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FACTORS ASSOCIATED WITH THROMBOCYTOPENIA IN SOLID CANCER PATIENTS POST-CHEMOTHERAPY AT PROF. DR. I.G.N.G. NGOERAH GENERAL HOSPITAL DENPASAR

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ABSTRACT

Background: Chemotherapy is associated with various hematologic and non-hematologic adverse effects, including thrombocytopenia, which may increase the risk of complications, necessitate chemotherapy modifications, and adversely affect patient prognosis.
Aims: This study aimed to evaluate patient characteristics and identify factors associated with thrombocytopenia in patients with solid malignancies following chemotherapy.
Methods: This analytical observational study employed a cross-sectional design, analyzing 514 medical records of patients with solid malignancies who underwent chemotherapy at Prof. I.G.N.G. Ngoerah General Hospital, Denpasar, using total sampling.
Results: The prevalence of thrombocytopenia was 26.8% (138 patients). The median patient age was 52 years, and the majority were female (77.1%). Multivariate analysis demonstrated a significant association between taxane-based chemotherapy regimens and thrombocytopenia ($p = 0.003$). Bivariate analysis identified significant associations between thrombocytopenia and breast cancer ($p < 0.001$), lung cancer ($p = 0.010$), and cervical cancer ($p = 0.029$). Chemotherapy regimens involving two or more agents were also significantly associated with thrombocytopenia ($p = 0.025$). Furthermore, platinum-based ($p < 0.001$), taxane-based ($p = 0.003$), and anthracycline-based ($p < 0.001$) chemotherapy regimens were significantly associated with a lower incidence of thrombocytopenia.
Conclusion: Platinum-, taxane-, and anthracycline-based chemotherapy regimens were significantly associated with a lower incidence of thrombocytopenia. Cancer type, particularly breast, lung, and cervical cancers, and the use of two or more chemotherapeutic agents were also associated with the incidence and severity of post-chemotherapy thrombocytopenia.
Keywords : antineoplastic agents, neoplasms, risk factors, thrombocytopenia

INTRODUCTION

Cancer is a significant global public health concern and the second leading cause of mortality worldwide.[1] According to the World Health Organization (WHO), nearly 10 million deaths are attributed to cancer annually.[2] In Indonesia, the prevalence of cancer increased from 1.4% to 1.79% per 1,082,300 population between 2013 and 2018.[3] Furthermore, in 2020, 396,914 new cases and 234,511 cancer-related deaths were reported.[4] These statistics underscore the critical importance of cancer prevention and management as focal points for healthcare professionals and institutions worldwide.

Malignancies are categorized into two types: solid and non-solid. According to the National Cancer Institute, solid tumors are defined as abnormal tissue masses that generally do not contain cysts or fluid. Solid tumors can be further classified as benign or malignant, with malignant solid tumors causing cancer. Examples of malignant solid tumors include colorectal, breast, and liver cancers. Conversely, hematological malignancies, such as leukemia, lymphoma, and myeloma, are not classified as solid tumors.

Numerous innovations in cancer treatment have been developed to improve patient survival. Chemotherapy, one of the most widely recognized cancer therapies, utilizes

chemical agents to inhibit the proliferation of malignant cells or pathogens.[5] However, chemotherapy is often accompanied by various adverse effects. One of the most common hematologic side effects is thrombocytopenia, a medical condition characterized by platelet counts below the normal threshold of 150,000/μL (150×10^9 L−1) in adults.[6,7] A study involving 15,521 patients with solid tumors reported that 13% of patients developed thrombocytopenia within three months of chemotherapy.[8] Similarly, in Dr. Mohammad Soewandhie General Hospital, Surabaya, 10.6% of post-chemotherapy patients experienced thrombocytopenia in 2018.[9]

Chemotherapy-induced thrombocytopenia, also known as drug-induced nonimmune thrombocytopenia, occurs due to bone marrow suppression or increased platelet destruction mediated by mononuclear phagocytes.[10] Chemotherapy agents may also increase platelet destruction by mononuclear phagocytes.[11] The severity of thrombocytopenia varies among patients, depending on cancer type, anti-cancer therapy, bone marrow involvement, and comorbidities. Platinum-based chemotherapies, such as carboplatin and oxaliplatin, are known to increase the risk of thrombocytopenia, which can lead to reduced chemotherapy dosing and frequency, ultimately affecting long-term cancer-free survival.[12] Additionally, thrombocytopenia heightens the risk of bleeding, particularly in patients with pre-existing hematological malignancies.

