

# **Investigation of Prescription Data of Cancer Patients: Insights from a Specialized Hospital in Dhaka**

**By**

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A thesis submitted to the School of Pharmacy in partial fulfillment of the requirements for the  
degree of Bachelor of Pharmacy

School of Pharmacy

BRAC University

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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 **–Investigation of Prescription Data of Cancer patient : Insights from a Specialized Hospital in Dhaka**” submitted by Lamiya Farhin (20146084), of Summer 2024 has been accepted as satisfactory in partial fulfillment of the requirement for the degree of Bachelor of Pharmacy.

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## **Ethics Statement**

If review or non-human or animal studies: This project does not involve any kind of animal and human trial.

## **Dedication**

Dedicated to my parents and my elder brother.

## **Acknowledgement**

First and foremost, I would like to express my gratitude to the Almighty for his endless gifts, which have been given to me in an effort to provide me with the strength and determination to complete this project.

It is my genuine pleasure to offer my heartfelt appreciation to my academic supervisor, Dr. Nishat Zareen Khair (Assistant Professor at BRAC University's School of Pharmacy), for her invaluable guidance and encouragement during this research. Through the course of my education and project writing, she was a true source of advice and support for me. I am quite grateful to her for her valuable comments and ideas during my study, which helped me much in completing my project work in a timely manner.

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## **Abstract**

Cancer is a significant global public health concern with 10 million cancer-related deaths and 19.3 million new cases recorded in 2020. Developing countries with inadequate healthcare systems are disproportionately affected. This study analyzes prescription data of 34 cancer patients that were collected from a prior study. The prescription analysis revealed breast, lung, and colorectal cancers as the most prevalent, with most patients diagnosed in advanced stages, primarily in stages II and IV. Chemotherapy emerged as the primary treatment modality, with 5-FU and Cisplatin being the most commonly prescribed drugs. In addition to this, drugs like Pantoprazole, Esomeprazole, Pregabalin, Enaxoparin Sodium, Mannitol, Pethidine, Clidium Bromide, albumin, Dihydrophenamin were also prescribed but no drug-drug interaction was found. 16 out of 34 patients experienced pain during their treatment but only 2 patients were found to be prescribed with painkillers. According to the study, eight out of thirty-four patients reported an improvement in their physical condition after taking medication, whereas eighteen patients reported no change in their physical state.

Keywords : Cancer, prescription, chemotherapy, 5-FU, Cisplatin, Carboplatin

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# **Chapter One: Introduction**

## **1.1 A worldwide perspective on Cancer**

Cancer is a major health concern all over the world which affects millions of people each year. It is a leading cause of death and imposes a substantial burden on patients, families, and healthcare systems. Like many other countries, Bangladesh is grappling with the serious public health issue of cancer. Dhaka, the capital and largest city of Bangladesh, with its dense population and rapid urbanization, presents unique challenges and opportunities for understanding the prevalence and management of cancer. The burden of cancer in Dhaka has been rising steadily, mirroring global trends but with local specificities influenced by socioeconomic, environmental, and lifestyle factors. According to recent statistics from the National Institute of Cancer Research and Hospital (NICRH) in Bangladesh, the incidence of various cancers such as breast, lung, cervical, and colorectal cancers has been increasing. Breast cancer is notably the most common cancer among women, while lung cancer is prevalent among men. The variation in cancer types and their incidence rates necessitates a detailed examination to identify the most pressing health challenges. According to National Institute of Cancer Research and Hospital most frequently observed cancers in Bangladeshi population are lungs, breast, cervix, lymph node, esophagus, larynx and stomach (Paul et al., 2016). According to estimates from the International Agency for Research on Cancer (IARC), globally there were 14.1 million new cancer cases, 8.2 million cancer deaths and in year 2012 there were 32.6 million people living with cancer (within five years of diagnosis) (Pieper et al., 2019). By 2030, the global burden is expected to grow to 23.6 million new cancer cases and this represents an increase of 68% compared with 2012.(66% in low and medium Human Development Index countries and 56% in high and very high development countries. Tobacco use is the most important risk factor for cancer causing over 20% of global cancer deaths and about 70% of global lung cancer deaths (Brecorder, 2015). Cancer

causing viral infections such as hepatitis B virus (HBV)/hepatitis C virus (HCV) and human papillomavirus (HPV) are responsible for up to 20% of cancer deaths in low-income countries like Bangladesh.

The specialized hospitals in Dhaka play a crucial role in providing care to cancer patients, offering a range of diagnostic and treatment services. Despite advances in cancer treatment, there are ongoing challenges related to the management and prescription practices for cancer patients. In addition to understanding which cancer types are most prevalent, it is equally important to analyze the prescription patterns for these conditions. The choice of medications, including chemotherapy, targeted therapy, and immunotherapy, plays a crucial role in the management and prognosis of cancer patients. Prescription patterns, which include the types and combinations of medications prescribed, are critical to understanding the effectiveness and efficiency of cancer treatments. Analyzing these patterns can provide insights into current practices, identify areas for improvement, and ultimately contribute to better patient outcomes.

This study analyzes cancer prescription patterns in a specialized hospital in metropolitan Dhaka, specifically analyzing the prescription practices for 34 patients from a previously conducted study where patients were diagnosed with various types of cancer, including breast cancer and lung cancer. By analyzing the prescriptions and treatment regimens, this study aims to identify common trends, mostly prescribed drugs and the outcomes associated with these treatments. By analyzing these aspects, we aim to identify trends and patterns that can contribute to more effective and equitable cancer care in Dhaka.

## 1.2 What is Cancer?

The term "cancer" refers to any of a wide range of illnesses marked by the growth of aberrant cells that divide uncontrolled and have the capacity to invade and destroy healthy bodily tissue (*Cancer - Symptoms and Causes*, n.d.). Almost 100 diseases fall under the umbrella of cancer, which can manifest almost anywhere in the body. Cell division, the replacement of injured or aged cells by new ones, can result in cancer if DNA mutations interfere with normal cell growth and cause irreversible damage to the cell, leading to the formation of benign or malignant tumor (J. Zhang et al., 2022). Unchecked proliferation of cancer cells leads to cancer development, infecting healthy tissues and organs, and causing damage to the entire body due to inability to respond appropriately to normal cell behavior (G. M. Cooper & Hausman, 2007). Figure 1 shows the process of cancer development (Chaudhry et al., 2022).

