 ISSN 2988-7054


# Evaluation of Chemotherapy Side Effects in Bladder Cancer Patients at Dr. Pirngadi Regional Hospital

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Introduction: Bladder cancer is a pathological condition in which there is uncontrolled and abnormal proliferation or growth of cells that form the lining of the bladder wall. One of the current methods of treating bladder cancer is chemotherapy. Chemotherapy has a substantial effect in reducing the number of cancer cells because its mechanism of action aims to induce cell death and inhibit the proliferation of cancer cells. However, patients undergoing chemotherapy treatment often experience various symptoms that can originate from the side effects of chemotherapy itself. This study aims to evaluate the description of the side effects of chemotherapy drugs in bladder cancer patients at Dr. Pirngadi Regional Hospital. Methods: This study was conducted using a retrospective observational study design with a cross-sectional design. Sampling in this study used the Total Sampling technique. The samples obtained were 42 samples. Data collection was obtained through secondary data taken from medical records obtained from Dr. Pirngadi Regional Hospital, Medan City and analyzed using univariate tests. Results: The most commonly used chemotherapy drugs by bladder cancer patients were the combination of gemcitabine-cisplatin (64.3%) and epirubicin (35.7%) and the most common side effects were dyspepsia (34.5%), followed by joint pain (23.6%), allergic responses and swelling (12.7%), infection (5.5%), thrombocytopenia and constipation (3.6%), hypovolemic shock (1.8%), vertigo, and neutropenia (0.9%). Conclusion: The most commonly used chemotherapy drugs by bladder cancer patients at Dr. Pirngadi Regional Hospital were gemcitabine-cisplatin with the most common side effect being dyspepsia.
**Keywords:** Side effects, bladder cancer, chemotherapy.



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## 1. Introduction

Bladder cancer, often referred to as bladder cancer, is a type of malignancy that originates in the tissue within the bladder. This disease occurs when the cells that form the lining of the bladder wall experience uncontrolled and abnormal growth and proliferation. This abnormal cell growth can lead to the formation of malignant tumors in the bladder. As the disease progresses, the tumors can grow increasingly extensively and have the ability to invade surrounding tissue. Under certain conditions, cancer cells can also spread to other organs or tissues of the body through metastasis, making the condition more complex and requiring appropriate and ongoing treatment (1).

Bladder cancer is a health issue that requires attention because its incidence remains quite high in various countries. According to data from the International Agency for Research on Cancer (IARC) in 2022, there were an estimated 614,298 new cases of bladder cancer worldwide, or approximately 3.1% of all cancer cases. In the same year, this disease also caused approximately 220,596 deaths, or 2.3% of all cancer deaths. These data indicate that bladder cancer remains a malignancy that places a significant burden on global public health and requires optimal management efforts, both through early detection and appropriate therapy (3).

Bladder cancer is also a concern in Indonesia. In 2022, bladder cancer ranked thirteenth as one of the types of cancer with a significant number of cases in Indonesia. There were 7,381 new cases, or approximately 1.8% of all cancer cases, recorded, with the death toll reaching 3,207 cases, or approximately 1.3%. These high incidence and death rates indicate that bladder cancer is not only a global health problem but also has a significant impact on the Indonesian healthcare system. This situation highlights the importance of improving the quality of care and treatment for bladder cancer patients to control disease progression and maintain their quality of life (4).

A picture of the incidence of bladder cancer in Indonesia can also be seen from several referral hospital reports. At Cipto Mangunkusumo Hospital and Dharmais Cancer Hospital in Jakarta, there were 340 cases of bladder cancer reported between January 1995 and December 2004. Meanwhile, a report from Dr. Soetomo Regional General Hospital recorded 126 cases of bladder cancer over a five-year period, from 2008 to 2012. These data show that bladder cancer has been found in significant numbers in various health care facilities in Indonesia. The continued presence of cases indicates the need for comprehensive disease management, including selecting appropriate therapy and monitoring patient conditions during treatment (5).

Bladder cancer generally requires a long-term treatment and care process. This is due to the nature of the disease, which requires continuous monitoring to determine the patient's condition and response to therapy. One treatment method used in bladder cancer management is chemotherapy. Chemotherapy uses anticancer drugs to inhibit the growth, development, and spread of cancer cells. The mechanism of action of chemotherapy drugs is essentially aimed at damaging or inhibiting the ability of cancer cells to divide, thereby suppressing malignant cell growth. Therefore, chemotherapy is an important part of bladder cancer patient management, tailored to each patient's clinical condition and individual therapeutic needs (6).

