JURNAL KEDOKTERAN DIPONEGORO
(*DIPONEGORO MEDICAL JOURNAL*)
Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
DOI : 10.14710/dmj.v14i1.47014
JKD (DMJ), Volume 14, Number 1, January 2025 : 12-21

THE RELATIONSHIP BETWEEN CHEMOTHERAPY TREATMENT AND THE INCIDENCE OF SEBORRHEIC DERMATITIS IN CANCER PATIENTS AT DR. KARIADI HOSPITAL

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Keywords:
Age,
Chemotherapy,
Gender,
Personal hygiene,
Seborrheic dermatitis

Received: 8 September 2024
Revised: 10 October 2024
Accepted: 14 October 2024
Available online: 31 October 2024

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ABSTRACT

Background: Seborrheic dermatitis is a chronic inflammation of sebaceous gland-rich areas in the form of reddish, well-demarcated plaques and yellowish flaking scabs that can interfere with the patient's comfort and quality of life. Immune system suppression such as chemotherapy in cancer patients is thought to be one of the contributing factors. When seborrheic dermatitis is caused by chemotherapy, it will add to the suffering of patients both in terms of quality of life and treatment costs. **Objective:** To find out the difference in the incidence of seborrheic dermatitis in cancer patients who are undergoing chemotherapy and cancer patients who are not receiving chemotherapy. **Methods:** This study was an analytic observational study with a cross-sectional design. The study subjects were 40 people who were cancer patients at Dr. Kariadi Hospital who were selected by consecutive sampling method. The questionnaire used to determine the details of chemotherapy actions and the incidence of seborrheic dermatitis made by the author has been tested validity. Data processing used Chi Square or Fisher Exact analysis test and multivariate logistic regression test. **Results:** There was 73.3% incidence of seborrheic dermatitis in patients who were undergoing chemotherapy, 26.7% incidence of seborrheic dermatitis in patients who were not. The Chi Square test found a significant association between chemotherapy treatment and the incidence of seborrheic dermatitis with p = 0.022. The bivariate analysis test did not show a significant relationship between age, gender, and personal hygiene with the incidence of seborrheic dermatitis. There was a significant and additive relationship between chemotherapy treatment and personal hygiene with the incidence of seborrheic dermatitis. **Conclusion:** Chemotherapy treatment is a risk factor for Seborrheic Dermatitis. Age, gender and personal hygiene are not independent risk factors for seborrheic dermatitis. Poor personal hygiene is also a risk factor when combined with chemotherapy.

BACKGROUND

Seborrheic dermatitis (DS) is a chronic skin disorder characterized by inflammation of sebaceous gland areas with a characteristic papulosquamous morphology in the form of well-demarcated reddish plaques and yellowish scaly scales.[1] Seborrheic dermatitis often affects the face and other visible areas of the body, causing embarrassment and other quality-of-life issues. The constant yellowish scaling of the skin also causes discomfort. This discomfort is exacerbated when seborrheic dermatitis is accompanied by pruritus or itching.[2]

Seborrheic dermatitis with a relapsing-remitting disease pattern ranks third after atopic dermatitis and contact dermatitis in terms of its impact on quality of life.[3] The incidence of seborrheic dermatitis worldwide is 3-5%, which is quite high.[1,4] The mildest or initial seborrheic dermatitis is dandruff. The prevalence of dandruff is much higher than that of seborrheic dermatitis, which is close to 50%.[1]

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The cause of seborrheic dermatitis is not fully understood, but many factors influence its pathogenesis, including colonization by Malassezia species and individual susceptibility, including poor immune response. Risk factors include age, male sex, other diseases such as HIV-AIDS, lymphoma, and use of medications including immunosuppressants.[5] Both the incidence and severity of DS are associated with immunosuppression, which has been widely described in HIV-AIDS patients.[1,6] This appears to be related to the role of Malassezia species in the pathogenesis of DS.[7] Individual differences in immune function are the reason why overgrowth of Malassezia organisms is thought to play an important role only in individuals who are immunologically predisposed to develop DS.[8,9]