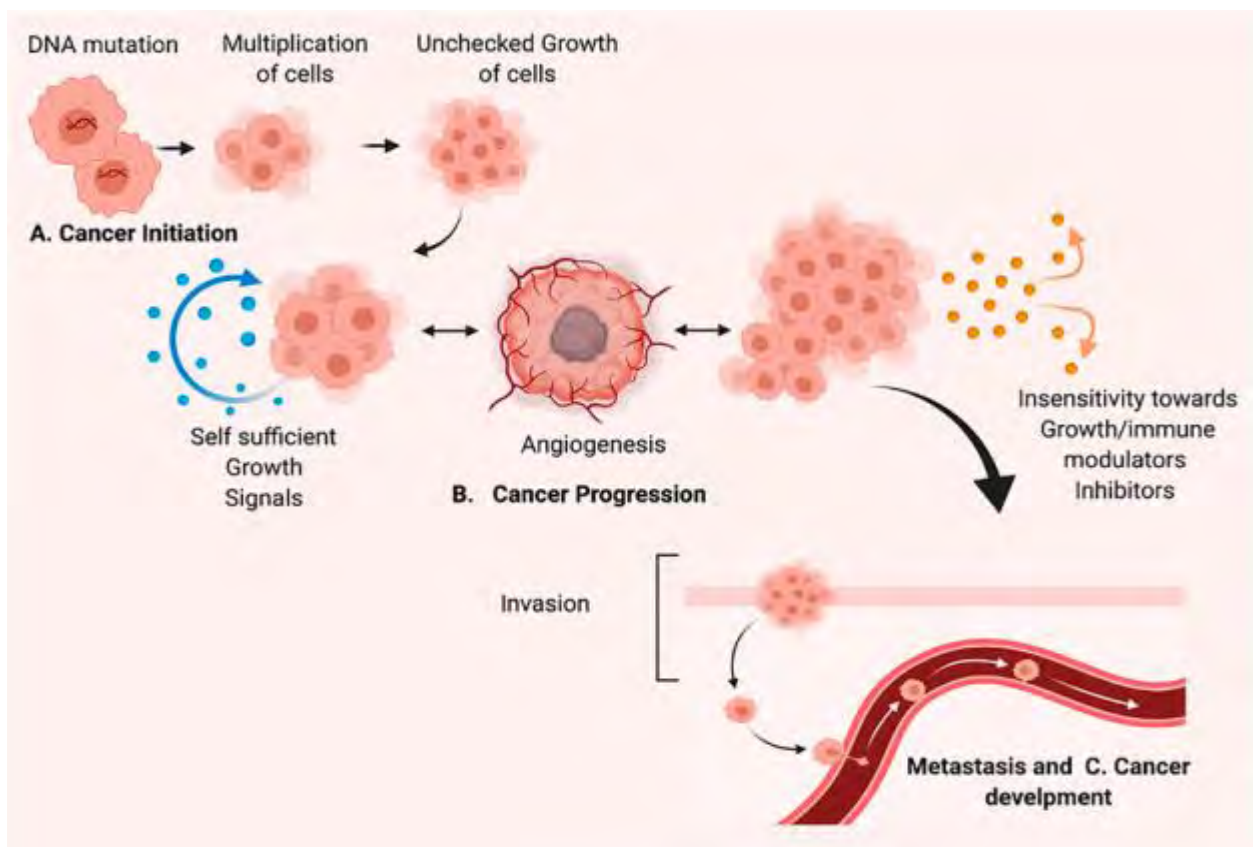


Figure 1: The process of cancer development (Chaudhry et al., 2022)

## 1.3 Current Cancer treatments

Recent advancements in cancer treatment and prescription practices highlight the importance of personalized care, early diagnosis, and multidisciplinary approaches. Here is a review of the current landscape:

### 1.3.1 Chemotherapy:

Chemotherapy remains a cornerstone of cancer treatment, utilizing various drugs to target and kill cancer cells (Amjad et al., 2023). Chemotherapy is often used in combination with other therapies, such as hormone therapy, radiation, or surgery.

Combination therapy is used in response to:

- The patient's overall health and the type, stage, and form of cancer they have
- Previous cancer treatments the patient have had
- The location of the cancerous cells
- Patient's personal treatment preferences

Chemotherapy is a treatment that lowers cancer cell count, reduces cancer spreading, shrinks tumor size, and reduces symptoms. Chemotherapy targets rapidly dividing cells, including cancer cells and can adversely affect blood, hair, skin, and intestinal tract lining (Tilsed et al., 2022). It is recommended for post-surgery treatments like lumpectomy, radiation therapy, and pain relief in late-stage cancer. It can also prepare individuals for bone marrow stem cell treatment and immune system disorders, with lower doses used for immune system-attacking disorders like lupus or rheumatoid arthritis. Blood loss, diarrhea, mouth sores, exhaustion, fever, hair loss, nausea, vomiting, weight loss, infections, nerve damage, anemia,

constipation, neuropathy, lymphedema, memory problems, concentration problems, and sexual changes are some of the side effects.

(*Chemotherapy Side Effects*, n.d.)

Chemotherapy drugs encompass a wide range of classes and mechanisms aimed at targeting and inhibiting the growth of cancer cells. Here are some common types of anticancer drugs along with their classes:

- a) **Alkylating Agents:** Alkylating agents are a class of medications that interact with significant biomolecules by forming covalent bonds. Although proteins and RNAs can also be alkylated, nucleophilic groups on DNA—particularly the N-7 position of guanine—are the main targets of pharmacological activity. Although the precise mechanism is unknown, cell death is thought to result from alkylation of DNA.

**Class:** Chemotherapy

Examples: Cyclophosphamide, Cisplatin, Carboplatin, Busulfan.

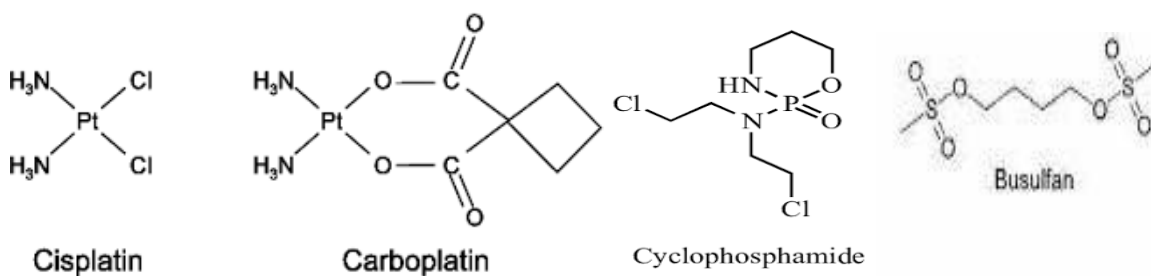


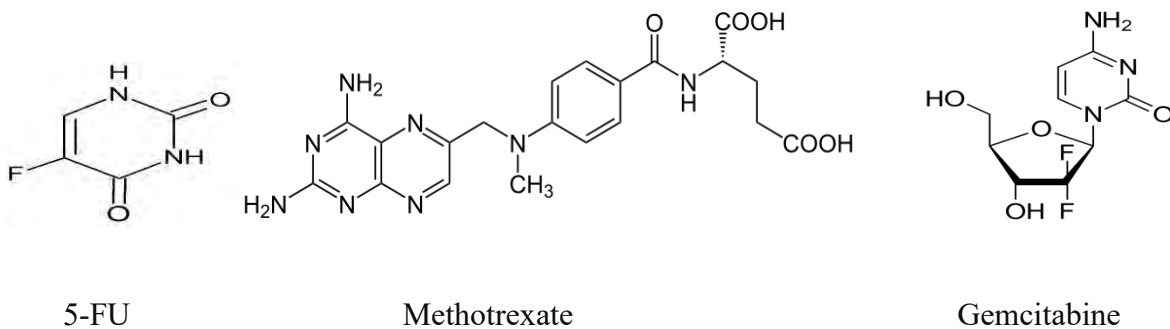
Figure 2: Alkylating agents : Cisplatin, Carboplatin, Cyclophosphamide, Busulfan

b) **Antimetabolites:** Antimetabolite medications are cytotoxic chemotherapy drugs that cause cell death and are commonly used in cancer chemotherapy due to their similar structure to the metabolite they interfere with. These medications can halt cell growth and division, leading to competitive inhibition. They are commonly used in treating leukemia, ovarian,

breast, and intestinal malignancies, but can also treat other rapidly dividing cell types. Different antimetabolite medications are administered orally or via intravenous lines. Side effects of these medications may include vomiting, nausea, muscle weakness, headaches, swelling, hair thinning, constipation, vision changes, and lower white blood cell levels.

