell division and growth. By stopping the cells from dividing, oxaliplatin helps to stop the growth of cancer (Culy et al., 2000). This drug is frequently used in combination with other chemotherapeutic drugs, the most popular of which is 5fu, due to its limited activity in many tumors when used alone. Although the precise mechanism of 5fu and oxaliplatin's synergism is

complicated, research indicates that oxaliplatin may slow down 5fu's catabolism by inhibiting dihydropyrimidine dehydrogenase (Alcindor & Beauger, 2011). Additionally, three patients were prescribed oxaliplatin and 5FU together throughout the prescription analysis for this current study. Docetaxel is an antineoplastic agent and belongs to the taxoid family's second generation. Due to its high lipophilic nature, this compound is almost insoluble in water. It functions by inhibiting the depolymerization of microtubules. In order to stabilize the microtubule structure and stop them from disassembling, it attaches itself to tubulin, a protein that produces microtubules. This interferes with regular cell division, which leads to mitotic arrest and, eventually, cell death, particularly in cancer cells that divide quickly. This drug contains alcohol, which can make you intoxicated (Imran et al., 2020).

Moreover, Vincristine was administered for soft tissue cancer, whereas etoposide was prescribed for brain cancer. This drug is a part of the vinca alkaloids class and blocks cancer cells from proliferating effectively. By interrupting the microtubule polymerization procedure during mitosis, this substance restricts cell proliferation. (Awosika et al., 2023).

An inhibitor of topoisomerase II is etoposide. The late S and G2 phases of the cell cycle are when it largely acts. Topoisomerase II simultaneously cuts the DNA helix's two strands. During replication, it forms and reseals cracks in double-stranded DNA. Etoposide contaminates the complexes formed by topoisomerase II cleavage, preventing DNA re-ligation, the reaction's second step. A mutagenesis and cell death process is triggered by the etoposide-topoisomeraseII complex, and this mechanism is most effective in tumor cells that have higher amounts of topoisomerase II enzymes (Reyhanoglu & Tadi, 2023).

For Hodgkin lymphoma, vinblastine and dacarbazine were both recommended in combination. Vinblastine is an alkaloid derived from the periwinkle, a flowering herb. This anticancer drug

prevents cell division during metaphase by attaching itself to microtubular proteins in the mitotic spindle. By blocking the use of glutamic acid and halting purine synthesis, the urea generation and citric acid cycle also disrupts the metabolism of amino acids. Vinblastine is mainly eliminated in the feces after being substantially metabolized by the liver. This drug usually has myelosuppressive side effects and is well tolerated (Chun et al., 2009).

Dacarbazine is an alkylating agent which is mostly used in the treatment of Hodgkin lymphoma cancer. This drug is a derivative of imidazole carboxamide, which shares structural similarities with purines. There are three potential ways that this medication works. They are as follows: via functioning as an alkylating agent, inhibiting the synthesis of DNA via functioning as a purine analog, and interacting with SH groups (Świdorski et al., 2021).

The anticancer drug ifosfamide was prescribed for a patient with soft tissue cancer. It is an alkylating agent used to treat several types of cancer that cause DNA to become cross-linked. Also, this drug belongs to the nitrogen mustard family. It is reported to work by obstructing the replication of DNA and the production of RNA. Ifosfamide is linked to a number of potential harmful kidney symptoms, including glomerular disease, Fanconi syndrome, and hemorrhagic cystitis. Patients who qualify for ifosfamide therapy should be made aware of the risk of permanent renal impairment (Sprangers & Lapman, 2020).

The chemotherapeutic drug bendamustine was prescribed in combination with rituximab for a patient with follicular lymphoma stage 4 cancer. The terms "Benda-R" or "BR" are frequently used to describe the combination of bendamustine and rituximab. Combining the monoclonal antibody Rituximab with the chemotherapy drug Bendamustine is commonly known as chemoimmunotherapy. Bendamustine is an alkylating agent that works by damaging the cell's DNA which leads to cell death. The combination of bendamustin and rituximab is frequently used

for patients receiving first-line therapy, or treatment for the first time, as well as for patients who have received successful treatment in the past but whose Waldenstrom macroglobulinemia (WM) resurfaces (Sarosiek, 2023).

