Overview of Erythrocyte Indices in Anemia Patients at RSUD Al-Ihsan

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Abstract. *Anemia is a condition characterized by a decrease in the number of erythrocytes and hemoglobin levels in the blood, which can impair physiological function. This study aims to describe the erythrocyte indices in anemia patients treated at RSUD Al-Ihsan Bandung. A descriptive, cross-sectional design was employed, with data obtained from patient medical records. The sample was selected using purposive sampling of patients diagnosed with anemia. The parameters analyzed included erythrocyte count, hemoglobin, hematocrit, MCV, MCH, and MCHC. The results showed significant variations in erythrocyte indices, potentially influenced by demographic and medical history factors. These findings are expected to enhance the understanding of anemia characteristics at RSUD Al-Ihsan and support more effective management and treatment of anemia.*

Keywords: Anemia, erythrocyte indices, MCV, MCH, MCHC

1. Introduction

Anemia is a medical condition marked by a decrease in red blood cells (erythrocytes) or hemoglobin levels in the blood, reducing the blood's capacity to transport oxygen to body tissues (Biya et al., 2022). One of the key parameters in assessing anemia is the erythrocyte index, which includes mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and mean corpuscular hemoglobin concentration (MCHC) (English et al., 2015; Helmyati et al., 2023).

The overarching aim of this study is to leverage erythrocyte indices—MCV, MCH, MCHC, and RDW—in a comprehensive evaluation of anemia among patients at RSUD Al-Ihsan. First, these indices enable the accurate diagnosis of anemia by revealing deviations in red blood cell size, hemoglobin content, and distribution width, which correspond with reductions in hemoglobin, hematocrit, or RBC count (Kar et al., 2020; Munesh et al., 2021). Second, by classifying anemia based on RBC morphology—such as microcytic, normocytic or macrocytic and hypochromic or normochromic—the study allows for precise anemia typing, which is essential for identifying conditions like iron deficiency, vitamin B_{12}/folate deficiency, or anemia of chronic disease (Levy & Schapkaitz, 2018). Third, the characteristic patterns of these indices assist in determining etiology, for instance, microcytic hypochromic anemia suggests iron deficiency or thalassemia, whereas elevated MCV and RDW point toward megaloblastic anemia (Kar et al., 2020; Pinto et al., 2023).

Fourth, by tracking changes in these parameters through serial CBCs, the study facilitates assessment of anemia severity and monitoring of therapeutic response, noting shifts in hemoglobin levels and normalization of RBC indices over time (Effect et al., n.d.). Finally, aggregating these laboratory data across the patient cohort provides valuable epidemiological insight into the prevalence, distribution, and types of anemia within the hospital population—

data that can inform public health planning, targeted screening, and supplementation strategies at RSUD Al-Ihsan (Biya et al., 2022; RI, 2018).

At RSUD Al-Ihsan Bandung, the prevalence of anemia among patients is significant, highlighting a public health challenge. This research aims to describe erythrocyte indices in anemia patients at the hospital, with the hope of offering deeper insights into anemia characteristics. Understanding erythrocyte index profiles is expected to support more accurate diagnosis and effective treatment (Beyene et al., 2023; Sandhya & Rashmi, 2017).

This research analyzes data from inpatients at RSUD Al-Ihsan to identify patterns and contributing factors of anemia, serving as a reference for improving anemia diagnosis and therapy in clinical settings.

2. Methods

This study used a descriptive, cross-sectional design to depict erythrocyte indices in anemia patients at RSUD Al-Ihsan Bandung. The analysis used autoanalyzer equipment (BC 5300 Mindray and BC 6200 Mindray) with EDTA venous blood samples. The study population consisted of all patients diagnosed with anemia at RSUD Al-Ihsan during the study period. A total of 40 samples were selected using purposive sampling. Data were collected from patient medical records, including erythrocyte count, hemoglobin, hematocrit, MCV, MCH, and MCHC. The data were analyzed descriptively using Microsoft Excel. Results are presented in tables and pie charts for better comprehension. The study followed ethical principles, including approval from the hospital ethics committee and informed consent from all participants 115/LPPM-PIKSI/VI/25.