**Class:** Chemotherapy

**Example:** 5-fluorouracil, Methotrexate, 6-mercaptopurine, fludarabine, gemcitabine, cytarabine, pemetrexed are a few antimetabolites that are frequently used to treat cancer.



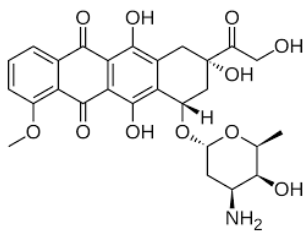
*Figure 3 : Antimetabolites : 5-FU, Methotrexate, Gemcitabine*

**c) Cytotoxic Antibiotics:** Cytotoxic antibodies, sometimes referred to as monoclonal antibodies (mAbs), are a family of targeted cancer treatments made to identify and attach to particular antigens on the outside of cancerous cells. The targeted cancer cells are destroyed as a result of the immunological reactions that these antibodies set off once they are bound.

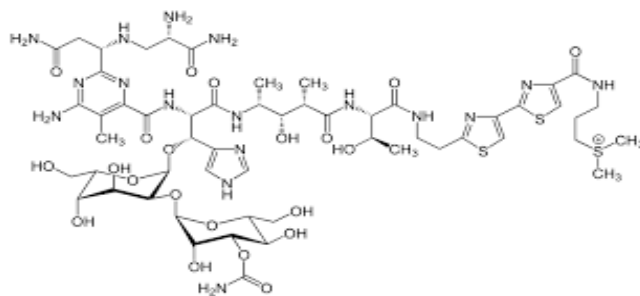
**Class:** Chemotherapy

**Examples:** Doxorubicin, Bleomycin, Daunorubicin





Doxorubicin



Bleomycine

Figure 4 : Cytotoxic antibodies : Doxorubicin, Bleomycin

These classifications highlight the diversity of approaches in cancer treatment, each targeting specific aspects of cancer cell biology or the tumor microenvironment to achieve therapeutic effects while minimizing adverse effects on healthy tissues.

### 1.3.2 Radiation Therapy:

Radiation therapy uses high-energy particles or waves to kill or harm cancer cells by breaking DNA, preventing their proliferation and dividing. It often targets the affected area, unlike chemotherapy, which exposes the entire body to cancer-fighting chemicals. Radiation treatments are planned to minimize damage to healthy cells while inflicting damage to malignant cells. Systemic radiation therapy administers radioactive materials intravenously (*How Radiation Therapy Is Used to Treat Cancer*, n.d.). Since the majority of radiation therapy forms don't target all areas of the body, they are ineffective in treating cancer that has metastasized across the body. Radiation therapy is still a useful treatment for a variety of cancers, and it can be used either on its own or in conjunction with other therapies (Health Jade Team, 2018).

**1.3.3 Surgery:** Surgical removal of tumors is common, especially for localized cancers. Advances in minimally invasive and robotic surgery have improved outcomes and reduced recovery times (Admin, 2024). However, surgery may not be viable for many cancer types due to frequent metastases or cancer proximity to sensitive tissues (*Surgery for Cancer*, 2015). Early surgery can reduce cancer risk and control pain. Reconstructive surgery may be possible if cancer is removed using other body tissues or a false body part.

### **1.3.4 Immunotherapy:**

Immunotherapy is a medical treatment used to fight diseases like cancer by focusing on immune system components. Examples include interferons, nivolumab, and pembrolizumab. (*What Is Immunotherapy? | Immunotherapy for Cancer*, n.d.) It involves increasing or strengthening the immune system's natural defenses to locate and eliminate cancer cells, and creating lab-produced compounds to enhance or repair the immune system's ability to recognize and combat cancer cells (*Immunotherapy for Cancer*, 2019). Various medications, including checkpoint inhibitors, CAR T-cell therapy, cytokines, immunomodulators, cancer vaccines, monoclonal antibodies, and oncolytic viruses, have shown promise in cancer treatment.

### **1.3.5 Targeted Therapy:**

Targeted therapy is a cancer treatment that uses drugs to target specific areas or substances in cancer cells without affecting normal cells. It has fewer side effects than traditional chemotherapy and can block chemical signals, change proteins, stop blood vessel production, trigger the immune system, or carry toxins to kill cancer cells but not normal ones. Examples include tyrosine kinase inhibitors and monoclonal antibodies: Trastuzumab, Imatinib, Erlotinib, Bevacizumab (*Targeted Therapy for Cancer*, 2022).

### **1.3.6 Hormone Therapy:**

Hormone therapy targets the growth of cancer by using hormones, mainly in cases of breast and prostate cancer. To delay or stop the progression of cancer, it interferes with hormone function or prevents the body from producing hormones (*Hormone Therapy for Cancer*, 2022). Hormone receptor-positive breast cancer and advanced prostate cancer are frequently treated with hormonal drugs such as tamoxifen and aromatase inhibitors. Hot flashes, diminished sexual drive, and an increased risk of various health issues are some of the side effects of hormone therapy that men may experience, depending on the type of therapy and other circumstances (*Hormone Therapy | Hormone Treatment for Cancer | Endocrine Therapy*, n.d.). Hormone therapy drug safety is very important, and additional safety precautions required.

## **1.8 Objective of the study**

The primary objective of this research is to understand and analyze the prescription patterns of cancer patients in a specialized hospital in Dhaka. Specifically, this study aims to:

1. Identify the most commonly prescribed medications for cancer patients in the hospital.
2. Identify the most commonly prescribed classes of anticancer drugs.
3. Asses post medication outcome of cancer patients.

The purpose of this study is to improve cancer therapy and patient outcomes in Bangladesh by examining the prescription practices of cancer patients in a specialized hospital in Dhaka.

The findings are expected to provide valuable insights for further research in this field.

## Chapter 2

### Methodology

The study incorporates a detailed analysis of prescription trends from surveys administered to 34 cancer patients admitted in a cancer hospital in Dhaka for chemotherapy in an earlier investigation.

The inclusion criteria were:

- Patients diagnosed with cancer and receiving treatment at the specialized hospital.
- Patients who provided informed consent to participate in the study.

Data were collected using a structured questionnaire developed specifically for this study. The questionnaire was designed to gather comprehensive information on patients' one time prescriptions and included the following sections:

- Demographic Information: Age, gender, *etc.*
- Cancer Diagnosis: Type of cancer and stage.
- Prescribed Medications: Drug names, dosages, frequency, and duration.
- Additional Treatments: Other therapies received.
- Adherence: Patients' adherence to prescribed medications and any barriers to adherence.

