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THE RELATIONSHIP BETWEEN THE SEVERITY OF *CHRONIC MYELOCYTIC LEUKEMIA* (CML) PATIENTS AND *THE MYELOID: ERYTHROID RATIO* AT MOHAMMAD HOESIN HOSPITAL, PALEMBANG

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ABSTRACT

Background: *Chronic Myelocytic Leukemia (CML) is a type of blood cancer caused by abnormalities in hematopoietic stem cells, often linked to the Philadelphia chromosome. It progresses through three phases: chronic, accelerated, and blastic. Diagnosis involves bone marrow puncture (BMP), which also measures the Myeloid: Erythroid (M: E) ratio to assess blood cell production. CML accounts for about 15% of adult leukemia cases, mostly in individuals aged 40–60. Mohammad Hoesin Hospital (RSMH) in Palembang serves as a cancer referral center with integrated oncology services.*
Objective: This study investigates the relationship between CML severity and M: E ratio in patients at RSMH in 2024.
Method: *The research method uses Descriptive Analytical with a Cross Sectional approach. The number of samples that will be used in this research is 40 Chronic Myelocytic Leukemia patients in the Internal Medicine Hematology Oncology Division of Mohammad Hoesin Hospital (RSMH). Bone marrow samples analyzed via BMP and stained with Wright stain. The Myeloid:Erythroid (M:E) ratio, measured from bone marrow examinations. This ratio indicates the balance of blood cell production and is essential for evaluating disease impact.*
Result: *The mean severity was in the chronic phase for 32 patients (76.2%). The average myeloid-to-erythroid (M: E) ratio was 22.69, with 40 patients (95.2%) showing a high ratio (>6:1). There was no statistically significant correlation between disease severity and the M: E ratio (p>0,05).*
Conclusion: *These findings suggest that most patients were in the chronic phase, indicating a lower severity. The chronic phase is characterized by a relatively stable condition with fewer blast cells in the blood and bone marrow, in contrast to the more aggressive accelerated and blastic phases. Implement a comprehensive early-detection program for leukemia across all age groups—from students to the general population to facilitate timely diagnosis and treatment.*

Keywords: *Bone marrow, Chronic Myelocytic Leukemia, Myeloid: Erythroid Ratio*

INTRODUCTION

Leukemia is a hematological malignancy caused by immunological, genetic, viral and chemical factors (Zelly, 2012). Chronic Myelocytic Leukemia (CML) is a type of cancer caused by disorders of the hematopoietic stem cell. CML is a form of leukemia characterized by an increase and uncontrolled growth of myeloid cells in the bone marrow (Sawyers, 2004). Bone marrow is an organ that produces blood cells in the body. Bone marrow examination, is often called Bone marrow puncture (BMP), is a procedure to take a bone marrow sample to check for signs of certain diseases, one of which is Chronic Myelocytic Leukemia (CML). Through BMP can be seen disorders and blood cancers, and other conditions that affect the bone marrow. (Bakta, 2016). Myeloid erythroid ratio (M: E ratio) can be used to see if there is a problem with blood cell production in the bone marrow. Myeloid-erythroid ratio is a procedure for taking a bone marrow sample to check for signs of certain diseases (Siloam Hospital, 2024). The cause of CML is unclear, with an important role of genetic and environmental factors, such as exposure to radiation (Jonathan and Rahmasari, 2017). The aims of this study is to investigate the relationship between CML

severity and M: E ratio in patients at RSMH in 2024.

METHODS

The research method uses Descriptive Analytical with a Cross Sectional approach. The number of samples that will be used in this research is 40 *Chronic Myelocytic Leukemia* patients in the Internal Medicine Hematology Oncology Division of Mohammad Hoesin Hospital (RSMH). Bone marrow samples analyzed via BMP and stained with Wright stain. The *Myeloid: Erythroid* (M:E) ratio, measured from bone marrow examinations. This ratio indicates the balance of blood cell production and is essential for evaluating disease impact.

RESULTS AND DISCUSSION

The research was conducted in January-June 2024 at Mohammad Hoesin Hospital (RSMH) Palembang City with 40 *Chronic Myelocytic Leukemia* patients in the Internal Medicine Hematology Oncology Division of Mohammad Hoesin Hospital (RSMH).

3.1 Characteristics of Respondents Based on Gender

Total respondents in this research were 42 patients with Chronic Myelocytic Leukemia (CML) at RSMH Palembang with male patients 23 (54.8%) in higher proportion. This result indicates a slight male predominance in CML cases at the study site (Figure 1).

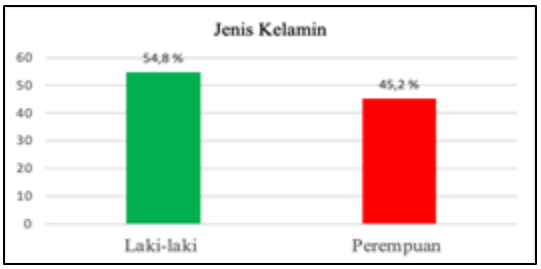

Figure 1. Characteristic of respondents based on gender

This aligns with a study by Adhika and Joko (2020) at the Regional General Hospital of West Nusa Tenggara Province, which also reported a higher number of male patients (61.5%). The study found that among 42 CML patients at Mohammad Hoesin Hospital, Palembang, the majority were male (54.8%). This may be due to genetic differences, including a higher number of target cells and cancer-prone genes in males, as suggested by Radivoyevitch (2020) and research from the Broad Institute of Harvard and MIT (Todd Gersten, 2022). Similarly, data from the United States show that males are about 38% more likely to be diagnosed with leukemia than females.