Currently, platelet transfusion is the primary intervention for preventing and managing chemotherapy-induced thrombocytopenia. However, this approach has limitations, including a high risk of residual bleeding and the need for chemotherapy dose reductions.[12] Research exploring the factors associated with thrombocytopenia in solid malignancy patients post-chemotherapy remains limited. Therefore, this study, titled "Factors Associated with Thrombocytopenia in Solid Cancer Patients Post-Chemotherapy at Prof. Dr. I.G.N.G. Ngoerah General Hospital Denpasar," was conducted.

MATERIALS AND METHODS

This study employs a retrospective, single-center, cross-sectional design utilizing medical records of patients from the Internal Medicine Hemato-Oncology Clinic at Prof. Dr. I.G.N.G. Ngoerah General Hospital, Denpasar. The data collection period spans from January 1, 2023, to December 31, 2023. The sample size will be determined by the number of eligible records available during this period, with a total sampling technique applied to ensure comprehensive data inclusion. This study was approved by the Education and Research Department of Prof. Dr. I.G.N.G. Ngoerah General Hospital, Denpasar, with the protocol number [2024.01.1.0277].

The inclusion criteria for this study are medical records of patients with confirmed diagnoses of solid malignancies who received treatment at the clinic during the study period. Laboratory test results included in the analysis must be from post-chemotherapy assessments conducted within the same timeframe.

Exclusion criteria are designed to eliminate confounding factors that could affect the analysis. Records will be excluded if they indicate thrombocytopenia caused by other etiologies, such as thrombotic microangiopathy, post-transfusion purpura, coagulopathy, or immune thrombocytopenia. Patients who have undergone stem cell therapy, bone marrow transplantation, or received blood/platelet transfusions or anticoagulant therapy will also be excluded. Additionally, records will be excluded if they document prior chemotherapy or radiotherapy before treatment at the clinic or lack laboratory test results during the study period.

RESULTS

Patient Characteristics

A total of 514 medical records meeting the inclusion criteria were identified through total sampling. Table 1 presents the distribution of patient characteristics based on thrombocytopenia status. Among the cohort, the prevalence of thrombocytopenia was 138 patients (26.8%). The median age of the patients was 52 years, with no significant difference between patients with and without thrombocytopenia.

Regarding gender distribution, female patients accounted for 397 (77.1%) cases, while male patients comprised 118 (22.9%). This imbalance may be attributed to the inclusion of breast and cervical cancer cases, which predominantly affect women. The most frequently observed cancer stages were Stage III, followed by Stage IV, Stage II, and Stage I. Additionally, 41 patients (8.0%) had undetermined or unclassifiable cancer stages based on the TNM classification system.

The median body mass index (BMI) for solid cancer patients was 22.06 (19.50–25.16), categorized as normal or ideal under the Asia-Pacific BMI classification. However, a significant difference in BMI was observed between patients with and without thrombocytopenia ($p = 0.021$), with thrombocytopenic patients exhibiting a lower average BMI. The majority of patients fell within the normal BMI range, followed by obesity, overweight, and underweight categories. Nonetheless, no statistically significant association was found between BMI classification and the incidence of thrombocytopenia in post-chemotherapy solid cancer patients ($p = 0.087$).