Despite its benefits in controlling cancer cell growth, chemotherapy drugs can also cause various side effects. This occurs because chemotherapy drugs do not always work solely on cancer cells, but can also affect normal cells that have the ability to divide rapidly. As a result, patients undergoing chemotherapy can experience various complaints during and after therapy. The level and type of side effects experienced by each patient can vary depending on the type of drug used, the dose, the frequency of administration, the patient's health condition, and the body's response to treatment. If side effects are not properly monitored and managed, they can affect the continuity of therapy and patient comfort during treatment (7).

Various side effects can occur in patients receiving chemotherapy drugs. Common side effects include hair loss or baldness, hematologic disorders such as anemia, leukopenia, and thrombocytopenia, and a decreased immune system that can increase the risk of infection. In addition, patients may experience digestive system disorders, such as nausea, vomiting, decreased appetite, and abdominal discomfort. These side effects can occur with varying degrees of severity in each patient. These conditions require attention because in addition to causing discomfort, side effects can also interfere with daily activities and reduce the patient's ability to optimally undergo treatment (8).

In addition to physical side effects, chemotherapy can also impact a patient's psychological state and social functioning. Patients who experience side effects such as weakness, fatigue, nausea, vomiting, or changes in physical condition may experience limitations in carrying out daily activities. Some patients may also experience hormonal changes that affect sexual drive and reproductive function. Repeated chemotherapy administration can also worsen a patient's functional status if side effects are not managed properly. This functional status relates to a patient's ability to carry out daily activities, meet self-care needs, carry out work, and fulfill roles within the family and social environment (7).

The emergence of side effects due to the use of chemotherapy drugs requires attention because they can affect the patient's overall quality of life. The symptoms experienced by patients not only cause physical disturbances, but can also affect emotional and psychological conditions during treatment. Prolonged fatigue, nausea, vomiting, impaired appetite, hair loss, and changes in physical condition can make patients feel uncomfortable and experience a decrease in self-confidence. In certain conditions, severe side effects can even affect patient compliance with the treatment schedule and patient response to therapy. Therefore, identifying and evaluating chemotherapy side effects is an important part of supporting successful treatment and maintaining patients' quality of life (7).

Evaluating drug use in cancer patients is a crucial step in ensuring that the therapy provided is appropriate to the patient's condition and needs. This evaluation is necessary to determine the type of drug used, the administration pattern, the potential for side effects, and the patient's condition after therapy. Through systematic evaluation, healthcare professionals can gain insight into the safety and effectiveness of chemotherapy drug use. Furthermore, evaluation can help identify side effects early so that preventative and treatment measures can be implemented more quickly and appropriately. Therefore, the drug use evaluation process not only aims to improve the success of therapy but also helps minimize risks that could harm the patient (9).

Evaluation of chemotherapy drug use also has the benefit of supporting the efficiency of healthcare services. Untreated side effects can require additional examinations, supportive treatment, and even further hospitalization. This ultimately increases the cost of treatment for both patients and hospitals. Therefore, structured monitoring of side effects is essential as part of efforts to improve the quality of pharmaceutical and overall healthcare services. Appropriate evaluation can help healthcare professionals determine appropriate treatment steps, reduce the risk of complications, and optimize resource utilization in cancer patient care (9,10).

Dr. Pirngadi Regional Hospital, located in Medan City, is a healthcare facility that provides services to the community, including services for cancer patients. One type of cancer treated at the hospital is bladder cancer, with chemotherapy as a treatment method that can be used according to the patient's condition. The use of chemotherapy drugs in bladder cancer patients requires continuous monitoring to determine the response to therapy and various side effects that may arise during the treatment process. A structured evaluation is expected to provide an overview of the type of chemotherapy drug used and the side effects experienced by patients. Based on this, researchers are interested in conducting research on the evaluation of chemotherapy drug side effects in bladder cancer patients at Dr. Pirngadi Regional Hospital. Thus, the results are expected to provide useful information to support the monitoring and management of chemotherapy therapy in bladder cancer patients (9,10).

## 2. Literature Review and Problem Statement

### Chemotherapy

Chemotherapy is a treatment method used in cancer management that utilizes anticancer drugs to inhibit the growth and development of cancer cells. In bladder cancer patients, chemotherapy can be given according to the clinical condition, stage of the disease, and other medical considerations. Although intended to control the growth of cancer cells, chemotherapy drugs can also affect normal cells, causing various side effects. These side effects can include nausea, vomiting, fatigue, hair loss, anemia, leukopenia, thrombocytopenia, decreased appetite, and an increased risk of infection. Therefore, chemotherapy requires careful monitoring of the patient's condition to determine the response to therapy and any side effects.

