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Comparison of Platelet Lymphocyte Ratio Values Reviewed from Body Mass Index in Head and Neck Cancer Patients

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Abstract

Head and neck cancer is strongly associated with both systemic inflammation and nutritional impairment. The Platelet–Lymphocyte Ratio (PLR) serves as a marker of systemic inflammation, while Body Mass Index (BMI) reflects nutritional status, which may influence inflammatory responses and immune function in patients. This study aims to determine the differences in PLR values based on BMI categories in head and neck cancer patients at PKU Muhammadiyah Gombong Hospital. This study employed a quantitative retrospective observational design using secondary data from the medical records of head and neck cancer patients from January 2023 to December 2025. The sampling technique used was purposive sampling with a total sample of 62 patients who met the inclusion and exclusion criteria. The Mann-Whitney test showed a significant difference in PLR values based on BMI categories in head and neck cancer patients ($p<0.001$). The underweight group had a higher mean PLR value compared to the non-underweight group. There was a significant difference in PLR values based on BMI categories among head and neck cancer patients. Patients in the underweight category tended to have higher PLR values compared to the non-underweight group. These findings suggest that nutritional assessment may support inflammation management strategies.

Keywords

Body Mass Index, Head and Neck Cancer, Inflammation, Nutritional Status, Platelet–Lymphocyte Ratio.

1. Introduction

Head and neck cancer is the seventh most common cancer worldwide, accounting for more than 660,000 new cases and 325,000 deaths annually, and imposing substantial health, social, and economic burdens (Seetohul et al., 2020; Hu et al., 2025). This group includes malignancies of the oral cavity, oropharynx, salivary glands, paranasal sinuses, nasopharynx, hypopharynx, and larynx. The distribution of subtypes varies geographically, with oropharyngeal cancer predominating in North America, South Africa, and Southern Europe, while nasopharyngeal cancer is more prevalent in Southeast Asia due to factors such as tobacco use, Epstein–Barr Virus infection, alcohol consumption, poor diet, and chemical exposure (Chen et al., 2021; Sun et al., 2025). In Indonesia, head and neck cancer ranks fourth among all cancers and second among men, with a prevalence of 4.7 cases per 100,000 population (Hasbie et al., 2022). At RS PKU Muhammadiyah Gombong, nasopharyngeal cancer was reported as the most common subtype (Kadarullah & Syafiie, 2020).

Chronic inflammation plays a crucial role in the development and progression of head and neck cancer. Deoxyribonucleic Acid (DNA) damage caused by reactive oxygen species and nitrogen derivatives can induce carcinogenesis through metaplasia, dysplasia, and abnormal cellular regeneration (Kawanishi et al., 2025). In addition, tumor-associated inflammation promotes interactions between cancer cells and the immune system, including apoptosis inhibition, thereby facilitating further DNA damage and tumor progression (Koca et al., 2024). Chronic inflammation in head and neck cancer can be assessed using inflammatory biomarkers, one of which is the Platelet–Lymphocyte Ratio (PLR). PLR is an inflammatory biomarker derived from peripheral blood examinations and has been associated with cancer prognosis. Elevated PLR values are considered indicative of poor prognosis due to their relationship with cytokine and chemokine release during inflammatory responses. Furthermore, PLR offers several advantages, including simple procedures, low cost, and easy accessibility because it only requires peripheral blood samples (Kumarasamy et al., 2021; Mireştean et al., 2023; Putra & Lany, 2025).

Head and neck cancer is frequently associated with nutritional disturbances due to impaired chewing and swallowing, leading to inadequate nutrient intake, weight loss, muscle wasting, fatigue, and anemia. Malnutrition is commonly indicated by significant weight loss, low Body Mass Index (BMI), and reduced serum albumin levels (Murad et al., 2022a; Martinovic et al., 2023). BMI, calculated from weight and height, is widely used to assess nutritional status and may be influenced by dysphagia, odynophagia, taste disturbances, and increased metabolic demands resulting from chronic inflammation in head and neck cancer patients (Nuttall, 2015; Ding et al., 2024). Underweight conditions in cancer patients do not merely reflect thin body composition but also indicate malnutrition, muscle mass loss, and reduced protein and energy reserves. Such conditions impair bone marrow function in producing lymphocytes and weaken immune responses, leading to decreased lymphocyte counts and elevated PLR values (Bradley et al., 2024).

