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ОСОБЕННОСТИ КАРТИНЫ КРОВИ ПРИ ЦИРРОЗЕ ПЕЧЕНИ: ПАТОГЕНЕТИЧЕСКОЕ ИССЛЕДОВАНИЕ В ЗАВИСИМОСТИ ОТ ПОКАЗАТЕЛЕЙ ОБЩЕГО АНАЛИЗА КРОВИ

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THE BLOOD PICTURE PECULIARITIES IN LIVER CIRRHOSIS: A PATHOPHYSIOLOGICAL STUDY IN CORRELATION TO COMPLETE BLOOD COUNT PARAMETERS

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Резюме. Цирроз печени связан с тромбоцитопенией и повышенным нейтрофильно-лимфоцитарным отношением (NLR). В исследовании 14 пациентов (61–70 лет) выявлена сильная обратная корреляция между тромбоцитами и NLR. Макроцитарная анемия ассоциировалась с наиболее низкими тромбоцитами и высоким NLR. У двух пациентов с микроцитарной анемией тромбоциты были сохранены

Ключевые слова: цирроз печени, тромбоциты, нейтрофильно-лимфоцитарное отношение (NLR), анемия, RDW.

Resume. Liver cirrhosis is associated with thrombocytopenia (portal hypertension) and elevated NLR (systemic inflammation). This study of 14 patients (median age 61–70 years) found a strong inverse correlation between platelet count and NLR with the use of a standard CBC report. Anemia was present; macrocytic anemia linked to lowest platelets and highest NLR. Microcytic anemia (2 patients) had preserved platelets.

Keywords: liver cirrhosis, platelets, neutrophil-lymphocyte ratio (NLR), anemia, RDW.

Relevance. Liver cirrhosis is a progressive condition characterized by the simultaneous development of portal hypertension and systemic inflammation, which aggravate one another. Thrombocytopenia, caused by splenic sequestration and decreased thrombopoietin production, has been acknowledged for a long time as an indicator of portal hypertension. Simultaneously, a heightened neutrophil-lymphocyte ratio (NLR) indicates bacterial translocation through a weakened gut barrier – a crucial factor in systemic inflammation in cirrhosis. Both metrics are obtained from a standard complete blood count (CBC) – the most readily available and cost-effective hematologic test globally. Nonetheless, the direct quantitative connection between platelet count and NLR in patients with confirmed cirrhosis has not been adequately examined. Recognizing this kind of correlation would encourage the utilization of the CBC as a comprehensive severity assessment tool, especially in resource-constrained environments where sophisticated biochemical panels (like Child-Pugh or MELD scores) are inaccessible or postponed.

Aim: to investigate the association between platelet count and neutrophil-lymphocyte ratio (NLR) in patients with confirmed liver cirrhosis, along with secondary correlations involving anemia type and red cell distribution width (RDW).

Objectives:

1. Evaluate the relationship between platelet count and NLR through Spearman's rank correlation coefficient.
2. Categorize anemia based on MCV (microcytic <80 fL, normocytic 80–100 fL, macrocytic >100 fL) per WHO standards and relate it to platelet count and NLR.
3. Assess the relationship between RDW and platelet count as well as NLR.
4. Assess if a typical CBC by itself can act as a comprehensive severity evaluation tool in cirrhosis.

Materials and methods. An analytical study with a cross-sectional design was carried out. Patient information was gathered through a standardized digital questionnaire approved by Belarusian State Medical University and affiliated hospitals in Sri Lanka. All identifiers related to patients were eliminated. The initial group consisted of 16 patients with confirmed liver cirrhosis (diagnosis verified by specialists through imaging or biopsy). Two patients were omitted because of incomplete CBC data. The completed sample included 14 individuals (7 males, 7 females; median age range 61–70 years). Gender breakdown: 56.3% women, 43.8% men. The biggest age group was 61–70 years. From each CBC, the following parameters were obtained: platelet count ($\times 10^9$/L), absolute counts of neutrophils and lymphocytes (NLR = neutrophils/lymphocytes), RDW (%), MCV (fL), and hemoglobin (g/dL) [4]. Anemia was characterized based on WHO standards [5]. The type of anemia was determined based on MCV. Statistical analysis utilized Spearman's rank correlation coefficient (ρ) with a significance level of $p < 0.05$.