### Bladder Cancer

Bladder cancer is a malignancy caused by abnormal and uncontrolled cell growth in bladder tissue. This disease can develop locally and, under certain conditions, can spread to other tissues or organs through metastasis. Treatment for bladder cancer can include surgery, chemotherapy, radiotherapy, immunotherapy, or a combination of these methods, depending on the patient's condition. Chemotherapy is a crucial component of bladder cancer treatment because it can inhibit the growth and spread of cancer cells. However, the use of chemotherapy drugs in bladder cancer patients requires caution, as they can cause side effects that can impact the patient's physical condition and quality of life.

### Side Effects of Chemotherapy Drugs

Chemotherapy side effects are a variety of reactions or complaints that patients may experience as a result of using anticancer drugs during treatment. Side effects can vary from patient to patient, depending on the type of drug, dosage, frequency of administration, duration of treatment, and the patient's health condition. Some common side effects include nausea, vomiting, fatigue, hair loss, hematological disorders such as anemia, leukopenia, and thrombocytopenia, and an increased risk of infection. These side effects can cause discomfort, disrupt daily activities, reduce functional status, and affect the patient's quality of life. Therefore, evaluating the side effects of chemotherapy drugs is necessary to identify the most common side effects and serve as a basis for appropriate monitoring and treatment.

### Problem Statement

Bladder cancer patients undergoing chemotherapy are at risk of experiencing various side effects from the use of anticancer drugs. Differences in drug types and patient conditions can lead to side effects of varying types and severity. If side effects are not properly recognized and monitored, they can disrupt patient comfort, daily activities, quality of life, and the continuity of treatment. Therefore, an evaluation of the side effects of chemotherapy drugs in bladder cancer patients at Dr. Pirngadi Regional Hospital is necessary to determine the types of chemotherapy drugs used and the various side effects experienced by patients during therapy.

## 3. Method

The study began by identifying patients diagnosed with bladder cancer and undergoing chemotherapy at Dr. Pirngadi Regional General Hospital in Medan. The study population was determined based on bladder cancer patient data obtained from the hospital. The sample was then selected based on established inclusion and exclusion criteria. Patients who met the study criteria were then sampled using a total sampling technique, where all members of the population who met the criteria were included in the study sample.

Next, data collection was conducted using secondary data obtained from patient medical records at Dr. Pirngadi Regional General Hospital, Medan City. The data collected included bladder cancer diagnosis, chemotherapy history and cycle, type of chemotherapy drug administered, and side effects recorded during treatment. The data obtained was then checked for completeness and legibility, then recorded and classified based on predetermined research variables.

The next stage is data processing and analysis. The collected data was edited, coded, entered, cleaned, and saved to ensure it was well-organized and usable for analysis. After processing, the data was analyzed using SPSS software using univariate analysis methods to determine the frequency and percentage distribution of chemotherapy drug types and side effects experienced by patients. The results were then

presented in tabular form and used to illustrate the side effects of chemotherapy drugs in bladder cancer patients at Dr. Pirngadi Regional General Hospital, Medan.

## 4. Results and Discussion

### Results

This research was conducted at Dr. Pirngadi Regional General Hospital in July–August 2024, with the approval of the Health Research Ethics Commission of the Faculty of Medicine, Muhammadiyah University of North Sumatra, No. 1192/KEPK/FKUMSU/2024. The study design was cross-sectional with the aim of evaluating the side effects of chemotherapy drugs in bladder cancer patients at Dr. Pirngadi Regional General Hospital. Sampling in this study used a total sampling technique with a total of 42 samples.

### Distribution of Patient Characteristics

**Table 4.1** Distribution of Characteristics of Bladder Cancer Patients at Dr. Pirngadi Regional Hospital

| Respondent Characteristics | Number (n) | Percentage (%) |
|---|---|---|
| **Age** | | |
| 26 - 35 Years | 2 | 4.8 |
| 36 - 45 Years | 2 | 4.8 |
| 46 - 55 Years | 10 | 23.8 |
| 56 - 65 Years | 15 | 35.7 |
| > 65 Years | 13 | 31.0 |
| **Gender** | | |
| Man | 28 | 66.7 |
| Woman | 14 | 33.3 |
| **Total** | **42** | **100.0** |

From table 4.1 it can be seen that the majority of bladder cancer patients are in the age range with a number of 56-65 years (35.7%), followed by the age of >65 years with a number of 13 people (31%), the age of 46-55 years with a number of 10 people (23.8%), the age of 26-35 years and 36-45 years each with a number of 2 people (4.8%). From the table it can also be seen that the majority of bladder cancer patients are male with a number of 28 people (66.7%) and female with a number of 14 people (33%).