Conversely, obesity may also contribute to systemic inflammatory conditions. Adipose tissue in obese individuals functions as an active immune organ that produces pro-inflammatory cytokines such as IL-6, TNF-α, and leptin. These cytokines stimulate megakaryocyte activity, increasing platelet production while simultaneously impairing lymphocyte function due to prolonged inflammatory exposure, thereby contributing to elevated PLR values (Yang et al., 2025). Therefore, BMI may reflect the nutritional and inflammatory status of head and neck cancer patients, where both low and high BMI conditions can contribute to systemic

inflammation and immune dysregulation. These mechanisms may alter platelet and lymphocyte levels, resulting in variations in PLR values (Murad et al., 2022b).

Based on these phenomena, it can be understood that nutritional status and inflammatory responses are closely interconnected in patients with head and neck cancer. However, studies specifically comparing PLR values across BMI categories in head and neck cancer patients remain limited, particularly among patients prior to therapeutic intervention. Therefore, this study aims to determine the differences in PLR values based on BMI categories among head and neck cancer patients at RS PKU Muhammadiyah Gombong. This study is expected to contribute scientifically to the development of research concerning the relationship between inflammatory biomarkers and nutritional status in head and neck cancer patients. Furthermore, the findings are anticipated to provide useful clinical information for healthcare professionals in assessing inflammatory conditions and nutritional status, as well as serving as a reference for future studies related to inflammatory biomarkers in head and neck cancer.

2. Literature Review and Hypothesis Development

2.1. Head and Neck Anatomy

The head and neck are complex body parts because they contain numerous nerves and major blood vessels that are closely interconnected. Within the cranial cavity is the brain and its extension, the spinal cord, which passes through the foramen magnum into the cervical and thoracic spine, reaching as high as the first lumbar vertebra (L1) in adults. Furthermore, the head also contains the initial parts of the digestive and respiratory systems, with the pharynx extending into the neck, and the larynx (voice box) branching from the inferior pharynx. Heylings et al. (2017) explained that the head and neck are anatomically complex regions containing the brain, spinal cord, major nerves, blood vessels, and the upper respiratory and digestive tracts, including the pharynx and larynx, which are essential for various physiological functions.

The anatomical space of the head and neck encompasses various structures, such as the oral cavity, oropharynx, laryngopharynx, larynx, nasopharynx, salivary glands, and nasal cavity. These structures play a role in vital functions such as breathing, phonation (voice production), and swallowing. The oral cavity, pharynx, and larynx work in an integrated manner in these processes. Damage to any of these structures can impair swallowing function and increase the risk of aspiration into the airways. Furthermore, Ofusa et al. (2020) explained that the oral cavity plays a role in the initial phase of swallowing by chewing and directing the food bolus toward the oropharynx.

2.2. Head and Neck Cancer

Head and neck cancer is a group of malignant tumors arising from various anatomical structures, including the oral cavity, nasopharynx, oropharynx, larynx, and hypopharynx. Histologically, most cases are classified as squamous cell carcinoma originating from the mucosal epithelium of the head and neck region. Guo et al. (2021) explained that these cancers are characterized by invasive growth and metastatic potential when they are not detected and treated at an early stage.

Globally, head and neck cancer accounts for approximately 4–5% of all cancer cases and remains a major contributor to cancer-related morbidity and mortality (Barsouk et al., 2023). The disease occurs more frequently in men than women, with an estimated ratio of 2:1, and is predominantly diagnosed in individuals over 50 years of age. South and Southeast Asia represent regions with particularly high incidence rates, partly due to the widespread practice of chewing areca nut (*Areca catechu* L.). The active compound arecoline can induce oxidative stress, stimulate abnormal cellular proliferation, and cause DNA damage that contributes to carcinogenesis,

especially in the oral cavity. Furthermore, Hasbie et al. (2022) reported that the burden of head and neck cancer in Indonesia remains substantial, with smoking, alcohol consumption, and passive smoking exposure identified as important risk factors.