Results and their discussion. Core finding – The median platelet count was 143 (range 40–401 $\times 10^9$/L), and the median NLR was 3.26 (1.33–8.40). An inverse correlation that is strong and statistically significant was identified between platelet count and NLR ($\rho = -0.64$, CI –0.87 to –0.23, $p = 0.01$). This indicates that when platelet count decreases, NLR increases [2]. The pathophysiological explanation is clear: decreasing platelets indicate worsening portal hypertension [2], whereas increasing NLR suggests advancing systemic inflammation due to bacterial translocation [6]. Their robust inverse correlation indicates that these are not isolated events but rather interconnected, mutually supportive processes in cirrhosis.

RDW and platelets – A notable negative correlation ($\rho = -0.58$, $p = 0.03$) [4]. As platelet levels decrease, RDW increases – indicating concurrent marrow suppression impacting both megakaryopoiesis and erythropoiesis in severe liver disease. NLR and RDW – An encouraging yet non-significant correlation ($\rho = +0.48$, $p = 0.08$) [4]. This indicates that systemic inflammation interferes with red blood cell development, increasing RDW [4]. The limited sample size (n=14) is likely responsible for the lack of significance (Fig1).

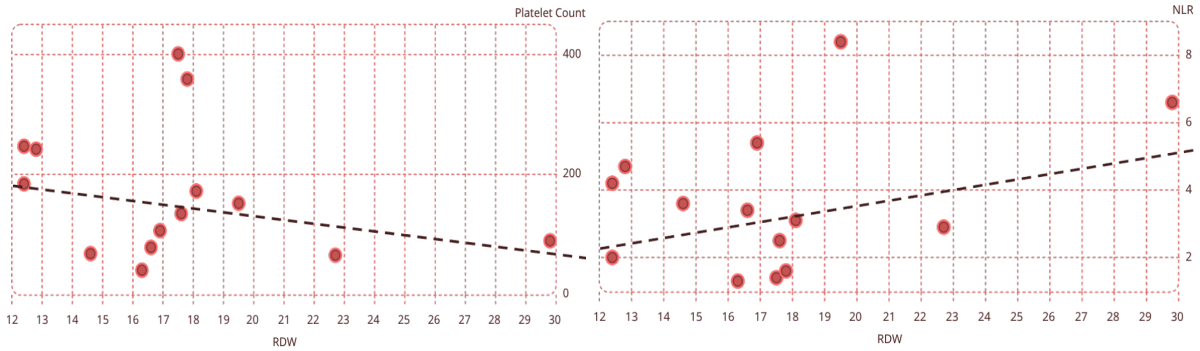

Fig. 1 – Correlation matrix: Platelets & RDW and NLR & RDW with ρ coefficients and p-values

Macrocytic anemia is the most prevalent form, affecting 43% of patients – representing 6 of 10 anemic individuals. Normocytic and microcytic anemia account for 14%, with 2 patients per category. 29% presented without anemia [5] (Fig.2).