### Univariate Analysis

### Distribution of Patient Characteristics by Type of Chemotherapy Drug

**Table 4.2** Distribution of Patient Characteristics by Type of Chemotherapy Drug

| Chemotherapy Drugs | Number (n) | Percentage (%) |
|---|---|---|
| Gemcitabine and Cisplatin | 27 | 64.3 |
| Epirubicin | 15 | 35.7 |
| **Total** | **42** | **100.0** |

From table 4.2 it can be seen that the chemotherapy drugs most frequently consumed by bladder cancer patients are a combination of gemcitabine and cisplatin with a total of 27 people (64.3%) and epirubicin with a total of 15 people (35.7%).

### Overview of Side Effects of Chemotherapy Drugs

**Table 4.3** Overview of Chemotherapy Drug Side Effects

| Side effects | Number (n) | Percentage (%) |
|---|---|---|
| Dyspepsia | 38 | 34.5 |

| Side effects | Number (n) | Percentage (%) |
|---|---|---|
| Joint pain | 26 | 23.6 |
| Allergic response | 14 | 12.7 |
| Swollen | 14 | 12.7 |
| Infection | 6 | 5.5 |
| Thrombocytopenia | 4 | 3.6 |
| Constipation | 4 | 3.6 |
| Hypovolemic shock | 2 | 1.8 |
| Vertigo | 1 | ,9 |
| Neutropenia | 1 | ,9 |
| **Total** | **110** | **100.0** |

From table 4.3 it can be seen that the most common side effects caused by bladder cancer chemotherapy drugs are dyspepsia with a total of 38 people (34.5%), followed by joint pain with a total of 26 people (23.6%), allergic responses and swelling each with a total of 14 people (12.7%), infection with a total of 6 people (5.5%), thrombocytopenia and constipation with a total of 4 people (3.6%), hypovolemic shock with a total of 2 people (1.8%), vertigo, and neutropenia each with a total of 1 person (0.9%)..

## Discussion

Bladder cancer is a leading cause of morbidity and mortality among elderly men. Table 4.1 shows that most bladder cancer patients are aged 56–65 years. This age group is categorized as late old age. According to Fan Yang, advanced age is a major risk factor for bladder cancer. (14)

Research conducted by Fikri Fadhil at Dr. M. Djamil Padang General Hospital in 2018–2021 showed that the highest number of bladder cancer patients were aged >45 years. (15) Research conducted by Rainy Umbas at Cipto Mangunkusumo Hospital (RSCM) and Dharmais Cancer Hospital (RSKD) Jakarta showed that there were 340 cases of bladder cancer between January 1995 and December 2004 with an average patient age of 54 years. (16) Likewise, research conducted by Abdih at Soetomo Hospital during a five-year period, namely 2008–2012, recorded 126 cases of bladder cancer with an average age of 60.6 years and most of the patients were over 60 years old. (16)

The theory of aging and genetic mutations suggests that with age, there is an accumulation of genetic material that undergoes a decline in function, particularly related to p53 inactivation. The aging process is accompanied by an increasing accumulation of DNA mutations, progressive shortening of telomeres, damage to mitochondria, and various other DNA damage. These conditions can disrupt the control of cell proliferation and the response to cell damage. In addition, this damage can also be influenced by external factors such as exposure to carcinogenic substances, thereby increasing the risk of abnormal cell development and bladder cancer. (17)

One of the risk factors that plays a role in the incidence of bladder cancer is male gender. Table 4.1 also shows that most bladder cancer patients are male. Bladder cancer is more common in men than women with a ratio of 3.5:1. This is in line with research conducted by Rangrez Shadab in India which reported that 72 participants (67.3%) with bladder cancer were male, while the remaining 35 participants (32.7%) were female. This cancer is significantly more common in men ($P < 0.001$) compared to women. Men tend to experience higher exposure to carcinogens that can damage bladder cells. In addition, sex hormones such as androgens, which are dominant in men, and estrogens, which are dominant in women, can also influence the risk of bladder cancer. Research shows that these hormones can influence the development of bladder cancer, with men showing a higher risk in both in vivo and in vitro studies. (18)