Functions of cellular and humoral immunity that are impaired in the form of deficiencies and can develop long enough are called immunocompromised states. Patients with immunocompromised states are the main targets of various infectious diseases, including fungal infections. This situation can be caused by immunosuppressive treatment, one of which is chemotherapy for cancer patients.[10]

The main goal of chemotherapy in cancer patients is to kill cancer cells using chemotherapeutic agents and to target cells that can divide rapidly.[11-13] The non-specific nature of chemotherapy makes it a double-edged sword.[14] Anticancer drugs can be cytostatic, which causes disturbances and changes in the patient's cellular immune system. In addition to attacking cancer cells, these drugs can also attack healthy cells such as white blood cells, causing neutropenia. If this occurs over a long period of time and in significant amounts, it can increase the risk of fungal infections. On the other hand, the humoral immune system remains normal and will function to fight microbes.[10]

Chemotherapy can also disrupt the physical barrier, including the skin. Particularly when chemotherapy is administered with the use of intravenous catheters, injection sites, or other surgeries that can also damage the protective barrier.[10] Changes in the host, such as epidermal dysfunction, cause changes in the skin microbiome, leading to the proliferation of Malassezia.[15-16]

In cancer patients, whose quality of life is already compromised, the incidence of chemotherapy-induced seborrheic dermatitis adds to the patient's suffering in terms of both quality of life and cost of treatment.[2,17] Therefore, to improve survival and overall quality of life of cancer patients, it is necessary to consider ways to protect patients from such infections in addition to treating the cancer itself.[7]

Until now, studies that discuss the relationship between DS and immune decline have been limited to HIV-AIDS patients and some types of cancer. It is still rare to find research that directly discusses the relationship between chemotherapy and DS. Therefore, researchers at Dr. Kariadi Hospital are interested in investigating the relationship between chemotherapy treatment and the incidence of seborrheic dermatitis in cancer patients.

METHODS

This study was an analytical observational study with a cross-sectional research design conducted from April to May at the Oncology Unit of Dr. Kariadi Hospital, "Sehati" Shelter House of Dr. Kariadi Hospital, and the Semarang Branch of Peduli Shelter House.

The study subjects were selected by consecutive sampling method from the population of cancer patients at Dr. Kariadi Hospital and surrounding shelters who met the criteria. The inclusion criteria were cancer patients who were undergoing chemotherapy, cancer patients who were not undergoing chemotherapy, and patients who were willing to be research subjects. Subjects were not accepted if they were patients who had been diagnosed with seborrheic dermatitis prior to starting chemotherapy, had diseases that weakened the immune system other than cancer, or were receiving immunosuppressive drugs in addition to chemotherapy. The required number of subjects was 40, consisting of 20 patients receiving chemotherapy and 20 patients not receiving chemotherapy.

Before any research data is collected, potential subjects are given a consent form or informed consent to be completed if they are willing to become research subjects. Researchers collected the required data by asking patients to complete demographic forms and questionnaires provided by the researcher, and then a diagnosis was made by the researcher if the questionnaire indicated that they were suffering from symptoms of seborrheic dermatitis. The collected data

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were rechecked for completeness and managed using the IBS SPSS Statistics 23 program with the process of cleaning, editing, coding, tabulating, and entering data for statistical analysis using chi-squared or Fisher exact analysis tests and multivariate logistic regression tests.

RESULTS

There were no respondents who had to be excluded, which meant that the 40 respondents found could be used to inform this study. The research subjects involved have characteristics according to their age and gender, which are presented in Table 1.

Table 1. General characteristics of research subjects

Variable	Frequency	%
Age		
Under 12 years old	3	7.5
12 years old to 40 years old	8	20.0
Above 40 years old	29	72.5
Gender		
Male	16	40
Female	24	60

Based on the table, it was found that the majority of the respondents in this study were over 40 years old, that is 29 people (72.5%), while 8 people (20%) were between 12 years and 40 years old, and the remaining 3 people (7.5%) were under 12 years old. It was also found that the respondents of this study were dominated by female patients consisting of 24 patients (60%) with the remaining 16 male patients (40%).