3. Results and Discussion

This study was conducted at Al-Ihsan Hospital on 40 anemia patients. Respondent characteristics were analyzed based on gender, age group, degree of anemia, and erythrocyte index (MCV, MCH, and MCHC).

Table 1. Gender Distribution

Gender	Frequency (n)	Percentage (%)
Male	12	30%
Female	28	70%
Total	**40**	**100%**

Table 1 shows that the majority of respondents are women, namely 28 people (70%), while men are 12 people (30%).
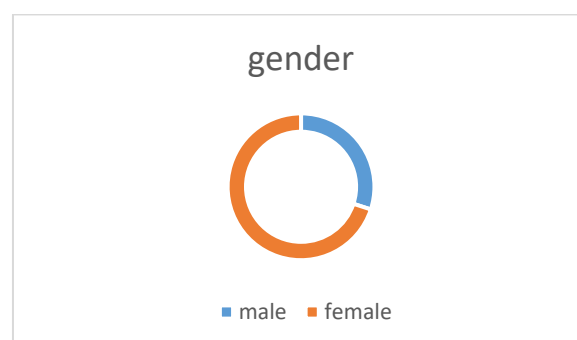

Figure 1. Gender distribution of respondents

Most anemia patients were female (70%). The higher proportion in women is in line with various studies showing that women, especially of reproductive age and the elderly, have a greater risk of anemia due to hormonal factors, menstruation, pregnancy, and nutritional status.

Table 2. Age Group Distribution

Age Group	Frequency (n)	Percentage (%)
Children (1–5)	5	12.5%
Teenagers (12–19)	3	7.5%
Adults (20–45)	11	27.5%
Elderly (46–80)	21	52.5%
Total	**40**	**100%**

The age distribution of respondents is shown in Table 2. The elderly age group (46–80 years) dominated with 52.5%, followed by adults (20–45 years) at 27.5%.
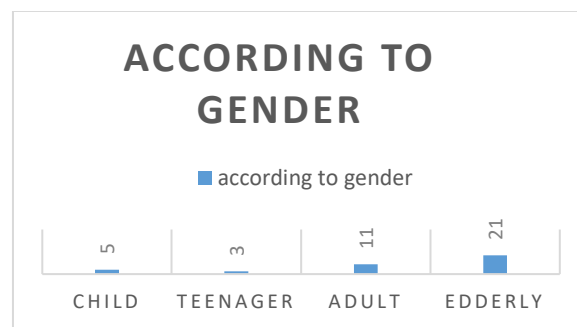

Figure 2. Age of respondens

Anemia was most prevalent among elderly patients (52.5%).

Table 3. Anemia Severity

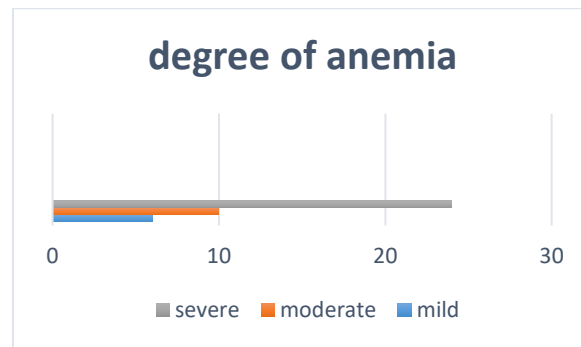| Severity	Frequency (n)	Percentage (%)
Mild (Hb 8–9.9 g/dL)	6	15%
Moderate (Hb 6–7.9 g/dL)	10	25%
Severe (Hb < 6 g/dL)	24	60%
Total	**40**	**100%**

Figure 3. Anemia Data Distribution

Most patients had severe anemia (60%).

