

Prognostic Significance of Neutrophil to Lymphocyte and Platelet to Lymphocyte Ratios in Patients with High Grade Epithelial Ovarian Cancer

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ABSTRACT

Background: The neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR) are biomarkers of severe inflammation. The prognostic role of NLR and PLR in patients with high-grade epithelial ovarian cancer (HG-EOC) remains inconsistent.

Objective: This study was conducted to evaluate the prognostic value of NLR/PLR in HG-EOC patients.

Methods: We retrospectively reviewed 32 patients with HG-EOC treated at the Sultan Qaboos Comprehensive Care & Research Center, University Medical City, between January 2022 and December 2023. The clinicopathologic records and complete blood counts of the patients were analyzed.

Results: Thirty-two epithelial HG-EOC patients were included in the analysis. Median age at diagnosis was 56 years (range: 16-89). Most of the patients (44%) were diagnosed at stage III, and 53% were high grade serous ovarian cancer (HGSOC). The decrease in NLR from baseline was statistically significant at 3 months ($p=0.040$) and 6 months ($p=0.005$) of follow-up post-treatment in patients without disease recurrence. Changes in NLR and PLR were not significantly different between the BRCA wild-type and mutant groups or between the HRD and homologous recombination proficient (HRp) groups. Baseline NLR was higher in the HGSOC group compared to the other histological subtypes. Higher baseline NLR/PLR levels were found if the CA125 was high ($CA125 \geq 35$). Neither NLR nor PLR predicted short-term progression-free survival (PFS).

Conclusion: Assessing NLR and PLR levels is simple and inexpensive using available complete blood counts. NLR levels were higher in patients with HG-EOC and patients with $CA125 \geq 35$. These findings suggest that NLR may serve as a treatment-response biomarker of systemic inflammation, but its prognostic utility in isolation is limited. Larger prospective studies integrating inflammatory indices with molecular biomarkers are warranted.

Keywords: Neutrophil-lymphocyte, platelet-lymphocyte ratios, epithelial ovarian cancer, prognostic significance, high-grade ovarian cancer.

INTRODUCTION

High-grade epithelial ovarian cancer (HG-EOC) is the 8th most common malignancy and the 5th leading cause of cancer-related deaths among women globally, accounting for more than 324 thousand new cases and 206 thousand deaths annually [1, 2]. The incidence rate is estimated at 10.3 per 100,000 women per year [1]. Most patients present with advanced-stage disease (IIIC/IV), as there are no specific symptoms [2]. Debulking surgery remains the mainstay of treatment. Initially, around 70% of patients respond to platinum-based chemotherapy; however, only 30-40% survive beyond 5 years [3, 4]. So far, primary screening trials have been negative [5]. There is a huge unmet need to diagnose ovarian cancer early.

Tumor biology and host response interact to induce systemic inflammation, contributing to tumor initiation, progression, angiogenesis, and immune evasion [6, 7]. Classical reviews have established inflammation as a hallmark of cancer. Simple peripheral blood indices

reflecting systemic inflammation - notably the neutrophil-to-lymphocyte ratio (NLR) and the platelet-to-lymphocyte ratio (PLR) - have attracted attention as prognostic biomarkers across many solid tumors, including ovarian cancer [8, 9]. Calculating these ratios is inexpensive and reproducible, making them attractive candidates for prognostic stratification. Mechanistically, elevated neutrophils can promote tumor progression by secreting proteases, reactive oxygen species, and pro-angiogenic factors, while relative lymphopenia signals impaired antitumor immune surveillance [10]. Similarly, thrombocytosis can protect circulating tumor cells and secrete growth factors that facilitate metastasis [11].

In HG-EOC, a growing body of observational studies and pooled analyses suggests that elevated pre-treatment NLR and PLR are associated with worse progression-free and overall survival [12-14]. Several meta-analyses and systematic reviews have reported that high NLR is associated with a significantly increased hazard of death and disease progression, and that similar relationships exist for PLR. However, effect sizes and optimal cut-off values vary between studies and cohorts [12-14]. Heterogeneity in patient selection (early vs advanced stage), timing of blood sampling (preoperative vs pre-chemotherapy), and analytical methods (single cut-off vs

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continuous variable) have contributed to inconsistent findings and limited clinical translation.