The questionnaire, which was completed by 40 respondents, included 5 statements about daily activities that were used to determine the patient's personal hygiene. From the 5 statements, the score was calculated and the respondent's personal hygiene could be categorized as good if they were doing 2 or more activities and poor if they were doing 1 or none. The data are shown in Table 2.

Table 2. Characteristics of research subjects based on personal hygiene

Personal Hygiene	Frequency	%
Good	28	70.0
Poor	12	30.0

Based on the table above, it was found that out of the 40 respondents who filled out the questionnaire, 28 patients (70%) have good personal hygiene. While the remaining 12 people (30%) have poor personal hygiene.

The subjects of this study were cancer patients undergoing chemotherapy and cancer patients not receiving chemotherapy. This is known from direct patient statements and is shown in Table 3.

Table 3. Characteristics of research subjects based on chemotherapy treatment

Chemotherapy Treatment	Frequency	%
Undergoing chemotherapy	20	50.0
Not currently receiving chemotherapy	20	50.0

Based on the table above, the research subjects consisted of 20 cancer patients (50%) undergoing chemotherapy and 20 cancer patients (50%) not currently receiving chemotherapy. This is adjusted to the minimum subject of this study, which is 20 subjects in both the chemotherapy group and the control group, so that the total number of minimum subjects is 40 subjects.

The questionnaire, which was completed by 40 cancer patients, included pictures of the UKK and descriptions of seborrheic dermatitis symptoms, which were then adapted to the patient's condition and validated by a dermatologist. This allowed the respondents to be categorized into two groups, the presence of seborrheic dermatitis and the absence of seborrheic dermatitis, as shown in Table 4 below.

Table 4. Characteristics of research subjects based on the incidence of seborrheic dermatitis

Incidence of Seborrheic Dermatitis	Frequency	%
Seborrheic dermatitis present	15	37.5
No seborrheic dermatitis present	25	62.5

Based on this table, 15 respondents (37.5%) had symptoms and signs of seborrheic dermatitis and 25 respondents (62.5%) had no symptoms and signs of seborrheic dermatitis.

The bivariate analysis test used to analyze the relationship between age and the incidence of seborrheic dermatitis alone is Fisher's Exact test, because the cells that have an expected frequency of less than 5 are more than 20%, that is, 25%. The results

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of the bivariate analysis test of the relationship between the two are presented in Table 5.

Table 5. Table of relationship between age and incidence of seborrheic dermatitis

Age		Incidence of Seborrheic Dermatitis: Seborrheic Dermatitis Present	Incidence of Seborrheic Dermatitis: No Seborrheic Dermatitis Present	Total	p
Under 12 years old	n	0	3	3	0.302¥
	%	0.0	12.0	7.5	
12 to 40 years old	n	2	6	8	
	%	13.3	24.0	20.0	
Above 40 years old	n	13	16	29	
	%	86.7	64.0	72.5	
Total	n	15	25	40	
	%	100.0	100.0	100.0	

Notes: *Significant p<0.05, ¥Fisher's Exact Test

From the results of Fisher's exact test, the relationship between age and the incidence of seborrheic dermatitis obtained a p value = 0.302, which means that the relationship between age and the incidence of seborrheic dermatitis alone is not meaningful because the significance value (p) is greater than 0.05. The variable age could not be included in the multivariate logistic regression analysis test because the p-value was > 0.25.

In order to determine the relationship between sex and the incidence of seborrheic dermatitis alone, the chi-square test was used because the cells that had an expected frequency of less than 5 were less than 20%, that is, 0%. The results of the bivariate analysis test of the relationship between the two are shown in Table 6.