Table 1. Characteristics of Post-Chemotherapy Solid Cancer Patients

Characteristics	Total (N = 514)	No Thrombocytopenia (N = 376)	Thrombocytopenia (N = 138)	*p*
Demographic Characteristics				
Age, median (IQR)	52.0 (45.0–59.0)	52.0 (45.0–58.0)	53.0 (45.75–67.1)	0.220
Sex, n (%)				
Male	118 (22.9)	83 (70.3)	35 (29.7)	0.457
Female	397 (77.1)	293 (73.8)	104 (26.2)	

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BMI, median (IQR)	22.06 (19.5–25.16)	22.45 (19.99–28.31)	21.20 (18.75–25)	0.021*
Nutritional Status, n (%)				
Normal	190 (36.9)	141 (74.2)	49 (25.8)	0.087
Underweight	78 (15.1)	50 (64.1)	28 (35.9)	
Overweight	81 (15.7)	66 (81.5)	15 (18.5)	
Obese	128 (24.9)	97 (75.8)	31 (24.2)	
N/A	38 (7.4)			
Clinical Characteristics				
Type of Tumor, n (%)				
Breast	220 (42.8)	183 (83.2)	37 (16.8)	0.001*
Lung	92 (17.9)	58 (63.0)	34 (37.0)	
Colorectal	15 (2.9)	12 (80.0)	3 (20.0)	
Prostate	9 (1.8)	7 (77.8)	2 (22.2)	
Gastric	6 (1.2)	5 (83.3)	1 (16.7)	
Cervical	115 (22.4)	75 (65.2)	40 (34.8)	
Nasopharyngeal	57 (11.1)	36 (63.2)	21 (36.8)	
Stage, n (%)				
I	11 (2.1)	8 (72.7)	3 (27.3)	0.087
II	108 (21.0)	80 (74.1)	28 (25.9)	
III	185 (35.9)	146 (78.9)	39 (21.1)	
IV	170 (33.0)	114 (67.1)	56 (32.9)	
N/A	41 (8.0)			
Infection Status, n (%)	17 (3.3)	11 (2.9)	6 (4.4)	0.425
Treatment Characteristics				
Type of Chemotherapy, n (%)				
Platinum-based	300 (58.3)	191 (63.7)	109 (36.3)	<0.001*
Taxane-based	52 (10.1)	47 (90.4)	5 (9.6)	
Topoisomerase	8 (1.6)	8 (100.0)	0 (0.0)	
Vinca Alkaloid	4 (0.8)	3 (75.0)	1 (25.0)	
Anthracycline	142 (27.6)	121 (85,2)	21 (14.8)	
Antimetabolite	1 (0.2)	1 (100,0)	0 (0.0)	
Alkylating Agent	8 (1.6)	5 (62,5)	3 (37.5)	
Number of Chemotherapy Agents, n (%)				
1	56 (10.9)	48 (85.7)	8 (14.3)	0.048*
2	436 (84.7)	311 (71.3)	125 (28.7)	
3	23 (4.5)	17 (73.9)	6 (26.1)	
Number of cycles, n (%)				
1–2	74 (14.4)	53 (71.6)	21 (28.4)	0.058
3–4	163 (31.7)	34 (70.8)	14 (29.2)	
≥5	275 (53.4)	50 (73.5)	18 (26.5)	
N/A	3 (0.6)			

The most common solid tumors are breast cancer (42.8%), followed by cervical cancer (22.4%), lung cancer (17.9%), nasopharyngeal cancer (11.1%), colorectal cancer (2.9%), prostate cancer (1.8%), and gastric cancer (1.2%). Analysis revealed a significant difference in the proportion of thrombocytopenia among different tumor types ($p < 0.001$). Stage III cancer was the most frequently observed. The majority of patients received chemotherapy based on platinum, anthracyclines, or taxane, with a significant difference in thrombocytopenia incidence among agents ($p = 0.048$). Most patients received two chemotherapy agents. No significant difference was found regarding the number of chemotherapy cycles or infection status between patients with and without thrombocytopenia.