Several behavioral, viral, and environmental factors contribute to the development of head and neck cancer. Barsouk et al. (2023) explained that tobacco smoke contains carcinogenic compounds, including nitrosamines, polycyclic aromatic hydrocarbons, and aldehydes, which can damage the DNA of epithelial cells. Alcohol further enhances carcinogenic effects by increasing mucosal permeability and generating mutagenic acetaldehyde. In addition, Human Papillomavirus (HPV) and Epstein–Barr Virus (EBV) infections play significant roles in carcinogenesis through genetic alterations and cellular transformation, particularly in oropharyngeal and nasopharyngeal cancers (Ghiani & Chiocca, 2022; Khalesi et al., 2022). Other contributing factors include exposure to industrial chemicals, poor oral hygiene, and malnutrition (Barsouk et al., 2023).

2.3. Platelet Lymphocyte Ratio

The Platelet–Lymphocyte Ratio (PLR) is a systemic inflammatory biomarker calculated from the ratio of platelet count to lymphocyte count obtained through a routine complete blood count examination (Liu et al., 2024). PLR reflects the balance between inflammation and immune function, making it a useful indicator of systemic inflammatory status in various diseases, including cancer. Nilasari et al. (2025) explained that, as a marker combining two hematological parameters, PLR provides a more comprehensive representation of the interaction between inflammatory processes and the body's immune response.

Biologically, elevated PLR is associated with chronic inflammation and impaired adaptive immunity. Inflammatory cytokines such as interleukin-6 (IL-6), tumor necrosis factor-alpha (TNF-α), and interleukin-1 beta (IL-1β) stimulate platelet production and activation. Activated platelets contribute to tumor progression by releasing growth factors, including Vascular Endothelial Growth Factor (VEGF) and Transforming Growth Factor-Beta (TGF-β), which promote angiogenesis, tumor growth, and metastasis. At the same time, reduced lymphocyte levels indicate weakened antitumor immune surveillance, allowing cancer cells to evade immune destruction. Furthermore, Jia et al. (2021) reported that a high PLR reflects the predominance of inflammation over antitumor immunity.

Clinically, PLR values are commonly categorized as low (<100), normal (100–200), and high (>200), with elevated PLR frequently associated with poorer prognosis and reduced survival among cancer patients (Platini et al., 2022). Kim and Sun (2024) explained that PLR is widely used because it is simple, inexpensive, and readily available from routine blood tests, making it applicable in cancer, sepsis, and other inflammatory conditions. However, its interpretation should be cautious because cut-off values vary across studies and may be influenced by factors such as infection, malnutrition, and cancer treatment (Yanni et al., 2019; Sarkar et al., 2022; Liu et al., 2024). In head and neck cancer, increased PLR has been linked to angiogenesis, metastasis, platelet activation, and tumor aggressiveness, indicating a less favorable prognosis (Kurniawan & Yusuf, 2014).

2.4. Body Mass Index

Body Mass Index (BMI) is a simple anthropometric measure used to assess nutritional status based on the ratio of body weight to height squared (kg/m^2) (Hasibuan & Palmizal, 2021). BMI reflects the balance between energy intake and expenditure and is influenced by multiple factors, including dietary habits, physical activity, socioeconomic conditions, education level, environmental factors, and chronic diseases. Consequently, BMI serves not only as a biological indicator but also as a reflection of broader social and lifestyle determinants of health.