Given the clinical need for robust tools to aid risk stratification in HG-EOC, additional well-described cohort studies are warranted, clearly defining inclusion criteria, the timing of blood sampling, and the statistical approaches to cut-point selection. This study was conducted to evaluate the prognostic value of NLR/PLR in epithelial HG-EOC patients.

PATIENTS AND METHODS

We performed a retrospective review of electronic patient records of patients diagnosed with histologically confirmed ovarian cancer treated at the Sultan Qaboos Comprehensive Care & Research Center (University Medical City) (SQCCRC, UMC) between January 2022 and December 2023. The institutional review board approved the study (REF. NO. SQCCRC-IRB&EC/135/2023/CCRC-67-2023) with waiver of consent for retrospective data review.

This was a single-center study. Approximately 30-35 cases of ovarian cancer are diagnosed in Oman annually [15]. Cancer services are provided at two centers. During the two-year study period, nearly half of these patients were managed at our center. Consecutive patients diagnosed with ovarian cancer were included. Inclusion criteria were as follows: age ≥ 18 years, newly diagnosed FIGO-staged epithelial ovarian cancer, availability of pre-treatment complete blood count (CBC) within 14 days before primary cytoreductive surgery or initiation of neoadjuvant chemotherapy, and follow-up data available for survival analysis. Patients who had active infection at the time of diagnosis, known autoimmune or hematologic disorders affecting blood counts, recent corticosteroid therapy, or a second malignancy were excluded.

Demographic, clinical, and treatment data were extracted from electronic patient records: age at diagnosis, ECOG performance status, FIGO stage, histologic subtype, preoperative CA-125, details of primary treatment (optimal vs suboptimal cytoreduction, neoadjuvant vs primary surgery, platinum-based chemotherapy regimens), and dates of progression/last follow-up/death. Pre-treatment CBC parameters (absolute neutrophil, lymphocyte, and platelet counts) were recorded and used to calculate NLR (absolute neutrophils \div absolute lymphocytes) and PLR (platelets \div absolute lymphocytes). When multiple CBCs were available within the pre-treatment window, the value closest to treatment initiation was used.

Primary endpoints were progression-free survival (PFS), defined as time from diagnosis to documented radiologic/clinical progression or death. The cut-off value for NLR was $1.5 \times 10^9/L$, and that for PLR was $160 \times 10^9/L$.

We used SAS software version 9.4 for all statistical analyses (SAS Institute, Cary, NC). Descriptive analysis was performed using means, standard deviations (SDs), and medians and ranges for continuous variables. Frequency and proportion were computed for the categorical variables. We examined group differences using the Wilcoxon rank-sum test for continuous variables. NLR and PLR changes at 3, 6, and 9-12 months from the baseline were examined using the Wilcoxon rank-sum test. The log-rank test was used to compare progression-free survival across subgroups. P-values ≤ 0.05 were considered statistically significant.

RESULTS

Thirty-two consecutively diagnosed patients with HG-EOC were included in this study. Median age at diagnosis was 56 years (range: 16-89), and median ECOG performance status was 1 (range 0-3). High-grade serous carcinoma was the predominant histological subtype (53.1%). Most patients presented with FIGO stage III disease (43.8%), while 25% patients had stage I disease. 15 (46.9%) patients received adjuvant chemotherapy after primary debulking surgery; 8 (25%) received neoadjuvant chemotherapy followed by interval debulking surgery and adjuvant chemotherapy; and 9 (28.1%) patients received either palliative chemotherapy or best supportive care only. BRCA mutation results were available for 16 (50%) patients; 4 (25%) were positive. HRD status was available for 11 patients. Five (45.5%) patients had HRd disease (**Table 1**).

Table 1: Baseline demographic and clinical characteristics of study population (N=32).

Variables	Median	Range
Age (in years)	56	16-89
ECOG PS	1	0-3
Baseline CA 125	194	5.4-4791
	N	%
Cell Type		
High-grade serous ovarian cancer	17	53.13
Other types	15	46.87
Stage		
I	10	31.2
II	0	0
III	14	43.8
IV	8	25.0
Treatment Intent		
Adjuvant	15	46.9
Neoadjuvant	8	25
Palliative	9	28.1
Molecular Type		
BRCA	4/16	25%
HRD	5/11	45.5%

BRCA: BReast CAncer gene, ECOG PS: ECOG PS: Eastern Cooperative Oncology Group Performance Status. HRD: Homologous Recombination Deficient. Eastern Cooperative Oncology Group Performance Status. HRD: Homologous Recombination Deficient.