Although the majority of cancer patients received anticancer drugs, some patients with stage 4 follicular lymphoma, acute abdomen hypertension, cholangiocarcinoma, breast, acute pyelonephritis, prostate, lymphoma, esophageal, adenocarcinoma and lung cancer did not receive such medication treatment. Some patients may have had more than one prescription because the ones examined in this study were one-time. As a result, perhaps we overlooked some important information.

Numerous antibiotics were prescribed for different types of cancer patients, as can also be seen from the table below:

| Patient Number | Type of cancer | Prescribed antibiotics |
|----------------|----------------|------------------------|
| 1              | esophageal     | Plazen                 |
| 2              | colon          | Ropenem                |
| 3              | Breast         | Fluclox, Troxyl        |
| 4              | breast         | Fluclox                |

*Table 2: Dataset of patients with various cancer types and the specific antibiotics they were prescribed.*

According to Table 2, a patient with esophageal cancer was prescribed the antibiotic Plazen. Additionally, an antibiotic called Ropenem was given to a patient with colon cancer. One patient was treated with Fluclox, a single antibiotic, for breast cancer. But in addition to Fluclox, another woman with breast cancer was administered the antibiotic Troxyl.

Notably, the examined 35 prescriptions did not contain any drug-drug interactions.

In 2020, the Department of Pharmacy at the University of Dhaka did a similar study on the availability of eleven WHO-listed essential anticancer medications regularly administered in Bangladesh for the top five most common cancer types (cervix, breast, lung, esophagus, lips, and oral cavity). The survey included one hundred and fifty-one pharmaceutical drug stores: twenty-seven model pharmacies, one hundred and nineteen retail pharmacies, and five hospital pharmacies. Among the one hundred and fifty-one pharmacies assessed, 5FU and Cisplatin were the most readily available anticancer medications, according to Bangladesh Pharmaceutical Journal 23. Cisplatin and 5FU were also cited as the anticancer medications with the highest sales (Reza et al., 2020).

Since the analysis in this current study was done on the prescriptions of 35 individuals, it is not possible to draw firm conclusions about the larger situation. Nonetheless, similar outcomes have been noted based on the results of this current study and the findings published in the Bangladesh Pharmaceutical Journal 23.

## Chapter 4

### Conclusion and Future Work

As the number of cancer cases in Bangladesh rises, the illness has gained national attention. Anti-cancer medications are an important part of the cancer treatment plan (Reza et al., 2020). In this current study, we have found that 5FU is the most commonly prescribed anticancer drug among the 35 patient prescriptions. Additionally, other commonly prescribed anticancer drugs include cisplatin, paclitaxel, docetaxel, oxaliplatin, carboplatin, vinblastine, dacarbazine, vincristine, ifosfamide, rituximab, bendamustine and etoposide for various cancer patients. Furthermore, 35 of the prescriptions were found to have no drug-drug interactions. Moreover, we cannot conclude that 5FU is the most prescribed anticancer drug for cancer patients because the analyzed prescriptions were only one-time occurrences, and the study involved a small group of individuals.

After thoroughly reviewing prescription analysis literature in Bangladesh, we found very few well documented results or reports available. In contrast, prescription analysis reports and articles from foreign countries are much more comprehensive and well-documented. For instance, in 2012, research on prescription analysis was carried out in the Midi-Pyrénées area of France among cancer patients 65 years of age and older. This study was conducted among 106 patients (Bugat et al., 2017). Furthermore, in the literature of Bangladesh, there is a lack of adequate datasets that identify the anticancer medications administered for particular cancer types. Investigating the development of these specific datasets is therefore crucial. This study must therefore be extended and carried out on a broader perspective. For example, there should be more analysis of prescriptions conducted on a large population in hospitals across Bangladesh. Additionally, hospitals should appoint pharmacists to assist oncologists in analyzing prescriptions, adjusting dosages, and

monitoring for drug-drug interactions and adverse effects, thereby ensuring the safety and effectiveness of cancer patient care. Academic institutions including medical schools, nursing schools, and universities with pharmacy departments should encourage students to conduct prescription analytic research.

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