Table 2. Characteristics of Complete Blood Count Parameters in Post-Chemotherapy Solid Cancer Patients

Parameter	Total (N = 514)	No Thrombocytopenia (N = 376)	Thrombocytopenia (N = 138)	*p*
WBC (10^3/µL)	3.51 (2.50–4.91)	3.68 (2.81–5.06)	2.88 (1.80–4.15)	<0.001*
RBC (10^6/µL)	3.57 ± 0.56	3.69 ± 0.52	3.24 ± 0.55	<0.001*
HGB (g/dL)	10.20 (9.30–11.10)	10.40 (9.60–11.20)	9.60 (8.80–10.33)	<0.001*

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HCT (%)	31.6 (28.5–34.1)	32.40 (29.93–34.7)	29.20 (26.2–31.94)	<0.001*
MCV (fL)	88.55 ± 6.27	87.92 ± 6.12	90.29 ± 6.38	<0.001*
MCH (pg)	28.90 (27.4–30.3)	28.50 (27.0–30.0)	29.80 (28,5–31.0)	<0.001*
MCHC (g/dL)	32.42 (31.65–33.20)	31.50 (30.80–32.20)	32.20 (31.60–33,0)	<0.001*
PLT (10^3/µL)	211.47 ± 94.75	252.68 ± 73.20	99.18 ± 39.83	-
Ne (10^3/µL)	1.59 (0.78–2.84)	1.85 (0.96–3.00)	0.99 (0.48–1.96)	<0.001*
Ly (10^3/µL)	1.27 (0.88–1.65)	1.30 (0.95–1.66)	1.04 (0.79–1.63)	0.001*
NLR	1.25 (0.60–2.26)	1.34 (0.70–2.34)	0.86 (0.44–2.11)	0.003*

*WBC = white blood cell, RBC = red blood cell, HGB = hemoglobin, HCT = hematocrit, MCV = mean corpuscular volume, MCHC = mean corpuscular hemoglobin concentration, PLT = platelet, Ne = Neutrophil, Ly = Lymphocyte, NLR = Neutrophil-Lymphocyte Ratio

In Table 2, the characteristics of several complete blood count parameters in solid cancer patients, which can be affected after chemotherapy administration, are presented. The table shows significant differences between the thrombocytopenia and non-thrombocytopenia patient groups for all parameters. WBC, RBC, HGB, HCT, MCV, MCH, MCHC, PLT, and Ne all have p-values < 0.001, while Ly has a p-value of 0.001, and NLR has a p-value of 0.003.

Bivariate and Multivariate Analysis

In addition to descriptive analysis, both bivariate and multivariate analyses were conducted to further examine the comparisons between categories within each factor. Table 3 presents the results of the bivariate and multivariate analyses between the studied factors and the occurrence of thrombocytopenia.

Both the bivariate and multivariate analyses did not show significant differences in thrombocytopenia incidence across age groups, gender, infection status, and nutritional status. However, the bivariate analysis of tumor types revealed significant differences, with breast cancer ($p < 0.001$), lung cancer ($p = 0.016$), and cervical cancer ($p = 0.029$) showing statistically significant associations. Specifically, breast cancer had a p-value < 0.001, lung cancer had $p = 0.016$, and cervical cancer had $p = 0.029$.

For chemotherapy types, significant differences were observed in platinum-based agents ($p < 0.001$), taxane ($p = 0.003$), and anthracycline agents ($p < 0.001$). Additionally, the administration of two or more chemotherapy agents was also significantly associated with thrombocytopenia ($p = 0.025$). On the other hand, the multivariate analysis indicated that tumor type did not show significant differences among the groups. However, taxane-based chemotherapy still exhibited a significant association ($p = 0.023$)

Table 3. Relationship Between Factors and Thrombocytopenia in Post-Chemotherapy Solid Cancer Patients

Factor	Bivariate Analysis p-value	Multivariate Analysis p-value
Age Group		
18–65	0.528	Ref
>65		0.861
Sex		
Male	0.433	Ref
Female		0.861
Infection Status		
No Infection	0.506	0.738
Infection		
Nutritional Status		
Normal	Ref	Ref
Underweight	0.098	0.503
Overweight	0.199	0.328
Obese	0.752	0.746
Type of Tumor		
Breast	<0.001*	0.548
Lung	0.016*	0.790
Colorectal	0.544	0.720
Prostate	0.752	0.215
Gastric	0.571	0.366
Cervical	0.029*	0.306