Table 2: NLR, PLR, and changes from baseline.

Variables	N	Mean	SD	Median	Min	Max	Signed-Rank Test p-value
NLR							
Baseline	26	4.81	7.1	2.05	0.29	32.8	-
3 months	21	2.13	2.11	1.5	0.38	8.5	-
6 months	13	1.41	0.56	1.35	0.5	2.31	-
9 months	11	1.95	1.38	1.43	0.47	4.61	-
12 months	13	2.53	2.43	1.53	0.7	8.5	-
PLR							
Baseline	26	244.72	146.73	174.93	90.3	611.4	-
3 months	21	189.39	116.46	129.8	90.3	520	-
6 months	13	152.01	59.84	148.12	77.9	276.4	-
9 months	11	200.8	125.59	153.2	54.6	537.5	-
12 months	13	188.66	144.7	124.7	74.68	575	-
Change in NLR from Baseline							
3 months	21	-2.19	5.73	-0.88	-24.3	3.45	0.040
6 months	12	-1.75	2.79	-0.62	-9.69	0.35	0.005
9-12 months	10	-0.54	3.91	-0.49	-9.71	6.5	0.430
Change in PLR from Baseline							
3 months	21	-52.05	140.41	-20.2	-377.46	207.97	0.140
6 months	12	-73.73	132.09	-26.77	-351.04	116.4	0.052
9-12 months	10	8.3	77.68	12.42	-108.08	153.7	0.850

NLR: Neutrophil to lymphocyte ratio; PLR Platelet to lymphocyte ratio. Both NLR and PLR were calculated before systemic treatment, and at various time points during the subsequent months for upto 1 year from diagnosis.

Baseline median NLR was $2.05 \times 10^9/L$ and demonstrated a statistically significant reduction to $1.5 \times 10^9/L$ at 3 months (median change -0.88; $p=0.040$), and further down to $1.35 \times 10^9/L$ at 6 months (median change -0.62; $p=0.005$) following treatment initiation. There was no further reduction between 9 and 12 months. In contrast, PLR was $174.9 \times 10^9/L$ at baseline, and although there was a mild reduction over the various time intervals, it did not reach statistical significance. (**Table 2**).

There was no significant difference between NLR ($3.5 \times 10^9/L$ vs $1.9 \times 10^9/L$) and PLR $249 \times 10^9/L$ vs $168 \times 10^9/L$) for BRCA wild type ($n=12$) and BRCA mutant cases ($n=4$). Also, there was no significant reduction in NLR and PLR at various time points over the course of 1 year, both in BRCA wild type and BRCA mutant cases. Similarly, there was no significant difference between NLR ($3.2 \times 10^9/L$ vs $4 \times 10^9/L$) and PLR ($3.2 \times 10^9/L$ vs $4 \times 10^9/L$) for BRCA wild type, HRD ($n=5$), and HRP ($n=6$) cases. There was no

Table 3: Comparison of NLR and PLR between different histological subtypes.

Variables	HGSOC				Other				Signed Rank Test p-value
	N	Median	Min	Max	N	Median	Min	Max	
NLR									
Baseline	16	3	1	32.8	10	1.4	0.3	19.5	0.048
Change at 3 months	14	-1.3	-24.3	3.5	7	0	-1.5	1.9	0.170
Change at 6 months	9	-1.3	-9.7	0.4	3	0	-0.8	0	0.211
Change at 9-12 months	7	-0.6	-9.7	6.5	3	0.2	-0.5	0.2	0.360
PLR									
Baseline	16	232.1	106.9	581.4	10	144.1	90.3	611.4	0.220
Change at 3 months	14	-128.2	-377.5	117	7	0	-31	208	0.057
Change at 6 months	9	-29.7	-351	116.4	3	-23.9	-41.6	-12.4	1.000
Change at 9-12 months	7	46.3	-108.1	153.7	3	-5.7	-35.4	30.5	0.820

NLR: Neutrophil to lymphocyte ratio; PLR Platelet to lymphocyte ratio; HGSOC High grade serous ovarian cancer.

significant reduction in NLR or PLR at any time point over 1 year, in either HRD or HRP cases.