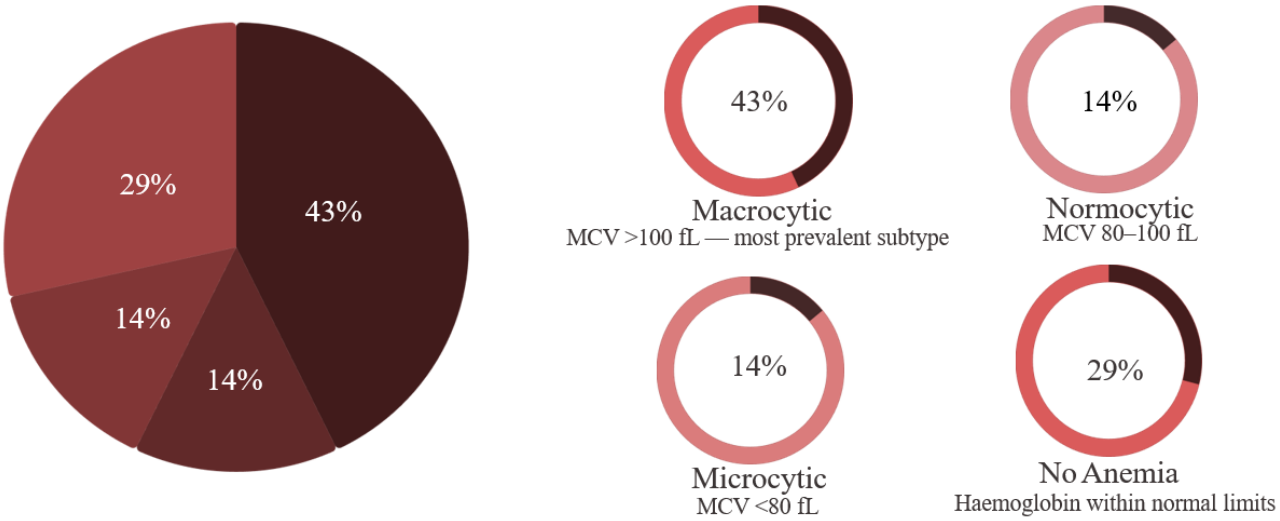

Fig. 2 – Distribution of anemia subtypes within study cohort (n=14)

Patients with the most common type of anemia, macrocytic anemia, had the highest median NLR (4.74) and the lowest median platelet count (106×10^9/L). Macrocytic anemia in cirrhosis usually signals more advanced disease with widespread hematological dysfunction and is linked to folate or vitamin B_{12} deficiency (common in alcoholic cirrhosis or general malnutrition) [5]. The microcytic paradox: Two individuals with microcytic anemia-maintained platelet counts (median 233) despite having low hemoglobin. This stands in sharp contrast to the macrocytic pattern and points to a pathophysiological process that is fundamentally distinct, most likely acute or chronic blood loss (from variceal hemorrhage, for example) without major megakaryocyte suppression [2, 5]. Crucially, no patient showed isolated thrombocytopenia in the absence of an increased NLR. Put differently, systemic inflammation was already evident when the platelet count fell below 150×10^9/L. Therefore, until shown otherwise, thrombocytopenia in a cirrhotic patient should not be easily written off as "just hypersplenism" because it indicates ongoing systemic inflammation.

Tbl. 1. Comparison of median platelet count and median NLR with anemia

Anemia Type	Median Platelets ($\times 10^3/\mu L$)	Median NLR	Clinical Implication
Macrocytic	106 (lowest)	4.74 (highest)	Severe disease. Linked to alcoholic cirrhosis with folate/B12 deficiency; bone marrow suppression likely.
Normocytic	150	2.8	Moderate disease. May indicate anemia of chronic disease or early-stage hemolysis
Microcytic	233	Low	Milder portal pressure. Often seen with concomitant GI bleeding or iron deficiency – a distinct pathophysiological pathway.

Conclusions:

1. The correlation was verified. Portal hypertension and systemic inflammation in cirrhosis are parallel, mutually reinforcing processes rather than independent events, as seen by the substantial inverse association between platelet count and NLR ($\rho = -0.64$, $p = 0.01$).

2. The phenotype of anemia is important. The highest NLR and lowest platelets are linked to macrocytic anemia (43% of patients), which indicates a more serious illness. In contrast, retained platelets are linked to microcytic anemia, suggesting a distinct cause (blood loss). Subtypes of anemia have significant independent diagnostic and prognostic significance. Cost-effective marker. A standard complete blood count alone simultaneously captures two major drivers of cirrhosis progression. This is critically important in resource-limited settings where advanced scoring systems (Child-Pugh, MELD) and biochemical panels are unavailable or delayed

3. The clinical rule. A platelet count of less than 150×10^9/L in cirrhosis should never be considered "just hypersplenism" until active systemic inflammation has been ruled out. At every clinical visit, NLR and platelet count should be routinely computed.

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