Table 4. MCV Index Distribution

MCV Type	Frequency (n)	Percentage (%)
Microcytic (<82 fL)	24	60%
Normocytic (82–92 fL)	10	25%
Macrocytic (>92 fL)	6	15%
Total	**40**	**100%**

Table 5. MCH Index Distribution

MCH Type	Frequency (n)	Percentage (%)
Hypochromic (<27 pg)	24	60%
Normochromic (27–33 pg)	9	22%
Hyperchromic (>33 pg)	7	18%
Total	**40**	**100%**

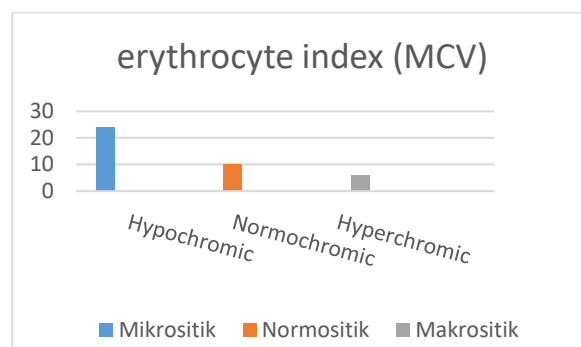**Figure 4.** Distribution of Respondents' MCV Data

Table 6. MCHC Index Distribution

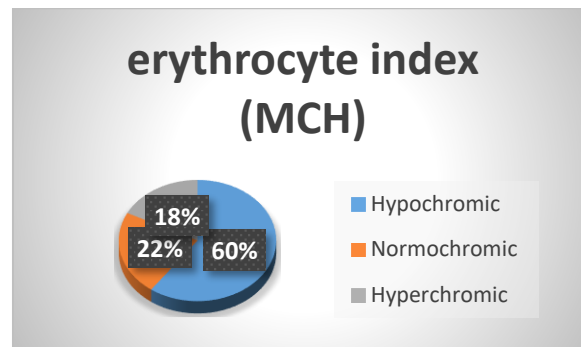| MCHC Type	Frequency (n)	Percentage (%)
Hypochromic (<32 g/dL)	21	52.5%
Normochromic (32–36 g/dL)	17	42.5%
Hyperchromic (>36 g/dL)	2	5%
Total	**40**	**100%**

Figure 5. MCHC data distribution

From Tables 4 to 6, anemia based on erythrocyte indices was most frequently microcytic (MCV – 60%), hypochromic (MCH – 60%), and hypochromic (MCHC – 52.5%). The study results align with existing literature indicating that most anemia cases, particularly in developing countries, are microcytic hypochromic and mainly caused by iron deficiency (Galat et al., 2025; Shah et al., 2025). This is confirmed by the high percentage of patients with microcytic MCV (60%), hypochromic MCH (60%), and hypochromic MCHC (52.5%).

These results support basic hematology theories that associate iron deficiency anemia with reduced erythrocyte size and hemoglobin content, leading to low MCV and MCH values. The findings are also consistent with Puri, n.d. who reported similar results in patients at a general hospital, where 58% had MCV <80 fL and MCH <27 pg. Likewise, our study shows 60% in both indices.

This consistency suggests that the anemia pattern at RSUD Al-Ihsan resembles that in other healthcare facilities, particularly among vulnerable groups like women and the elderly. Nutritional status, hormonal conditions, and chronic diseases contribute to the higher prevalence. These findings reinforce the use of erythrocyte indices as early indicators for identifying anemia types and serve as a foundation for more specific and effective diagnosis and therapy (Manandhar & Bhattarai, 2018; Sharma et al., 2020).

Conclusions

This study shows that the majority of anemia patients at RSUD Al-Ihsan experienced significant alterations in erythrocyte indices, primarily presenting as microcytic hypochromic anemia, commonly associated with iron deficiency. The age and gender distribution also showed that elderly patients and females were the most affected groups. Understanding these erythrocyte index patterns can assist medical personnel in more accurately diagnosing anemia types and formulating appropriate treatment strategies tailored to individual patient profiles. These findings may also serve as a basis for planning effective anemia preventi**.**

Acknowledgments

Recommendations

a. For Medical Personnel: Regularly monitor erythrocyte indices in anemia patients to ensure accurate diagnosis and appropriate treatment.
b. For Future Researchers: Conduct studies with larger samples and longer durations to strengthen findings and examine specific etiological relationships.
c. For Hospitals: Increase patient education, especially for vulnerable groups (women and the elderly), about anemia prevention and the importance of routine blood tests

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