Table 6. Table of the relationship between gender and the incidence of seborrheic dermatitis

Gender		Incidence of Seborrheic Dermatitis: Seborrheic Dermatitis Present	Incidence of Seborrheic Dermatitis: No Seborrheic Dermatitis Present	Total	Crude OR	p
Male	n	8	8	16	2.43	0.182$
	%	53.3	32.0	40.0		
Female	n	7	17	24	1	
	%	46.7	68.0	60.0		
Total	n	15	25	40		
	%	100.0	100.0	100.0		

Notes: *Significant p<0.05, $Chi Square Test

From the results of chi-squared test of the relationship between gender and the incidence of seborrheic dermatitis, it was found that p = 0.182, which proves that the relationship between gender and the incidence of seborrheic dermatitis alone is not significant because the p-value is more than 0.05. Due to the p-value <0.25, the variable gender is included in the multivariate logistic regression analysis test. The OR value of 2.43 means that males are 2.43 times more likely to develop seborrheic dermatitis.

The relationship between personal hygiene and the incidence of seborrheic dermatitis alone was analyzed using Fisher's Exact test, because there were more than 20% of cells with an expected frequency of less than 5, that is, 25%. The results of this bivariate analysis test are shown in Table 7.

Table 7. Table of the relationship between personal hygiene and the incidence of seborrheic dermatitis

Personal Hygiene		Incidence of Seborrheic Dermatitis: Seborrheic Dermatitis Present	Incidence of Seborrheic Dermatitis: No Seborrheic Dermatitis Present	Total	Crude OR	p
Good	n	7	5	12	3.5	0.091¥
	%	46.7	20.0	30.0		
Poor	n	8	20	28	1	
	%	53.3	80.0	70.0		
Total	n	15	25	40		
	%	100.0	100.0	100.0		

Notes: *Significant p<0.05, ¥Fisher's Exact Test

Based on the results of Fisher's exact test according to the table above, the p-value = 0.091 was found, indicating that the relationship between personal hygiene and the incidence of seborrheic dermatitis alone is not meaningful because the significance value (p) is more than 0.05. As well as the variables of chemotherapy treatment and gender, the variable of personal hygiene can be included in the multivariate logistic regression test because the p-value is greater than 0.25. The OR value of 3.5 means that people with poor hygiene have a 3.5 times higher risk of developing seborrheic dermatitis.

From the three confounding variables, that is age, gender and personal hygiene, variables with p < 0.25 (according to Lemeshow) in the bivariate test were taken to perform a multivariate logistic regression test with the independent variables to determine the relationship of these variables together with the incidence of seborrheic dermatitis. The variables used for the multivariate logistic regression test were gender (p = 0.182), personal hygiene (p = 0.091), and chemotherapy treatment (p = 0.022). Two variables of the three tested were found to be most associated with the incidence of seborrheic dermatitis and are presented in Table 8 below.

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Table 8. Table of the relationship between personal hygiene and chemotherapy treatment with the incidence of seborrheic dermatitis

Variable	Incidence of Seborrheic Dermatitis				Crude OR	Adjusted OR	95% CI	p
	Seborrheic Dermatitis Present		No Seborrheic Dermatitis Present					
	n	%	n	%				
Personal Hygiene								
Good	7	46.7	5	20.0	3.5	6.45	1.1-38.5	**0.039*€**
Poor	8	53.3	20	80.0	1	1	-	-
Chemotherapy Treatment								
Undergoing chemotherapy	11	73.3	9	36.0	4.88	8.052	1.46-44.2	**0.016*€**
Not currently receiving chemotherapy	4	26.7	16	64.0	1	1	-	-

Notes: *Significant p<0.05, €Logistic Regression Test

Based on the table above, it is known that there are two variables that have the most influence on the incidence of seborrheic dermatitis, and these variables are personal hygiene and chemotherapy treatment. It was found in the multivariate logistic regression test that p = 0.016 for the relationship between chemotherapy treatment variables and p = 0.039 for the relationship between personal hygiene and the incidence of seborrheic dermatitis. This means that both have a significant relationship because the p-value is less than 0.05. From the table above, it was found that Crude OR < Adjusted OR (additive), which means that the variables of chemotherapy effect and personal hygiene reinforce each other. An OR value greater than 2 indicates that the variable is a strong risk factor.

The statistical test used to analyze the relationship between chemotherapy treatment and the incidence of seborrheic dermatitis is the Chi-Square test, because cells with an expected frequency of less than 5 are less than 20%, which is 0%. The results of this statistical test are shown in Table 9.