One approach in treating bladder cancer is the application of chemotherapy. From Table 4.2 it can be seen that the chemotherapy drug most commonly used by bladder cancer patients is a combination of gemcitabine and cisplatin. The combination of gemcitabine and cisplatin has been shown to significantly produce a synergistic therapeutic effect on bladder cancer cells, causing a significant decrease in cell viability. (19) Research conducted by Erin G. Whynot reported that cisplatin is cytotoxic to T24 cells and TCCSUP transitional cell carcinoma cells with EC50 values of 10.75 mM and 6.75 mM, respectively. Likewise, gemcitabine showed cytotoxic activity against T24 cells with an EC50 of 102 nM. (20) These data indicate that gemcitabine and cisplatin are effective in killing cancer cells, but with different levels of potency.

Chemotherapy drugs are designed to target rapidly growing cancer cells. However, this therapy can also affect healthy cells with high proliferation rates, such as cells in the digestive tract and blood cells. Table 4.3 shows that the most common side effects caused by chemotherapy drugs in bladder cancer patients are dyspepsia, joint pain, allergic reactions, swelling, thrombocytopenia, constipation, hypovolemic shock, vertigo, and neutropenia. The side effects experienced by patients in this study generally included more than one symptom. Gastrointestinal side effects, or dyspepsia, can occur in up to 40% of patients receiving standard-dose chemotherapy or 100% of patients receiving high-dose chemotherapy.

Chemotherapy drugs, including cisplatin, can cause mucosal lesions along the gastrointestinal tract, namely the stomach, small intestine, and large intestine (22). The gastrointestinal tract is highly susceptible to chemotherapy drugs that inhibit cell growth and/or division. Chemotherapy drugs target vulnerable gastrointestinal tissue by disrupting DNA synthesis, thus causing apoptosis. (23) The body's inability to resist damage and/or repair and restore epithelial barrier function quickly after chemotherapy can be detrimental to cancer patients by resulting in various pathological conditions, including inflammation, ulceration, pain, nausea, and dysfunction and failure of various organs. During chemotherapy treatment, various dyspeptic symptoms, including nausea and vomiting, often occur. Chemotherapy drugs cause nausea and vomiting through two main pathways. Injury to the gastrointestinal mucosa causes the release of substances from enterochromaffin cells, such as 5-hydroxytryptamine (5-HT), which stimulates 5-HT3 receptors on the vagus afferent nerve in the intestinal wall and stimulates the vomiting center in the medulla oblongata. This is in line with research by Deborah A. Matesun who reported that the use of epirubicin as an anticancer agent resulted in nausea and vomiting in 10.38% of patients.

In addition, chemotherapy regimens using gemcitabine-cisplatin and anthracyclines, including epirubicin, have been reported to cause constipation. These drugs can affect the balance of intestinal microflora and modify gastrointestinal secretions, leading to disruptions in digestion and bowel movements. In addition to changes in gastrointestinal microflora and secretions, chemotherapy can also affect the enteric nervous system, which regulates intestinal motor activity through three main types of neurons: sensory neurons, interneurons, and motor neurons. Myenteric neurons in the enteric nervous system control intestinal motility by regulating smooth muscle contraction patterns. Chemotherapy can disrupt the function of neurons and interstitial cells of Cajal (ICC), which act as pacemakers for intestinal motility. Disruption of these neurons can alter intestinal contraction patterns, including phasic contractions with a repetitive rhythm and tonic contractions that occur continuously, resulting in constipation by slowing the movement of fecal matter through the colon (23). Overall, the effects of chemotherapy on the intestinal microflora, gastrointestinal secretions, and the enteric nervous system contribute to impaired intestinal motility and the development of constipation in patients.

Patients undergoing chemotherapy can experience various musculoskeletal manifestations, including arthralgia, or joint pain. Several studies have reported joint inflammation characterized by tenderness and

swelling after chemotherapy therapy. Research conducted by Aref H. Amiri reported clinical symptoms similar to rheumatoid arthritis (RA), such as morning stiffness, polyarthritis often involving the fingers and toes, and a symmetrical distribution (22). This joint pain is thought to arise from the effects of chemotherapy, which disrupts immune system function, triggers autoantibody production, and results in relevant musculoskeletal manifestations.