According to the Asia-Pacific classification, BMI is categorized as underweight (<18.5 kg/m²), normal (18.5–22.9 kg/m²), overweight (23–24.9 kg/m²), obesity I (25–29.9 kg/m²), and obesity II (≥30 kg/m²). Clinically, BMI is widely used to evaluate nutritional status, health risks, and disease prognosis. According to Wen et al. (2024), a low BMI is associated with an increased risk of morbidity and mortality compared with a normal BMI, underscoring its value as a prognostic indicator. The World Health Organization also recognizes BMI as a practical and accessible tool for classifying body weight and assessing population health risks.

In patients with head and neck cancer, BMI is often affected by disease-related symptoms such as dysphagia, mucositis, xerostomia, and reduced appetite, which can result in energy and protein deficiencies (Haghjoo, 2015). The relationship between BMI and head and neck cancer is primarily prognostic rather than etiological. According to Gaudet et al. (2012), low BMI is generally associated with poorer clinical outcomes and higher mortality, whereas higher BMI may have a protective effect in some populations. Nevertheless, BMI should be interpreted alongside other clinical and biological indicators because it does not fully capture body composition, fat distribution, or the influence of factors such as smoking, alcohol consumption, and systemic health conditions.

2.5. Body Mass Index and Systemic Inflammation in Head and Neck Cancer

Inflammation is a biological response that functions to protect the body from damage and infection. However, in the context of cancer, inflammation has a dual role. Under physiological conditions, inflammation contributes to the elimination of abnormal cells and tissue regeneration through the secretion of mediators such as pro-inflammatory cytokines, including TNF, IL-1, and IL-6. However, if inflammation occurs persistently or chronically, it can play a role in supporting carcinogenesis. Chronic inflammation can trigger DNA damage through increased free radical production, stimulate uncontrolled cell proliferation, and inhibit apoptosis through the activation of signaling pathways such as NF-κB. Furthermore, Chen et al. (2017) explained that inflammatory mediators contribute to angiogenesis and alterations in the tumor microenvironment that support cancer cell growth and metastasis.

In patients with head and neck cancer, nutritional status may influence systemic inflammatory responses, which can be reflected by changes in PLR values. Patients with low BMI are more likely to experience malnutrition, impaired immune function, and chronic inflammation, resulting in altered lymphocyte and platelet counts. Conversely, excess body weight may also contribute to a pro-inflammatory state through increased production of inflammatory cytokines from adipose tissue. Previous studies have demonstrated that both malnutrition and obesity are associated with inflammatory dysregulation and adverse cancer outcomes (Ellulu et al., 2017; Wang et al., 2024; Kapała et al., 2025). Furthermore, Adham et al. (2012) explained that inflammation plays a central role in the progression of head and neck cancer and is closely linked to nutritional deterioration during the disease course. Therefore, differences in BMI categories may be associated with variations in PLR values among patients with head and neck cancer.

H1: There is a difference in platelet–lymphocyte ratio values among head and neck cancer patients based on body mass index.

3. Methods

This study employed a retrospective observational design using secondary data derived from medical records of head and neck cancer patients at RS PKU Muhammadiyah Gombong, Kebumen Regency, Central Java. The study will be conducted in February 2026 and aims to determine the differences in Platelet

Lymphocyte Ratio (PLR) values based on Body Mass Index (BMI) categories. The study population consisted of all head and neck cancer patients aged >18 years who were registered in the medical records of RS PKU Muhammadiyah Gombong from January 2023 to December 2025, with an estimated total population of 200 patients. The sampling technique used was purposive sampling based on the established inclusion and exclusion criteria. Sample size calculation was conducted using G*Power version 3.1 with a chi-square test (goodness-of-fit contingency tables), assuming an effect size (w) of 0.5, significance level (α) of 0.05, statistical power ($1-\beta$) of 0.95, and degree of freedom (df) of 2. The analysis indicated a minimum sample size requirement of 62 participants.