Table 9. Table of the relationship between chemotherapy treatment and the incidence of seborrheic dermatitis

Chemotherapy Treatment		Incidence of Seborrheic Dermatitis		Total	Crude OR	p
		Seborrheic Dermatitis Present	No Seborrheic Dermatitis Present			
Undergoing chemotherapy	n	11	9	20	4.88	0.022*$
	%	73.3	36.0	50.0		
Not currently receiving chemotherapy	n	4	16	20	1	
	%	26.7	64.0	50		
Total	n	15	25	40		
	%	100.0	100.0	100.0		

Notes: *Significant p<0.05, $Chi Square Test

The statistical test results showed a p-value = 0.022, which means that there is a statistically significant relationship between chemotherapy treatment and the incidence of seborrheic dermatitis. This is because the significance level (p) is less than 0.05. This variable is included in the multivariate logistic regression test because the p-value is <0.25. The OR value of more than 2, 4.88, indicates that chemotherapy is a strong risk factor. In other words, cancer patients undergoing chemotherapy are 4.88 times more likely to develop seborrheic dermatitis.

DISCUSSION

The results of the bivariate analysis of the relationship between age and the incidence of seborrheic dermatitis in this study showed p = 0.302, which means that there was no significant relationship between the two (p>0.05). This is in contrast to previous studies that found a significant relationship between the increased prevalence of seborrheic dermatitis and age.[18] The Rotterdam study, which focused on the elderly, found that the prevalence of seborrheic dermatitis increased with age.[18,19] The reason for this may be that several physiopathological changes occur in the skin of the elderly, that is a decrease in the amount of lipids in the stratum corneum and thinning of the epidermis and dermis. This results in increased susceptibility to external stimuli in this age group.[19,20] Human skin degenerates with age. This is due to AGE (Advanced Glycated End) factors and thinning of the fat layer, which makes it easier for chemicals and microorganisms to penetrate and infect.[4]

Other sources report that seborrheic dermatitis has a bimodal form of prevalence, with the first peak in the first three months of life and then from adrecarche to the second peak after the fourth decade.

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The likely reason for this is that the secretion of the sebaceous glands, which are most abundant on the scalp, face, and chest, is hormonally controlled. During puberty, these glands are reactivated under the control of circulating androgens after being under the influence of maternal androgens at birth. This leads to an increase in sebum secretion during adolescence, which continues steadily until the age of 20 or 30 and then decreases[5] During puberty, the increase in sebaceous lipids appears to provide a "friendly environment" for more persistent colonization by Malassezia sp.[21-23]

However, DS patients may have normal sebum production, and individuals with excessive sebum production sometimes do not have DS. This finding suggests that although sebaceous gland activity is strongly correlated with DS and dandruff, sebum production alone is not the determining cause.[5] There are several other studies that say the age relationship is not significant in multivariable analysis, most likely because the study is dominated by the elderly of the entire population.[18] In line with these studies, this study also found no significant relationship between age and the incidence of seborrheic dermatitis. This could also be due to the heterogeneity of the population. In the subjects of this study, most of them were elderly patients as many as 29 subjects, 8 subjects with age 12-40 years and 3 subjects with age under 12 years. Although no significant relationship was found, of all the cases of seborrheic dermatitis in this study, 86.7% occurred at the age of over 40 years. Followed by 13.3% of the incidence occurred at the age of 12-40 years, which is in line with research that says there is an increase in DS during adolescence and after the third decade.[5] The incidence of DS at the age of under 12 years in this study was 0%. It should be noted that the subjects under 12 years of age in this study were not between the ages of 3-12 months, which is a common age for infantile seborrheic dermatitis according to previous studies, so it is not contradictory even though the incidence rate is 0%.[23]