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Nasopharyngeal	0.071	Ref
Type of Chemotherapy		
Platinum-based	<0.001*	1.459
Taxane-based	0.003*	0.023*
Topoisomerase	–	–
Vinca Alkaloid	0.933	0.224
Anthracycline	<0.001*	0.520
Antimetabolite	–	–
Alkylating Agent	0.448	Ref
Number of Chemotherapy Agents		
1		Ref
≥2	0.025*	0.123
Number of Cycles		
1–2	Ref	Ref
3–4	0.168	0.644
≥5	0.705	0.707

Multicollinearity Assessment

In addition to univariate, bivariate, and multivariate analyses, a multicollinearity assessment was conducted to ensure that none of the independent variables or studied factors were strongly correlated. Table 4 presents the results of the multicollinearity test.

Data are considered to have high multicollinearity when the variance inflation factor (VIF) exceeds 5. A VIF value between 1 and 5 indicates moderate multicollinearity, while a VIF of 1 suggests no multicollinearity. Tolerance values closer to 1 indicate low collinearity, whereas tolerance values approaching 0 indicate high collinearity.

In this study, all tolerance values were above 0.5, indicating the absence of significant collinearity. The highest VIF value observed was 1.451 for the chemotherapy type variable, suggesting a low level of multicollinearity. These findings confirm that the data is suitable for further analysis without the risk of distortion from multicollinearity among variables.

DISCUSSION

The median age of the total patient cohort was 52.0 years, with no statistically significant difference observed between the non-thrombocytopenia and thrombocytopenia groups. This finding was consistent with a cohort study conducted in Denmark, which reported that advanced age was not associated with an increased risk of thrombocytopenia in patients with solid malignancies.[13] In another study involving patients with solid and hematologic malignancies, younger age was associated with an increased risk of thrombocytopenia.[14] The gender distribution did not differ significantly between males and females. Another study on gastric cancer reported that males had a higher incidence of thrombocytopenia, although this difference was not statistically significant.[15] Similarly, another study involving solid malignancies demonstrated no significant difference in the incidence of post-chemotherapy thrombocytopenia between males and females.[16] Multivariate analysis of thrombocytopenia incidence also yielded non-significant results for age and gender, indicating that these variables were not significant predictors of thrombocytopenia in this cohort. However, the present study revealed a statistically significant difference in BMI between patients with and without thrombocytopenia. This finding suggested that a relatively lower BMI was associated with a higher incidence of post-chemotherapy thrombocytopenia. Nevertheless, the mean BMI in both groups remained within the normal range.

The classification of patients' nutritional status based on BMI revealed no significant differences between the thrombocytopenia and non-thrombocytopenia groups. Both bivariate and multivariate analyses showed no association between patients' nutritional status and the incidence of post-chemotherapy thrombocytopenia. These findings contrasted with the results of a prospective multicenter study in Turkey, which concluded that patients with moderate to severe malnutrition had a higher incidence of cytopenia.[17] Several other studies also reported that patients with moderate to severe malnutrition tended to have a higher likelihood of developing thrombocytopenia.[18] However, another study involving patients with ovarian cancer found that nutritional status was not significantly associated with the incidence of thrombocytopenia following adjuvant chemotherapy.[19] This finding was consistent with a randomized prospective study involving cancer patients, which also found no statistically significant association between nutritional status and the incidence of thrombocytopenia.[20] Since the present study used only BMI as a parameter for nutritional status, inaccuracies in the classification of patients' nutritional status might have occurred.

Similar to nutritional status, infection status also showed no association with the incidence of thrombocytopenia. Viral infections are among the factors that can lead to thrombocytopenia in post-chemotherapy patients by inhibiting platelet production in the bone marrow.[21] A pilot study indicated that patients with stage III colon cancer who were infected with *H. pylori* were more susceptible to developing post-chemotherapy thrombocytopenia. Further in-depth research is needed to confirm this association.