The independent variable in this study was Body Mass Index (BMI), measured on an ordinal scale and categorized into underweight (<18.5 kg/m²) and non-underweight (≥18.5 kg/m²). The dependent variable was Platelet Lymphocyte Ratio (PLR), measured on a ratio scale and obtained by dividing the platelet count by the lymphocyte count from complete blood examination results prior to therapy initiation. Data were collected from medical records of patients who met the inclusion criteria, namely patients aged >18 years, diagnosed with head and neck cancer during 2023–2025, who had not undergone radiotherapy, chemotherapy, or immunotherapy, and had complete anthropometric and laboratory data. Patients with acute infections, hematological disorders, autoimmune diseases, or incomplete medical record data were excluded from the study.

Data collection was carried out by identifying eligible medical records and recording anthropometric data, including body weight and height, to calculate BMI, as well as laboratory data on platelet and lymphocyte counts to determine PLR values. The collected data were processed and analyzed using Jeffreys's Amazing Statistics Program (JASP) statistical software. Data analysis included univariate and bivariate analyses. Univariate analysis was used to describe the characteristics of the study variables, where BMI categories were presented as frequency distributions and percentages, while PLR values were presented as median and minimum–maximum values due to non-normal data distribution. Bivariate analysis was conducted to assess differences in PLR values based on BMI categories using the Mann–Whitney test, as PLR was a numerical variable with non-normal distribution and BMI consisted of two independent categorical groups. Statistical significance was determined at $p < 0.05$.

4. Results

This study was conducted at PKU Muhammadiyah Gombong Hospital using secondary data obtained from the medical records of patients diagnosed with head and neck cancer. The study population consisted of patients who had not yet received chemotherapy, radiotherapy, or other cancer-related treatments, allowing the assessment of inflammatory and nutritional parameters without potential treatment-related effects. Medical records from January 2023 to December 2025 were reviewed, and eligible participants were selected using a purposive sampling technique based on predetermined inclusion and exclusion criteria.

A total of 62 patients met the study criteria and were included in the analysis. Data collection was carried out in February 2026 at PKU Muhammadiyah Gombong Hospital. The collected data included demographic characteristics, Body Mass Index (BMI), and Platelet–Lymphocyte Ratio (PLR), which were subsequently analyzed to evaluate differences in systemic inflammatory status according to nutritional status among patients with head and neck cancer.

Table 1. Characteristic Respondent

Characteristic Respondent	Category	Frequency	Percentage
Gender	Male	41	66.1%
	Female	21	33.9%
Age	25–44	6	9.7%
	45–59	24	38.7%
	60–74	30	48.4%
	75–90	2	3.2%
Type of Cancer	Nasopharyngeal Cancer	43	69.4%
	Sinonasal Cancer	6	9.7%
	Laryngeal Cancer	5	8.1%
	Oropharyngeal Cancer	5	8.1%
	Oral Cancer	1	1.6%
	Nasal Cancer	1	1.6%
Body Mass Index	Underweight	22	35.5%
	Non-Underweight	40	64.5%
Total		100	100%

Table 1 presents the characteristics of the study subjects based on gender, age, cancer type, and Body Mass Index (BMI). The majority of participants were male, comprising 41 individuals (66.1%), while 21 individuals (33.9%) were female, with a total of 62 subjects. Based on age distribution, most subjects were in the 60–74 years age group (30 individuals; 48.4%), followed by the 45–59 years group (24 individuals; 38.7%), the 25–44 years group (6 individuals; 9.7%), and the 75–90 years group (2 individuals; 3.2%). Regarding cancer type distribution, nasopharyngeal cancer was the most common diagnosis, affecting 43 patients (69.4%), followed by sinonasal cancer in 6 patients (9.7%), laryngeal cancer in 5 patients (8.1%), and oropharyngeal cancer in 5 patients (8.1%). Oral cancer, nasal cancer, and nasal cavity cancer were each found in 1 patient (1.6%). In terms of BMI classification, most subjects were categorized as non-underweight (40 individuals; 64.5%), while 22 individuals (35.5%) were classified as underweight.