Bivariate analysis of gender and its relationship with the incidence of seborrheic dermatitis resulted in a p value = 0.182, which indicates that there is no significant relationship between the two. This is different from other studies which show the results of statistical tests with Chi-Square obtained p = 0.008 (p <0.05) which means that there is a significant relationship between gender and seborrheic dermatitis. This is supported by other studies[24] which say that seborrheic dermatitis is more common in males than females in all age groups. This suggests a possible relationship between seborrheic dermatitis and sex hormones, such as androgens.[25] This statement is supported by the results of research by Park, S.Y., et al. who concluded that one of the risk factors for seborrheic dermatitis is gender, that is, men.[26]

Other studies have also found that men are twice as likely as women to develop seborrheic dermatitis. Hormonal differences between men and women may explain this association, as seborrheic dermatitis has a peak incidence during puberty, when androgen levels in men are high.[27,28] However, logistic regression analysis of seborrheic dermatitis and total testosterone in men and seborrheic dermatitis and Free Androgen Index (FAI) in women showed no direct association between previously measured hormone levels and the presence of seborrheic dermatitis among participants in the Rotterdam Study.[29] Sex differences in incidence may also be explained in part by differences in skin pH and/or use of skin products, which may affect microbial colonization and barrier integrity.[30]

In this study, there was an uneven population of males and females, that is 24 female subjects and 16 male subjects. This may explain the difference in the results of the bivariate test of the relationship between gender and the incidence of seborrheic dermatitis in this study, which is not significant compared with previous studies. However, of the 15 cases of seborrheic dermatitis, 53.3% occurred in male subjects and the remaining 46.67% occurred in female subjects. Similarly, of the 25 subjects who did not suffer from seborrheic dermatitis, 68.0% were female subjects and the remaining 32.0% were male subjects. Thus, although no significant relationship was found, the results of this study are not entirely different from the statement that men are said to be affected more often than women, which is thought to be DS related to androgen hormones in previous studies.[5] In this study, the prevalence of seborrheic dermatitis in men was found to be 2.43%. This means that males are a strong risk factor for the incidence of DS, males have a 2.43 times higher risk of developing seborrheic dermatitis.

The bivariate analysis of the relationship between personal hygiene and the incidence of seborrheic dermatitis shows a p-value = 0.091, which means that the relationship between the two is not significant.

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Previous studies have stated that poor personal hygiene is a factor that facilitates the spread of infection to the extremities of the human body, both the scalp and other extremities, such as the development of dandruff as a noninflammatory form of seborrheic dermatitis.[31] In contradiction to this statement, the results of this study showed that 53.3% of the incidence of seborrheic dermatitis occurred in subjects with good personal hygiene and 46.7% of the incidence of DS occurred in subjects with poor personal hygiene. However, it is not completely off the mark, of the 25 subjects who did not get DS, 80% of them were patients with good personal hygiene, while the remaining 20% had poor personal hygiene.

Another study found similar results. The study showed p = 1.00 in the statistical test of the relationship between the level of personal hygiene and seborrheic dermatitis, which is also not significant. In this study, the thing that could be related is the immune status of the subject. A decrease in immune status may be related to the regulation of the inflammatory process, causing the body to produce more pro-inflammatory mediators such as cytokines and also the stress hormone cortisol. These mediators make the body more susceptible to bacterial, viral or fungal infections[4] Therefore, personal hygiene is not a significant risk factor for the onset of seborrheic dermatitis because even if an individual's hygiene status is relatively good, it does not guarantee that an individual will be immune to skin disorders.[32]

The involvement of the subject's immune system was demonstrated in this study. Since the p-value in the bivariate analysis of the personal hygiene variable was greater than 0.25 (p = 0.091), a multivariate logistic regression analysis test was performed with other variables that also had a p-value <0.25, that is gender (p = 0.182) and chemotherapy treatment (p = 0.022). The results showed that 2 of the 3 variables tested had a significant effect on the incidence of DS. The variables were personal hygiene with p = 0.039 and chemotherapy with p = 0.016. The Crude OR value <Adjusted OR, which means that the variables of personal hygiene and chemotherapy treatment reinforce each other. Subjects with poor personal hygiene have a 3.5 times higher risk of developing DS than subjects with good personal hygiene, but when subjects with poor hygiene receive chemotherapy, the risk increases to 6.45 times.