The data collection was carried out in person by trained research assistants who explained the purpose of the study and provided assistance as needed. Data collection took place in a private setting within the hospital to ensure confidentiality and comfort for the participants.

## Chapter 3

### Result

This chapter presents the findings from the analysis of the questionnaire and prescription data collected from 34 cancer patients; 12 male and 22 female cancer patients at a specialized hospital in Metropolitan Dhaka from previously conducted study. Prescribed medications for each type of cancer patients are provided in Table 1. 5-FU + Cisplatin was the most commonly prescribed drugs for the patients of lung cancer, larynx cancer and testes cancer. 5FU + Oxaliplatin was prescribed to Esophageal and Gastroesophageal cancer patients. Cisplatin + Gemcitabine was prescribed to urinary bladder cancer patients and 5-FU + Cyclophosphamide was prescribed to breast cancer and gall bladder cancer patients. Additionally, patients with brain cancer, adenocarcinoma and cervix cancer were prescribed with carboplatin and cisplatin was given to the patients of bladder cancer, larynx cancer, urinary cancer, testes cancer, duodenum cancer and liver cancer. For breast cancer, different anticancer drugs were observed to be prescribed, for instance 5-FU, carboplatin, cisplatin, doxorubicin and cyclophosphamide were prescribed to different patients. Patients with leukemia and lymphoma cancer received rituximab.

### 3.1 Prescribed Medications for each type of Cancer

Type of Cancer	Prescribed drugs	Number of Patients
Brain Cancer	Clexane + Cordarone	1
	Carboplatin	1
Anal cancer	Albutein+Pantonix	1
Lung Cancer	Preline + Sonexa	1
	Bevacizumab + Cisplatin	1
	5-FU + Cisplatin	2
Urinary Bladder Cancer	Cisplatin + Mannitol + Gemcitabine	1
	5-FU	1
	Cisplatin + Gemcitabine	1
Breast Cancer	Emistat + 5-FU	1
	Emistat + Maxpro + Carboplatin	1
	Cisplatin + Maxpro	1
	Sonexa + Pantonix + Doxorubicin	1
	Sonexa + Doxorubicin	1
	5-FU + Cyclophosphamide	1
Gall Bladder Cancer	Cyclophosphamide + 5-FU	1
Leukemia	L-asparaginase + Vincristine	1
	Rituximab	1
Esophageal Cancer	5-FU + Oxaliplatin	1
Colon Cancer	5-FU	1
Ovarian Cancer	5-FU	1
Stomach Cancer	Oxaliplatin	1
Lymphoma	Rituximab	1
	Avil + Coston + Bleomycin	1
	Cisplatin	1
Larynx cancer	5-FU + Cisplatin	1
Testes Cancer	5-FU + Cisplatin	1
Duodenum Cancer	Cisplatin + Pethidine	1
Liver Cancer	Cisplatin	1
Adenocarcinoma	Carboplatin	1

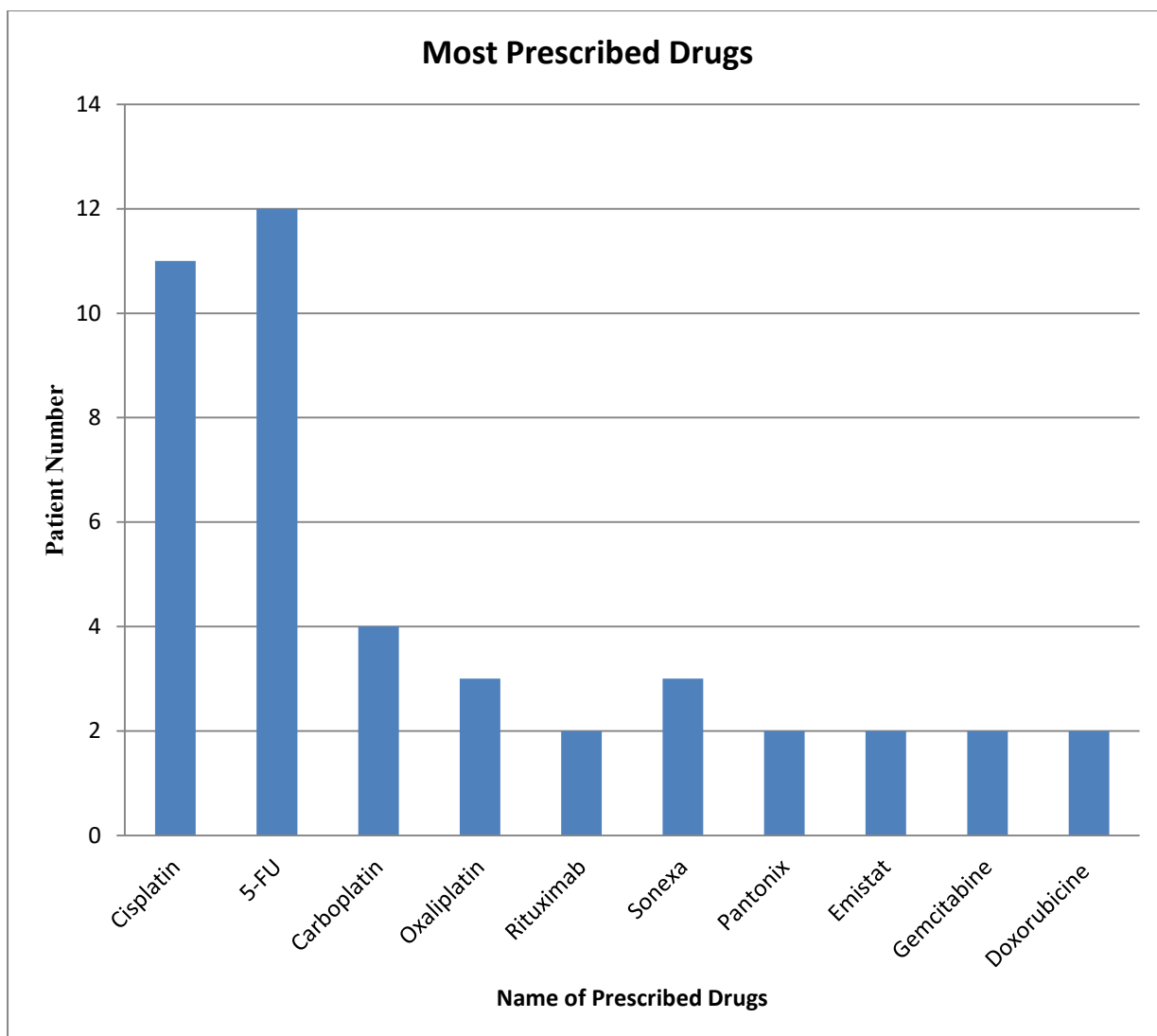
Thyroid Cancer	Clidip + Thyrox	1
Gastro esophageal Cancer	Oxaliplatin + 5-FU	1
Cervix Cancer	Carboplatin	1

*Table 1: prescribed medications for each type of cancer*

### **3.2 Most prescribed drugs for cancer treatment**

The bar graph in Figure 5 displays the 34 patients' most frequently recommended medications for cancer therapy. Eleven cancer patients received a 5-FU prescription and a Cisplatin prescription. Four patients received carboplatin prescriptions, and three individuals received oxaliplatin treatment. Furthermore, two patients were prescribed Rituximab, three patients were treated with Sonexa, two patients were prescribed Pantonix, two patients were prescribed Emistat, two patients were prescribed Gencitabine, and two patients were prescribed Doxorubicine.