Table 2. Mann-Whitney Test

Statistic	Value
Variable	PLR
Mann–Whitney U	106.0
p-value	< 0.001

Table 2 presents the results of the Mann–Whitney U test assessing differences in Platelet–Lymphocyte Ratio (PLR) values according to Body Mass Index (BMI) categories among patients with head and neck cancer. The analysis yielded a Mann–Whitney U statistic of 106.0 and a p-value of less than 0.001, indicating a statistically significant difference in PLR values between the compared BMI groups. Because the p-value was substantially lower than the predetermined significance level of 0.05, the null hypothesis was rejected, and the alternative hypothesis was accepted. These findings demonstrate that PLR values vary significantly across BMI categories in patients with head and neck cancer.

The observed difference suggests that nutritional status, as represented by BMI, may be associated with variations in systemic inflammatory responses. Patients with different BMI levels may exhibit distinct inflammatory and immunological profiles, which are reflected in their PLR values. Given that PLR is widely recognized as an indicator of the balance between inflammation and immune function, the significant result obtained in this study supports the premise that nutritional status is closely linked to inflammatory conditions in head and neck cancer patients.

Table 3. Description of PLR Values

BMI Group	N	Mean ± SD	Mean Rank
Non-underweight	40	180.2 ± 96.16	23.15
Underweight	22	332.4 ± 86.25	46.68

Table 3 presents the comparison of Platelet–Lymphocyte Ratio (PLR) values between underweight and non-underweight patients with head and neck cancer. The underweight group consisted of 22 patients and demonstrated a mean PLR value of 332.4, whereas the non-underweight group consisted of 40 patients with a substantially lower mean PLR value of 180.2. This finding indicates that patients with an underweight BMI tend to exhibit higher PLR values compared with those who are not underweight.

The higher PLR observed in the underweight group suggests a greater degree of systemic inflammation and a potential imbalance between inflammatory activity and immune response. Since PLR reflects the relationship between platelet count and lymphocyte count, elevated values may indicate increased inflammatory processes accompanied by reduced immune surveillance. In contrast, the lower mean PLR value in the non-underweight group may reflect a relatively more balanced inflammatory and immunological status. The difference in mean rank values between the two groups further supports the presence of distinct inflammatory profiles according to nutritional status.

These results suggest that undernutrition may be associated with increased systemic inflammatory responses among patients with head and neck cancer. Given that nutritional impairment is common in this population due to difficulties in chewing, swallowing, and maintaining adequate nutritional intake, patients with lower BMI may be more vulnerable to inflammation-related complications. Therefore, the findings presented in Table 3 indicate that underweight patients tend to have a higher inflammatory burden, as reflected by elevated PLR values, compared with non-underweight patients.

5. Discussion

Based on the demographic characteristics, most subjects were male (66.1%), while females accounted for 33.9% of cases, indicating a higher prevalence of head and neck cancer among men. This finding is consistent with Musyarifah and Yenita (2020), who attributed the increased risk in males to greater exposure to smoking and alcohol consumption. Tobacco carcinogens and alcohol-related metabolic processes contribute to carcinogenesis, whereas estrogen may provide a protective effect by regulating cell proliferation, apoptosis, and antioxidant activity (Orzołek et al., 2022; Nabilah et al., 2023). Regarding age distribution, the majority of patients were in the 60–74 years group (48.4%), followed by the 45–59 years group (38.7%). These results indicate that head and neck cancer predominantly occurs in older age groups. This finding is in line with literature stating that cancer incidence increases with age due to accumulated DNA damage, decreased immune function, and long-term exposure to risk factors such as smoking and alcohol (Sari & Purwanza, 2022; Gatta et al., 2023; Filippini et al., 2024). Aging also increases oxidative stress and reduces cellular repair capacity, thereby increasing the risk of malignant transformation.

In terms of cancer type, nasopharyngeal cancer was the most common diagnosis (69.4%). This is consistent with the findings of Adham et al. (2012) and Jicman et al. (2022), who reported that nasopharyngeal carcinoma has a high prevalence in Southeast Asia, including Indonesia, which is considered an endemic region. Major risk factors include Epstein-Barr Virus (EBV) infection, environmental exposure, and consumption of nitrosamine-containing foods (Daniela et al., 2021). In addition, the anatomical location of the nasopharynx, which is difficult to access, often leads to delayed diagnosis due to nonspecific early symptoms (Adham et al., 2014).