3.2 Characteristic Respondents Based on Age

Most patients were in the early elderly group (46–55 years): 13 patients (31.0%). Most CML patients fall within the middle-aged to early elderly range, with fewer cases in very young or older populations (Figure 2).

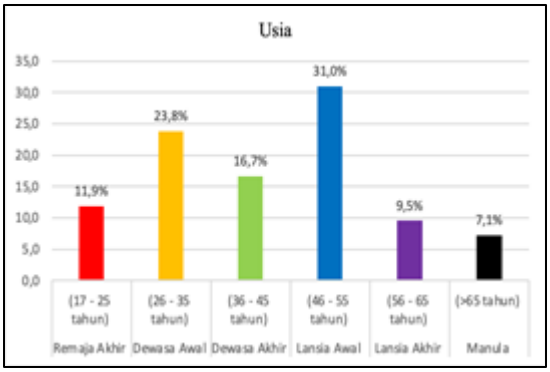

Figure 2. Characteristic of respondents based on age

This Study is consistent with a 2020 study by Adhika and Joko. CML is more common in adults aged 65-74, with a median diagnosis age of 65. Bintoro (2019) identifies age, gender, radiation exposure, and low immunity as risk factors for CML. Genetic mutations in bone marrow cells, which are more common in older adults, contribute to the development of the disease.

3.3 Average Severity of Chronic Myelocytic Leukemia (CML) Patients

The average severity of Chronic Myelocytic Leukemia (CML) based on 42 patients was chronic phase (<10% blast cells): 32 patients (76.2%). Accelerated phase (10–19% blast cells): 5 patients (11.9%). Blastic phase (≥20% blast cells): 5 patients (11.9%). The majority of patients are in the chronic phase, indicating early detection and potentially better prognosis (Figure 3).

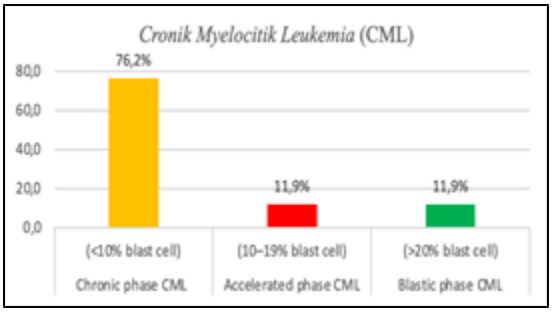

Figure 3. Average Severity of Chronic Myelocytic Leukemia (CML) Patients

These findings suggest that most patients were in the chronic phase, indicating a lower severity. The chronic phase is characterized by a relatively stable condition with fewer blast cells in the blood and bone marrow, in contrast to the more aggressive accelerated and blastic phases.

3.4 Average Myeloid Erythroid Ratio In Chronic Myelocytic Leukemia (CML) Patients

The average Myeloid Erythroid Ratio in Chronic Myelocytic Leukemia (CML) Patients was a High Ratio (≥6:1): 40 patients (95.2%), a Normal Ratio (1.2:1 – 5:1): 2 patients (4.8%), Low Ratio (<1.2:1): 0 patients (0%). Almost all patients exhibit elevated M: E ratios, indicating an overproduction of myeloid cells in bone marrow, a hallmark of CML (Figure 4).

In 42 CML patients at Mohammad Hoesin Hospital in Palembang (2024). Subsequent correlation analysis revealed no significant relationship between disease severity and the myeloid-to-erythroid (M: E) ratio (p <0,05).

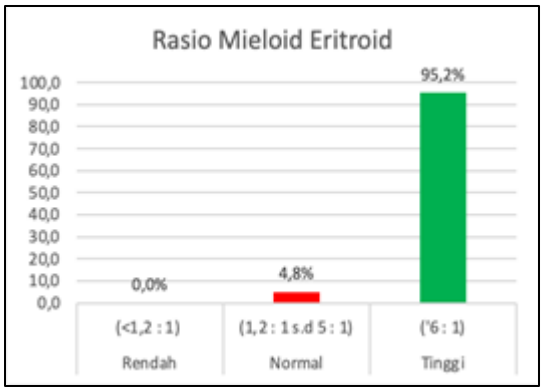

Figure 4. Average Myeloid Erythroid Ratio in Chronic Myelocytic Leukemia (CML) Patients

Myeloblasts, immature white-blood cells in the bone marrow, may rise during CML progression, but did not show a direct link to the M:E ratio. This finding aligns with Ashkan (2023), who noted that elevated granulocyte counts (up to ≤50 × 10^9/L in asymptomatic and 200–1,000 × 10^9/L in symptomatic patients), along with neutrophilia, basophilia, and eosinophilia, characterize CML, while hemoglobin and platelet levels often remain near normal.

CONCLUSION

There was no statistically significant correlation between disease severity and the M: E ratio (p>0,05). These findings suggest that most patients were in the chronic phase, indicating a lower severity. The chronic phase is characterized by a relatively stable condition with fewer blast cells in the blood and bone marrow, in contrast to the more aggressive accelerated and blastic phases. Implement a comprehensive early-detection program for leukemia across all age groups—from students to the general population to facilitate timely diagnosis and treatment.

CONFLICT OF INTEREST

There was no conflict of interest in the manuscript.

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