*Figure 5. Most prescribed drugs for cancer treatment*

### **3.3 Most commonly prescribed classes of anticancer agents**

Alkylating agents were the most frequently prescribed types of anticancer drugs, followed by antimetabolites, monoclonal antibodies, targeted therapy and anthracyclines. In antimetabolites 5-FU was commonly prescribed and in alkylating agents cisplatin and carboplatin were commonly prescribed drugs Table 2.

Drug Class	Commonly prescribed class of anticancer agent
Alkylating agents	19
Antimetabolites	13
Monoclonal antibodies	02
Targeted Therapy	03
Anthracyclin	02

Table 2 : Most commonly prescribed classes of anticancer agents

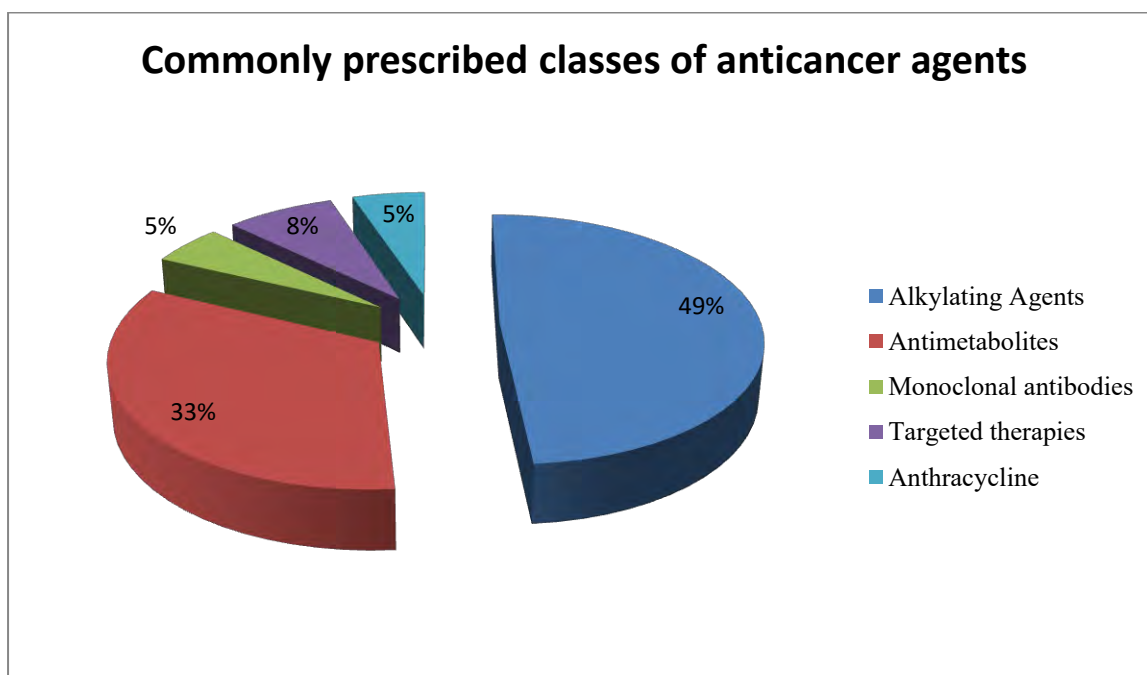


Figure 6. Most commonly prescribed classes of anticancer agents

### 3.4 Prescribed adjuvant medications along anticancer agents

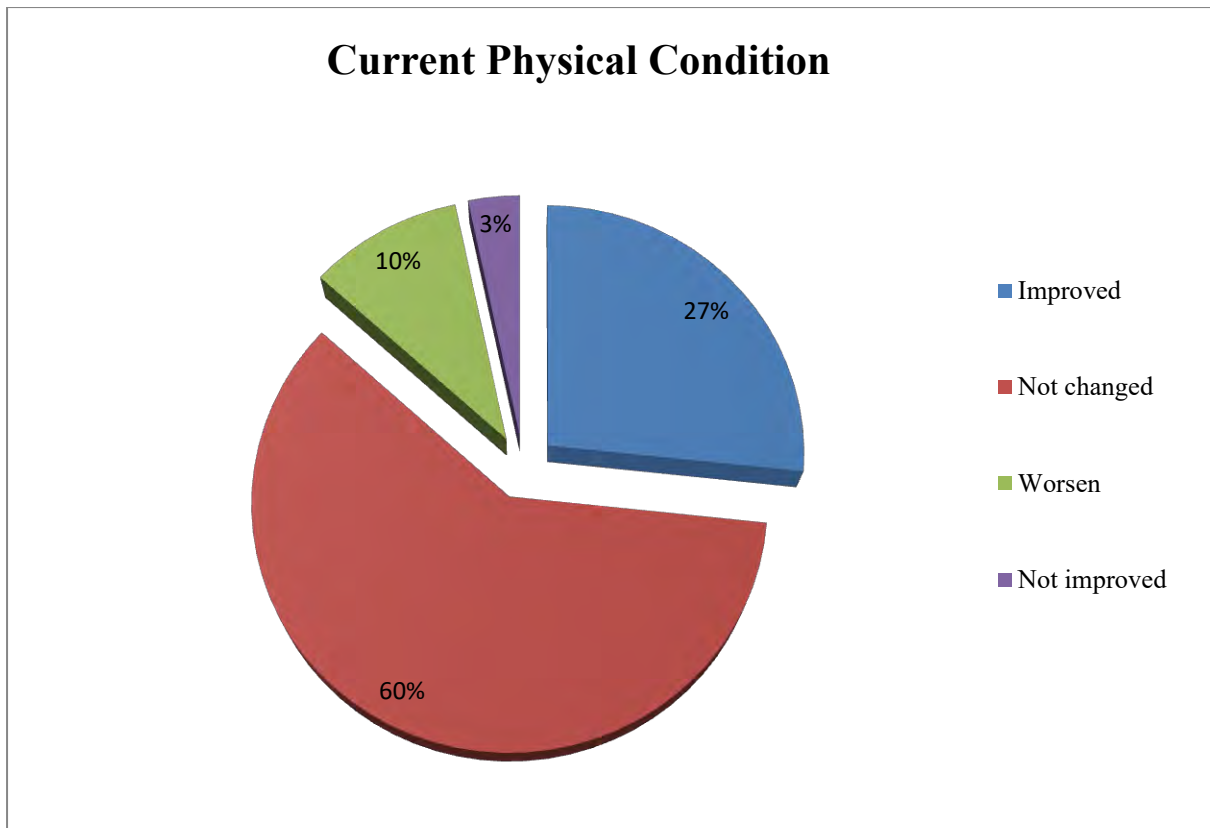
Adjuvant drugs include medications that reduce the side effects of anticancer agents. The list of adjuvant drugs and their corresponding number of prescriptions is shown in Table 3.