Research conducted by Stephen Yustianto Pribadi reports that chemotherapy can cause various physical responses, including allergic responses that have the potential to cause skin toxicity. (30) These allergic responses are often triggered by chemotherapy drugs used in cancer therapy and can cause various clinical manifestations. In particular, the combination of chemotherapy with drugs such as cisplatin can stimulate allergic responses. These findings are supported by other studies that reveal that the use of drugs such as gemcitabine can trigger allergic responses with symptoms such as chills, fever, anaphylactic shock, and edema.

Chemotherapy regimens can cause significant decreases in hematopoietic cells, especially hemoglobin (Hb), neutrophils, and platelets. In this study, the identified side effects of chemotherapy included thrombocytopenia and neutropenia. Cisplatin, as a chemotherapy drug, can cause DNA damage through the formation of intrastrand DNA crosslinks induced by reactive oxygen species (ROS), cytochrome-c, and the JNK, p38MAPK, caspase 8, 9, and 3 signaling pathways. Cisplatin can cause cell death or impaired cell development in the bone marrow, especially in the erythrocyte-megakaryocyte progenitor cell pathway. This condition causes a decrease in the production of megakaryioblasts and megakaryocytes, thereby reducing the number of platelets and causing thrombocytopenia (20).

Research conducted by Aminullah at Dr. Kariadi General Hospital Semarang on the effects of cisplatin post-chemotherapy on hematopoietic cells reported that the average platelet count before chemotherapy was 333.7 (130.5) thousand cells/mm³, while after chemotherapy it decreased to 268.5 (81.8) thousand cells/mm³, with a statistically significant difference (p=0.006). The percentage decrease in platelet count after chemotherapy was recorded at 19.53% (24).

Research conducted by Surtajomo at Dr. Saiful Anwar Malang Regional General Hospital on the impact of cisplatin-based chemotherapy on neutrophil counts showed a significant difference between neutrophil counts before and after chemotherapy, with a p value of 0.000. The decrease in neutrophil counts after chemotherapy was recorded at 45.52%. (35) Chemotherapy can cause cell death or disruption in the development of cells in the bone marrow, especially through the granulocyte-monocyte progenitor cell pathway. This condition can result in disruption of the development of monodendritic progenitor cells and a decrease in dendritic progenitor cells which contribute to a decrease in neutrophil counts and can cause neutropenia. In general, neutropenia usually appears within 3 to 7 days and peaks on the 10th to 15th day after chemotherapy and can increase the risk of infection (23).

Another study conducted by Deborah A. Matesun also reported that thrombocytopenia and neutropenia can be caused by epirubicin treatment with percentages of 3.19% and 8.83%, respectively. (37) The study showed that the release of epirubicin can cause toxicity in the circulatory system, causing damage to normal cells and tissues, and resulting in metabolic disorders.

The use of platinum-based chemotherapy drugs such as cisplatin has also been reported to cause vestibulotoxicity. The loss of vestibular function due to the drug can affect both ears symmetrically and gradually, resulting in vertigo. However, another study conducted by Pattarawade Prayuenyong reported that vertigo symptoms may be caused by the underlying cancer and a decline in the patient's general condition during and after treatment, such as dehydration, nausea and vomiting, chronic fatigue, and anemia. (38) This study has limitations because the focus of the study only describes the side effects of

chemotherapy drugs without evaluating age, gender, education level, physical activity, and other factors that can trigger and increase side effect reactions in bladder cancer patients.

## 5. Conclusion

Based on the results of research and discussions that have been conducted regarding the evaluation of chemotherapy drug side effects in bladder cancer patients at Dr. Pirngadi Regional Hospital, it can be concluded that the majority of patients received chemotherapy treatment using a combination of gemcitabine-cisplatin. During the treatment, various side effects were found to be experienced by patients, namely dyspepsia, joint pain, allergic responses, swelling, thrombocytopenia, constipation, hypovolemic shock, vertigo, and neutropenia. Of these various side effects, dyspepsia was the most common side effect found in bladder cancer patients undergoing chemotherapy at Dr. Pirngadi Regional Hospital.

It is hoped that further research will be conducted with a broader scope and consider various factors that can influence the occurrence of chemotherapy side effects in bladder cancer patients. These factors include age, gender, education level, physical activity, patient health condition, type and dose of chemotherapy drug, and other factors that could potentially trigger or increase side effects. By considering these factors, it is hoped that further research will provide a more comprehensive picture of chemotherapy side effects and serve as a basis for improving the monitoring and management of therapy in bladder cancer patients.

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