Breast cancer patients accounted for the largest proportion (42.8%) of the cohort, with the majority not experiencing thrombocytopenia (83.2%). In contrast, lung cancer patients showed a relatively higher frequency of thrombocytopenia (37.0%). A multicenter study reported that the highest prevalence of thrombocytopenia was observed in colorectal cancer, non-small cell lung cancer, and ovarian cancer, whereas the lowest

prevalence was found in breast cancer.[22] A highly significant association was observed between tumor type and the incidence of thrombocytopenia ($p < 0.001$). This finding was consistent with another study that reported the same significance value ($p < 0.001$).[16] The results indicated that the likelihood of thrombocytopenia was 161% higher in breast cancer patients, 56% lower in lung cancer patients, and 62% lower in cervical cancer patients. Another study also found significant associations between thrombocytopenia and breast cancer ($p < 0.001$) and lung cancer ($p < 0.001$), but not cervical cancer ($p = 0.95$).[23] This discrepancy might have been attributed to differences in tumor characteristics or the chemotherapy regimens typically administered for breast, lung, or cervical cancers. Bone marrow metastasis is common in patients with breast and lung cancer.[21]

In addition to cancer type, the type of chemotherapy regimen administered to patients was also significantly associated with the incidence of thrombocytopenia. The highest prevalence of thrombocytopenia was observed in patients receiving platinum-based chemotherapy and alkylating agents. Conversely, the lowest prevalence was found in those receiving antimetabolite-based (gemcitabine) and topoisomerase inhibitor chemotherapy. These findings differed slightly from those of other studies, which reported the highest prevalence of thrombocytopenia in patients receiving gemcitabine- and platinum-based chemotherapy, whereas the lowest prevalence was observed in patients receiving taxane- and anthracycline-based chemotherapy.[8] This discrepancy might have resulted from differences in the classification of chemotherapy regimens or variations in the patient populations included in the studies. As a result, the effects of other chemotherapy regimens may have been underestimated compared to their actual impact. Platinum-based chemotherapy was associated with a significantly lower incidence of thrombocytopenia in the univariate analysis, but the results became non-significant in the multivariate analysis. In contrast, Taxane-based chemotherapy showed a strong negative association with thrombocytopenia in the bivariate analysis, which remained significant after adjustment. This suggests that Taxane-based regimens might have had a protective association against thrombocytopenia. Other studies reported that chemotherapy regimens associated with the highest risk of thrombocytopenia were those based on platinum and gemcitabine.[24] However, because chemotherapy types in the present study were classified according to their order of hematotoxicity, the hematotoxic effects of other chemotherapy agents might have been underestimated.

In general, combination therapy using two main chemotherapy agents was the most commonly administered treatment among patients. Both univariate and bivariate analyses showed significant differences in thrombocytopenia status among patients receiving one, two, or two or more chemotherapy agents, with a higher likelihood of thrombocytopenia observed in patients receiving combination therapy. However, these associations were not statistically significant in the multivariate model. These results suggested that combination therapy with additional agents might have increased the hematotoxic effects of chemotherapy. This finding contrasted with the results of another study, which indicated that the incidence of thrombocytopenia in patients receiving combination therapy was lower than that in patients undergoing monotherapy.[21] To the best of the authors' knowledge, no previous studies had specifically compared the number of chemotherapy agents administered with the risk of thrombocytopenia.

Univariate analysis showed no statistically significant association between the number of chemotherapy cycles and the occurrence of thrombocytopenia. Similar findings were observed in both the bivariate and multivariate analyses of thrombocytopenia incidence. These findings contrasted with those of several other studies, which suggested that multiple chemotherapy cycles could impair erythropoiesis.[22] Another study showed that patients receiving three or more chemotherapy cycles had a slightly higher incidence of thrombocytopenia (2.9%) than those receiving one or two cycles (2.7%). Similarly, a retrospective study found a positive correlation between thrombocytopenia and the number of chemotherapy cycles.[25] These discrepancies might have been attributed to differences in the size and characteristics of the study populations or to confounding variables that could not be controlled, such as patients' nutritional status.