<b>Adjuvant Drugs</b>	<b>Generic Name</b>	<b>Number of Patients</b>
Clexane	Enaxoparin Sodium	1
Prelin	Pregabalin	1
Sonexa	Dexamethasone	1
Cordarone	Amiodarone	1
Albutein	Albumin	1
Pantonix	Pantoprazole	2
Maxpro	Esomeprazole	2
Mannitol	Mannitol	1
Emistat	Ondansetron	2
Avil	Diphenhydramine	1
Coston	Calcium carbonate	1
Pethidine	Pethidine	1
Clidip	Clidinium bromide	1
Thyrox	Levothyroxin Sodium	1

*Table 3 : Prescribed adjuvant medications along anticancer agents*

### **3.5 Current physical condition of Cancer patients after treatment with chemotherapeutic agents**

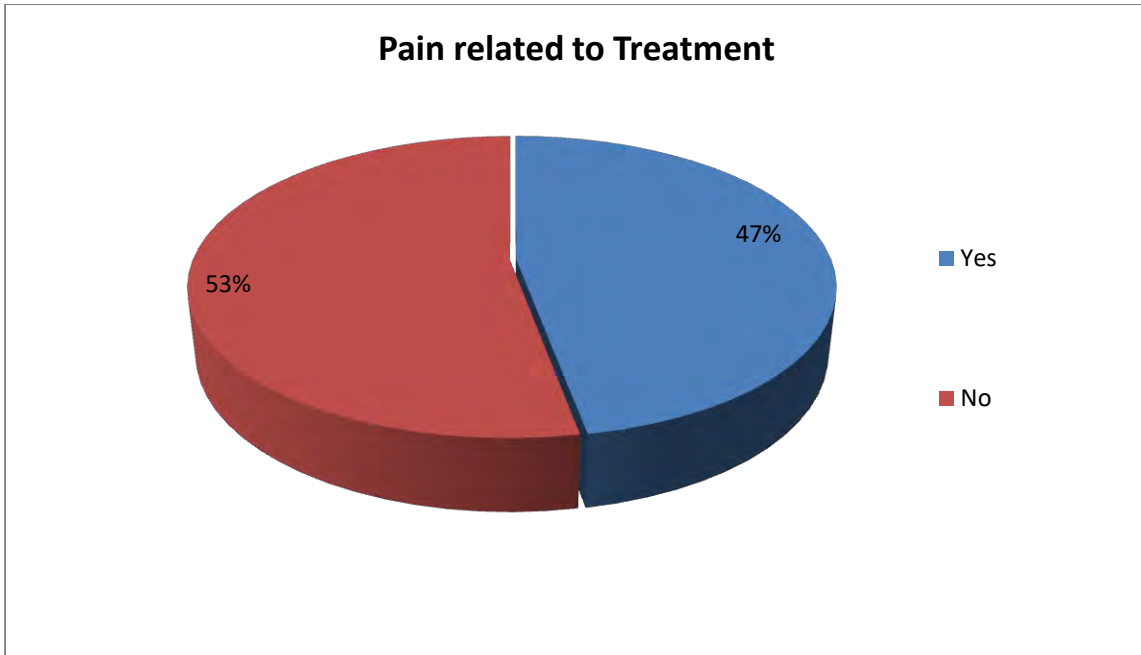
Figure 7 depicts the post-medication physical condition of the 34 cancer patients in the study. It indicates that eight participants, or 27% of the study's total population, had shown improvements in their physical health. One patient's physical condition has not improved, representing 3% of the population; three patients' conditions have gotten worse, representing 10% of the population. Furthermore, there has been no change in the physical state of 18 individuals. Thus, it is evident that 60% of patients' physical conditions have remained unchanged.



*Figure 7. Post therapeutic physical condition of cancer patients*

### **3.6 Pain related to treatment of Cancer Patients**

The pie chart in Figure 8 illustrates the proportion of patients experiencing pain related to their cancer treatment. According to the chart, 53% (18 out of 34) patients reported not experiencing treatment-related pain, while 47% (16 out of 34) patients did experience pain associated with their treatment. This nearly even distribution indicates that pain management is a significant concern for almost half of the patients undergoing cancer treatment, highlighting the need for effective pain relief strategies in clinical practice.



*Figure 8. Pain related to treatment of Cancer Patients*

## Chapter 4

### Discussion

The data shows different drug use trends based on the type of cancer. Chemotherapy is still the cornerstone of treatment for many cancer types, and prescriptions for medications including Cisplatin, Carboplatin, Oxaliplatin and Fluorouracil (5-FU) are frequent. These drugs are some of the most important and widely used treatments for cancer, each having a distinct mode of action, adverse effect profile, and therapeutic efficacy. In this study, patients with testicular cancer, lung cancer, gastroesophageal cancer, gall bladder cancer, esophageal cancer, colon cancer, breast cancer, and ovarian cancer were prescribed with 5-FU. Additionally Oxaliplatin was prescribed to the esophageal, stomach and gastroesophageal cancer patients. Also, rituximab was prescribed to lymphoma and leukemia patients and cisplatin was prescribed to breast cancer, lung cancer, lymphoma, leukemia, duodenum cancer, liver cancer and testes cancer patients.

In this study, 5-FU and cisplatin was the most prescribed anticancer drugs followed by carboplatin and oxaliplatin and antimetabolites and alkylating agents are the most common class of prescribed anticancer drugs. The results of Aggarwal M et al. and Mugada V et al. studies show that 5-Fluorouracil and Cisplatin are most commonly prescribed anticancer drugs followed by cyclophosphamide (Mugada et al., 2016b). Cisplatin, a platinum-based drug, is used in treating various cancers and is a cornerstone of chemotherapy. It forms cross-links with DNA, inhibiting DNA synthesis and function, leading to cell death. This process, called aquation, disrupts the DNA double helix, triggering DNA repair mechanisms and potentially leading to apoptosis (Dasari et al., 2022). Cisplatin also generates reactive oxygen species, contributing to its cytotoxic effects. Common side effects include nephrotoxicity, ototoxicity,

nausea, and vomiting, and can interact with other drugs. On the other hand 5-FU, a fluorinated pyrimidine analog, is used in cancer treatment since the 1950s. It inhibits thymidylate synthase, reducing thymidine, essential for DNA replication and repair. 5-FU is converted into active metabolites like FdUMP, FUTP, and FdUTP, leading to DNA damage and cell death (Pouya et al., 2022). Side effects include myelosuppression, mucositis, diarrhea, and hand-foot syndrome. It can interact with drugs like warfarin, leading to an increased bleeding risk, and be a risk for elderly patients and those with DPD deficiency. Capecitabine offers improved versions with better patient compliance and fewer side effects (Welkoborsky et al., 1992). Carboplatin is used to treat ovarian, lung, head and neck, and testicular cancers (*Carboplatin: Uses, Interactions, Mechanism of Action / DrugBank Online*, n.d.). It causes DNA cross-linking, leading to apoptosis, and is less reactive than cisplatin, resulting in fewer side effects like nephrotoxicity and ototoxicity. Carboplatin may interact with other drugs and is more tolerable in elderly patients and those with renal impairment (*Carboplatin*, 2007). Oxaliplatin functions similar to cisplatin and carboplatin as it involves DNA cross-linking and cell death. The drug's DACH ring makes it less recognizable by DNA repair enzymes, leading to prolonged DNA damage and apoptosis (Devanabanda & Kasi, 2023). Common side effects include neuropathy, mild myelosuppression, and gastrointestinal symptoms. Careful dose management is required for elderly patients and those with pre-existing peripheral neuropathy. In case of person-wise different interaction, patients with pre-existing kidney conditions are at higher risk of nephrotoxicity. Carboplatin and oxaliplatin are newer versions with reduced toxicity profiles. Carboplatin is less nephrotoxic, and oxaliplatin is less ototoxic (Yüce et al., 2014).