Regarding BMI distribution, most patients were categorized as non-underweight (64.5%), while 35.5% were underweight. BMI reflects nutritional status and energy balance in the body. In cancer patients, metabolic alterations such as cachexia, systemic inflammation, and increased catabolism can lead to weight loss (Ni & Zhang, 2020; Muthanandam & Muthu, 2021). Malnutrition may impair immune function, particularly lymphocyte activity, which plays a key role in antitumor response.

The Mann–Whitney U test revealed a statistically significant difference in PLR values between the underweight and non-underweight groups ($p < 0.001$). This indicates that BMI status is significantly associated with the level of systemic inflammation in patients with head and neck cancer. These findings suggest that differences in nutritional status may influence inflammatory responses reflected by PLR. Furthermore, the underweight group showed a higher PLR value (332.4 ± 86.25) compared to the non-underweight group (180.2 ± 96.16). The mean rank was also higher in the underweight group (46.68 vs. 23.15), indicating a stronger tendency toward systemic inflammation in this group. This can be explained by malnutrition-induced lymphocyte reduction and increased inflammatory activity. Pro-inflammatory cytokines such as IL-6 and TNF-α stimulate thrombopoiesis while suppressing lymphocyte function, leading to elevated PLR (Imai et al., 2023).

Platelets promote tumor progression via VEGF and TGF-β, which enhance angiogenesis and metastasis, while lymphocytes support antitumor immunity. An increased platelet count combined with decreased lymphocytes elevates PLR, indicating systemic inflammation and immunosuppression (Zhou et al., 2023). This aligns with evidence that higher PLR is associated with poorer cancer prognosis and more aggressive disease, suggesting that underweight patients may experience greater inflammatory burden and disease progression (Templeton et al., 2014). This study demonstrates that head and neck cancer patients with underweight status have higher PLR values compared to non-underweight patients. This suggests that nutritional status is closely associated with systemic inflammatory response in cancer patients. BMI not only reflects energy status but is also linked to immune and inflammatory conditions that influence disease progression. Therefore, PLR can serve as an additional important parameter in evaluating the clinical condition of head and neck cancer patients, particularly in assessing systemic inflammation prior to treatment.

6. Conclusion

This study investigated the difference in Platelet Lymphocyte Ratio (PLR) based on Body Mass Index (BMI) among patients with head and neck cancer at PKU Muhammadiyah Gombong Hospital. The findings showed that the majority of patients were male, aged 60–74 years, and predominantly diagnosed with nasopharyngeal cancer. Most subjects were classified as non-underweight. Statistical analysis using the Mann–Whitney test revealed a significant difference in PLR between underweight and non-underweight groups ($p < 0.001$). Patients in the underweight group demonstrated higher PLR values compared to the non-underweight group, indicating a stronger systemic inflammatory response in patients with poorer nutritional status. These findings suggest that BMI is associated with inflammatory status in head and neck cancer patients, where undernutrition may contribute to increased systemic inflammation and potentially more aggressive disease progression.

This study has several limitations. First, it was conducted in a single hospital, which limits the generalizability of the findings and reduces variability across different populations. Second, the use of secondary data from medical records resulted in incomplete information, particularly regarding anthropometric and laboratory variables. Third, the inclusion of patients who had undergone or were

undergoing chemotherapy and radiotherapy limited the number of eligible samples. These factors also affected the statistical power and representativeness of the study population. Future research is recommended to involve multiple hospitals to improve external validity and population diversity. Additionally, further studies should include inflammatory and nutritional biomarkers such as C-Reactive Protein (CRP), Neutrophil-To-Lymphocyte Ratio (NLR), and albumin to provide a more comprehensive assessment. A prospective study design is also suggested to ensure better control of inclusion criteria and more accurate data collection on clinical variables such as cancer stage and comorbidities.

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