It can be said that although there is no significant relationship between personal hygiene alone and the incidence of seborrheic dermatitis, the relationship between personal hygiene and chemotherapy treatment together with the incidence of DS is significant and mutually reinforcing. This explains that:

- Patients with good personal hygiene, when there are conditions that weaken the immune system, still have a risk of developing seborrheic dermatitis.
- Patients with poor personal hygiene have a greater risk of developing seborrheic dermatitis compared to patients with good personal hygiene.
- The immune system affects the incidence of seborrheic dermatitis, both in patients with good and poor personal hygiene.

The results of this study showed a significant relationship between chemotherapy treatment and the incidence of seborrheic dermatitis with p = 0.022 (p <0.05). This indicates that the incidence of seborrheic dermatitis is more common in cancer patients undergoing chemotherapy (73.3%). Cancer patients who were not affected by seborrheic dermatitis were mostly cancer patients who were not undergoing chemotherapy (64%). These results are in line with previous studies indicating that the prevalence of DS increases in immunocompromised populations.[27,33]

Several mechanisms by chemotherapy causes Malassezia sp. fungal infection have been described in previous studies, including:

1. The immunosuppressive effects of chemotherapeutic drugs result in a reduction in the number and function of effector cells such as neutrophils, monocytes, macrophages and lymphocytes, thereby weakening the host's defense against pathogens.
2. Maintenance and renewal of the epithelial barrier is impaired by the action of chemotherapeutic agents on rapidly dividing cells.
3. Chemotherapy may also cause an overall decrease in the abundance and/or composition of the microbiota. This results in reduced production of bacterial metabolites that normally control Malassezia sp. colonization and virulence.
4. Malassezia sp. overgrowth following chemotherapy may occur as a result of reduced production of antimicrobial peptides (AMPs) by

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epithelial cells that normally inhibit Malassezia sp. Growth.[14]

Chemotherapy itself is significantly associated with the incidence of DS, with a 4.88 times greater risk than cancer patients not currently receiving chemotherapy. In addition, the results of this study showed that the risk increased to 8.052 times greater if the cancer patient undergoing chemotherapy also had poor personal hygiene.

The limitations of this study are that the medical records of the research subjects were not included, the type of chemotherapy agent could not be specifically related to the incidence of seborrheic dermatitis, and other risk factors (duration of chemotherapy, frequency of chemotherapy, method of chemotherapy administration, other actions, and duration of seborrheic dermatitis) that may affect the relationship between variables could not be included.

CONCLUSION

1. Chemotherapy, which is a medical treatment that has the effect of weakening the immune system, is one of the risk factors for seborrheic dermatitis, as there are more cases of seborrheic dermatitis in cancer patients undergoing chemotherapy than in cancer patients not undergoing chemotherapy.
2. In this study, there was a significant relationship between chemotherapy treatment and the incidence of seborrheic dermatitis, both in patients with good and poor hygiene.
3. There was no significant relationship between age, gender, and personal hygiene alone with the incidence of seborrheic dermatitis in this study. Personal hygiene and chemotherapy treatment together have a significant and additive relationship with the incidence of seborrheic dermatitis in this study.

ETHICAL APPROVAL

An ethical clearance was obtained from the Health Research Ethics Commission (KEPK) Faculty of Medicine UNDIP with No.123/EC/KEPK/FK-UNDIP/IV/2024.

CONFLICTS OF INTEREST

The authors declare no conflict of interest in this study.

FUNDING

All financial resources come from the author.

AUTHOR CONTRIBUTIONS

Conceptualization, DNAG and LA; methodology, DNAG, LA, W, BP; validation, LA, W; data analysis, DNAG; investigation, DNAG, LA, W; resources, DNAG; data curation, DNAG; original draft preparation, DNAG; review and editing, DNAG, LA, W, BP; supervision, LA, W, BP; funding acquisition, DNAG.

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Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
DOI : 10.14710/dmj.v14i1.47014
JKD (DMJ), Volume 14, Number 1, January 2025 : 12-21

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