Adjuvant medications are used in conjunction with anticancer medications to lessen adverse effects. Among prescribed adjuvant drugs with anticancer agents, pantoprazole, esomeprazole and ondansetron was mostly prescribed. Granisetron, dexamethasone, pantoprazole, and aprepitant were the most common drugs for chemotherapy-induced nausea and vomiting and to prevent gastric acid reflux diseases (Janowitz et al., 2021). Proton pump inhibitors like pantoprazole are prescribed to treat GERD, Zollinger-Ellison syndrome, and peptic ulcers. For GERD and ulcers, esomeprazole, a comparable PPI, reduces the formation of stomach acid. Ondansetron is a serotonin receptor antagonist that stops nausea and vomiting that comes from radiation, chemotherapy, or surgery. Almost 70% to 80% of patients can avoid nausea and vomiting if antiemetics are used appropriately (Mugada et al., 2016). Dexamethasone was co-prescribed to the patient with lung cancer and breast cancer with pantonix. Pregabalin was co-prescribed to the lung cancer patient to reduce neuropathic pain and postherpetic neuralgia. In case of lymphoma patient along with cisplatin and rituximab, Diphenhydramine was also prescribed to improve the effectiveness of immunotherapy and relieve nausea and vomiting. Pain relieving drug pethidine was prescribed to duodenum cancer patient. Enaxoparin Sodium is an anticoagulant, which reduces the risk of Thrombosis (Jupalli & Iqbal, 2023) and it was co-prescribed with Amiodarone which is an antiarrhythmic to the patient with brain cancer who might have pre-existing heart conditions. Also, the anal cancer patient was prescribed albumin, which is recommended for the treatment of shock and other comparable circumstances where there is an urgent need to restore blood volume (*Albumin Human: Uses, Interactions, Mechanism of Action | DrugBank Online*, n.d.). During intensive chemotherapy treatments, it may occur. Transfusion with packed red blood cells is recommended if there has been a significant loss of red blood cells (Hoogenboezem & Duvall, 2018). Additionally, patient suffering from urinary bladder cancer was mannitol with cisplatin and gemcitabine. An osmotic diuretic used to reduce intracranial pressure and to



prevent kidney damage during chemotherapy. Other adjuvant drugs like Clidinium Bromide was prescribed to thyroid cancer patient which is generally used to relieve stomach cramps and reduce gastrointestinal discomfort, which can be side effects of both cancer and chemotherapy (Verburg et al., 2019). According to Figure 7, 8 out of 34 cancer patients experienced improvements in their physical health after taking medication, but physical condition of 18 patients stayed the same, with 1 patient's condition not improving and 3 patients physical condition getting worse. But Physical condition was not defined in the previously conducted study. The survey question did not clarify what kind of improvement or degradation of physical condition the patients were currently going through after post medication.

Figure 8 shows a nearly even distribution of pain management among cancer patients, with 53% (18 out of 34) Patients not experiencing treatment-related pain and 47% (16 out of 34) patients experiencing it, highlighting the need for effective pain relief strategies. Though the survey question and previously conducted study did not clarify what kind of pain patients were experiencing after treatment. The one time prescription data that has been analyzed in this study, only two cancer patients has been observed to be prescribed with pain medication; one lung cancer patient was prescribed with pregabalin and one duodenum cancer patient received pethidine. As only one time prescription was analyzed in this study, the work is not statistically valid as the patient could have another prescription which had pain medication. According to a recent systematic review that included research from 2014 to 2021, 44% of cancer patients reported having pain overall (Mestdagh et al., 2023). 31% of the patients reported having moderate to severe pain (Mestdagh et al., 2023).55% of patients with advanced metastatic and terminal cancer reported having pain (Mestdagh et al., 2023). It appears that for the last ten years, there has been a decrease in the frequency and severity of pain (Farrer & Dickman, 2022).

Even though it doesn't always pose a threat to life, persistent pain is one of the most common and incapacitating signs of cancer. Because chronic pain causes psychological discomfort (fatigue, sadness) and impairs functionality, it is always linked to a lower quality of life.

## **Chapter 5**

### **Conclusion**

In conclusion, this study provides a comprehensive overview of prescription practices and medication-related challenges among cancer patients in Metropolitan Dhaka. Cancer is a major health issue worldwide thus to improve the treatment quality and therapeutic outcomes, it is necessary to analyze treatment patterns in a larger scale. Though the study was done in a smaller scale and only one time prescriptions were analyzed, it gave a thorough idea of prescription pattern of cancer patients which contributes to optimize therapeutic outcomes and enhance quality of life for patients battling cancer. Our findings reveal a diverse array of medications administered across different types and stages of cancer. Notably, chemotherapy remains a cornerstone across various cancers, with drugs like Fluorouracil (5-FU), Cisplatin, and Oxaliplatin frequently prescribed and these medications target rapid cell growth characteristic of cancer but are also associated with significant side effects such as nausea, vomiting, mucositis, myelosuppression, and fatigue. Other drugs like panoprazole, esomeprazole, mannitol, enaxoparin sodium, pregabalin, clidium bromide, pethidine etc were also co-prescribed with anticancer agents. Each type of cancer necessitates tailored treatment regimens. For instance, breast cancer patients commonly receive Doxorubicin and Erlotinib for chemotherapy and targeted therapy, respectively, while lung cancer treatments often include Bevacizumab and Erlotinib, focusing on anti-angiogenesis and epidermal growth factor receptor inhibition. These targeted therapies aim to enhance treatment efficacy while minimizing systemic toxicity compared to traditional chemotherapy agents. According to the study, eight out of thirty-four patients reported an improvement in their physical condition after taking medication, whereas eighteen patients reported no change in their physical state but the physical condition was not defined in that survey. This study is limited by its small

scale of population. Future research could explore larger patient populations across diverse healthcare settings to validate these findings and explore emerging treatment modalities such as immunotherapy and precision medicine (Research and development are ongoing with the aim of improving their efficacy, reducing their toxicity, and tailoring treatment to the individual characteristics of each patient, including age, genetic background, and kind of cancer).

### **Future work**

This study was conducted in a small scale, with only 34 cancer patient's one time prescription pattern. To get a reliable statistics more studies on a large epidemiologic scale should be conducted on analyzing prescription patterns of cancer patients. There was not adequate literature works, more research should be done on prescription analysis of cancer patients.