Univariate analysis of complete blood count parameters revealed that chemotherapy affected various blood components. This finding was consistent with the myelosuppressive effects of chemotherapy, which can suppress the production of white blood cells, including neutrophils and lymphocytes, as well as red blood cells and platelets, potentially resulting in anemia, neutropenia, lymphopenia, and thrombocytopenia.[26] Hematocrit levels were significantly lower in patients who developed thrombocytopenia. MCV values also differed significantly between the groups, with higher values observed in patients experiencing thrombocytopenia. This finding was consistent with previous studies, which demonstrated an increasing trend in MCV values following chemotherapy administration.[27] This association might have been related to nutritional status, particularly deficiencies in vitamin B12 and folic acid, which could have increased susceptibility to thrombocytopenia following chemotherapy. In addition to micronutrient deficiencies, elevated MCV values are associated with liver disease, hyperglycemia, alcohol consumption, and smoking.[28] These factors might have had independent associations with thrombocytopenia or other hematologic disorders. An increase in MCH values was also observed in the thrombocytopenia group. This finding might have been attributed to deficiencies in vitamin B9 (folate) or vitamin B12.[27]

Based on the results of the present study, several factors were identified as significantly associated with the incidence of thrombocytopenia. Thrombocytopenia is associated with an increased risk of bleeding, although platelet count alone is not always an accurate predictor of bleeding risk.[21] Nevertheless, several factors that had been associated with thrombocytopenia in previous studies did not demonstrate statistically significant associations in the present study. These discrepancies might have resulted from differences in population characteristics, the categorization of chemotherapy regimens, confounding variables, or the types of cancer investigated. The identification of factors associated with thrombocytopenia was expected to facilitate earlier anticipation of this complication and support preventive measures or interventions when thrombocytopenia occurred or became more severe. Furthermore, the findings indicated that

thrombocytopenia was one manifestation of the broader myelosuppressive effects of chemotherapy.

Several limitations of the present study should be considered. Because this study employed a cross-sectional design, causal relationships between the investigated factors and thrombocytopenia could not be established. Additionally, the retrospective collection of data was susceptible to selection and information biases. Patients with infections and other severe comorbidities that could affect platelet counts were excluded. Patients who received platelet transfusions during chemotherapy were also excluded, which might have led to an underestimation of the number of patients with severe thrombocytopenia. Moreover, patients with incomplete medical record data were excluded from the analysis. Although adjustments were performed using multivariate analysis, residual confounding factors, including nutritional status, infection, and a history of radiotherapy, might still have influenced the final results.

CONCLUSION AND RECOMMENDATIONS

The prevalence of thrombocytopenia in solid cancer patients post-chemotherapy at Prof. Dr. I.G.N.G. Ngoerah General Hospital Denpasar, is 26.8%, with 138 out of 514 patients affected. This study found no significant association between age, gender, nutritional status, or the number of chemotherapy cycles and the occurrence of thrombocytopenia. However, there were significant associations between cancer types (such as breast, lung, and cervical cancers) and the occurrence of thrombocytopenia. Additionally, chemotherapy regimens based on platinum, taxane, and anthracycline, as well as the administration of two or more chemotherapy agents, were also significantly associated with thrombocytopenia in patients.

This study has several limitations. While it identified several significant factors associated with the occurrence and severity of thrombocytopenia, its findings are not entirely consistent with previous studies. These discrepancies may be due to differences in population characteristics, cancer types studied, chemotherapy regimens, and unmeasured confounding variables. A prospective cohort or case-control study in a larger and more diverse population could provide a more accurate and representative understanding of thrombocytopenia and its risk factors in solid cancer patients post-chemotherapy. Furthermore, developing a predictive model for thrombocytopenia risk could aid in prevention efforts. Including additional confounding variables in the analysis may also lead to more accurate results.

The findings of this study are expected to help identify patients at higher risk of thrombocytopenia and provide better management strategies, both in terms of preventive measures and early interventions for solid cancer patients post-chemotherapy.

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