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## Appendix 1

### Demographic and Lifestyle Data of 34 Cancer Patients: Family History, Cancer Type, Clinical Stage, Diagnosis and Treatment Dates, Sleep Patterns, Tobacco Use, and Dietary Changes

Patient number	Family history of cancer	Type of cancer	Clinical stage of cancer	Date of diagnosis	Date of first treatment	Sleeping time	Sign of insomnia	Use of tobacco products	Major change in diet in last 6 months
1	Yes	Brain cancer	2	2022	2022	Regular	No	Yes	No
2	No	Anal cancer	2	2022	2022	Regular	No	yes	Yes
3	Yes	Lung cancer	2	2022	2022	Regular	No	Yes	Yes
4	No	Bladder cancer	2	2022	2022	Regular	No	Yes	Yes
5	No	Breast cancer	1	2022	2022	Irregular	Yes	No	Yes
6	No	Breast cancer	2	2022	2022	Irregular	Yes	No	yes
7	No	Gall bladder	1	2022	2022	Regular	No	Yes	No
8	No	Leukemia	1	2022	2022	Irregular	Yes	No	yes
9	Yes	Esophageal cancer	4	2021	2021	Irregular	Yes	No	No
10	No	Colon cancer	2	2022	2022	Regular	No	Yes	No
11	Yes	Ovarian cancer	1	2022	2022	Regular	No	Yes	No
12	No	Stomach cancer	2	2022	2022	Irregular	Yes	Yes	No
13	No	Lymphoma	2	2022	2022	Regular	No	Yes	No
14	Yes	Lung Cancer	1	2022	2022	Regular	No	No	No
15	Yes	Larynx	1	2022	2022	Regular	No	Yes	No
16	Yes	Urinary Bladder cancer	2	2022	2022	Irregular	Yes	Yes	No
17	No	Testes cancer	2	2022	2022	Regular	No	No	No
18	Yes	Lung Cancer	2	2022	2022	Irregular	No	Yes	Yes
19	Yes	Lung Cancer	2	2022	2022	Regular	No	Yes	No
20	Yes	Leukemia	2	2018	2018	Irregular	Yes	Yes	Yes
21	No	Breast Cancer	1	2020	2020	Irregular	Yes	No	Yes
22	No	Breast Cancer	1	2022	2022	Irregular	Yes	No	Yes
23	No	Urinary Bladder Cancer	1	2022	2022	Irregular	Yes	No	Yes
24	No	Lymphoma	1	2022	2022	Irregular	Yes	NO	Yes
25	No	Breast Cancer	2	2022	2022	Irregular	Yes	No	Yes
26	No	Brain cancer	2	2022	2022	Regular	No	Yes	No
27	No	Lymphoma	2	2022	2022	Regular	No	Yes	Yes
28	No	Dudoneum cancer	1	2022	2022	Regular	No	No	No
29	Yes	Liver cancer	4	2022	2022	Regular	No	Yes	Yes
30	No	Adenocarcinoma	1	2022	2022	Regular	No	No	No
31	No	Thyroid cancer	1	2022	2022	Regular	No	Yes	No
32	No	Gastroesophageal Cancer	4	2022	2022	Irregular	No	Yes	No
33	No	Cervix cancer	1	2022	2022	Regular	No	Yes	No
34	No	Breast cancer	2	2022	2022	Irregular	No	No	No

## Appendix2

### Treatment and Medication Analysis of 34 Cancer Patients: Clinical Stage, Radiotherapy, Chemotherapy, Current Medications, Physical Condition, and Supplement Use

Patient number	Type of cancer	Clinical stage of cancer	Number of radiotherapy	Number of chemotherapy	Medication of cancer using at the moment (brand name and generic name)	Current physical condition	Any pain related to treatment	Medications, vitamins and minerals
1	Brain cancer	2	0	0	Clexane	Not changed	No	Vitamin D
2	Anal cancer	2	0	0	Albutein Pantonix	Not changed	No	Vitamin D
3	Lung cancer	2	1	0	Prelin Sonexa	Not changed	No	Vitamin C
4	Urinary bladder cancer	2	0	1	Cisplatin Mannitol Gemcitabine	Not Changed	No	None
5	Breast cancer	1	0	4	Emistat 5-FU	Not Changed	Yes	None
6	Breast cancer	2	1	4	Emistat Maxpro Carboplatin	Not Changed	Yes	None
7	Gall bladder cancer	1	0	2	Cyclophosphamide 5 FU	Improved	No	Vitamin C
8	Leukemia	1	2	1	L-aspa Vincristine	Improved	No	None
9	Esophageal cancer	4	3	8	5-FU Oxaliplatin	Worsen	Yes	None
10	Colon cancer	2	2	4	5- FU	Not changed	Yes	Vitamin C
11	Ovarian cancer	1	2	3	5- FU		Yes	Vitamin C
12	Stomach cancer	2	4	6	Oxaliplatin	Improved	Yes	Vitamin C
13	Lymphoma	2	1	2	Rituximab	Worsen	No	Vitamin C, Vitamin E, Zinc
14	Lung Cancer	1	2	0	Bandena Cisplatin	Not improved	No	Vitamin C
15	Larynx cancer	1	1	1	5- FU Cisplatin	Not changed	No	None
16	Urinary Bladder cancer	2	3	4	5- FU	Improved	Yes	None
17	Testes cancer	2	1	2	5-FU Cisplatin	Not changed	No	None
18	Lung Cancer	2	0	6	5- FU Cisplatin	Improved	Yes	Vitamin C
19	Lung Cancer	2	0	1	5- FU Cisplatin	Improved	No	Vitamin C
20	Leukemia	2	2	5	Rituximab		Yes	None

21	Breast Cancer	1	0	3	Cisplatin Maxpro		No	None
22	Breast Cancer	1	0	2	Sonexa Pantonix Doxorubicin		Yes	None
23	Urinary bladder Cancer	1	2	4	Cisplatin Gemcitabine		Yes	Vitamin D, E
24	Lymphoma	1	0	2	Avil Coston Bleomycin	Worsen	Yes	Vitamin D, E
25	Breast Cancer	2	2	4	Sonexa Doxorubicin		Yes	Vitamin D, E
26	Brain cancer	2	0	0	Carbocisplastin	Not changed	No	Vitamin D
27	Lymphoma	2	0	0	Cisplatin	Not changed	No	Vitamin D
28	Duodenum cancer	1	0	0	Cisplatin Pethidine	Not changed	No	Vitamin D
29	Liver cancer	4	0	0	Cisplatin	Not changed	No	Vitamin D
30	Adenocarcinoma	1	0	4	Carboplatin	Not changed	No	Vitamin D
31	Thyroid cancer	1	0	0	Clidip Thyrox	Not changed	No	Vitamin D
32	Gastroesophageal Cancer	4	4	6	Oxaliplatin 5-FU	Not changed	No	Vitamin D
33	Cervix Cancer	1	0	4	Carboplatin	Not changed	No	none
34	Breast cancer	2	0	6	5-FU Cyclophosphamide	Improved	Yes	Vitamin C, E



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