Baseline NLR was significantly higher in patients with high-grade serous histology (n=17) than in patients with other epithelial subtypes (n=15) (Table 3); however, there was no significant decline in either NLR or PLR in

response to treatment between the two groups. Patients with elevated baseline CA-125 (≥ 35 U/mL) demonstrated significantly higher baseline NLR ($1.6 \times 10^9/L$ vs $3.3 \times 10^9/L$; $p=0.022$) and PLR ($131 \times 10^9/L$ vs $242 \times 10^9/L$; $p=0.037$) (Table 4). No consistent association was observed between baseline CA-125 and clinical stage of disease at presentation.

Table 4: Comparison of NLR and PLR among CA125 categories.

Variables	CA125<35				CA125 ≥35				Signed Rank Test p-value
	N	Median	Min	Max	N	Median	Min	Max	
NLR									
Baseline	8	1.6	0.3	4.1	14	3.3	1	32.8	0.022
3 months	7	1.3	0.6	4.4	12	1.6	0.4	8.5	0.610
6 months	5	1.3	0.5	1.5	7	1.8	0.6	2.3	0.420
9 months	5	1.4	0.5	2	5	2.3	1.2	4.6	0.210
12 months	4	0.9	0.7	2	5	4.1	1.2	8.5	0.066
PLR									
Baseline	8	131.3	90.3	440.6	14	242.1	142.1	581.4	0.037
3 months	7	129.8	90.3	292	12	150.8	91.6	520	0.830
6 months	5	130	77.9	276.4	7	148.1	88.7	177.6	1.000
9 months	5	153.2	54.6	270	5	186	121.1	537.5	0.830
12 months	4	145.4	74.7	230	5	121	94.9	575	0.710
NLR Change									
3 months	7	0.1	-2.9	1.9	12	-1.4	-24.3	3.5	0.069
6 months	5	-0.5	-2.6	0.4	7	-1.3	-9.7	0	0.330
9-12 months	5	-0.5	-0.9	1	5	-0.5	-9.7	6.5	0.830
PLR Change									
3 months	7	7.7	-320.1	148.1	12	-128.2	-377.5	208	0.099
6 months	5	-12.4	-351	116.4	7	-41.6	-273.2	5.3	0.330
9-12 months	5	46.3	-5.7	70	5	-42.3	-108.1	153.7	0.140

NLR: Neutrophil to lymphocyte ratio; PLR Platelet to lymphocyte ratio. Both NLR and PLR were calculated before systemic treatment, and at various time points during the subsequent months for upto 1 year from diagnosis, and a comparison was made for patients whose baseline CA125 was within the normal limits (<35IU/L), or high (>35IU/L), significance was set at <0.05.

One-year progression-free survival was 100% in patients with CA125 ≥ 35 IU/L and Stage I-II. However, one-year PFS was not associated with

CA125 ($p=0.351$) and stage ($p=0.235$). Neither NLR ($p=0.270$) nor PLR ($p=0.270$) was significantly associated with one-year PFS (Table 5).

Table 5: Progression-free survival (PFS) for CA125, Clinical Stage, NLR and PLR.

Variables	N	One-Year PFS (±SE) (%)	p-value
CA125			
<35 IU/L	8	87.5 (±11.7)	0.351
≥35 IU/L	5	100 (±0)	
Stage			
I-II	8	100 (±0)	0.235
III-IV	22	85.7 (±13.2)	
NLR			
Low (<1.5)	5	80 (±17.9)	0.270
High (≥1.5)	9	100 (±0)	
PLR			
Low (<160)	5	80 (±17.9)	0.270
High (≥160)	9	100 (±0)	

NLR: Neutrophil to lymphocyte ratio; PLR Platelet to lymphocyte ratio.

DISCUSSION

In this single-institution cohort of patients with HG-EOC, we demonstrated a significant early post-treatment reduction in NLR, while PLR remained largely unchanged. These findings suggest that NLR may reflect short-term modulation of systemic inflammation following treatment, whereas PLR appears less dynamic in this setting.

Elevated baseline NLR has been consistently associated with inferior survival outcomes in HG-EOC across multiple retrospective series and meta-analyses [12, 13]. However, most published studies have relied on static baseline measurements and have provided limited longitudinal evaluation. Our observation of an early decline in NLR following treatment aligns with prior reports suggesting that chemotherapy and cytoreductive surgery may partially reverse tumor-driven systemic inflammation. However, the converse may also happen [16]. The induction of tumor/host-reactive responses by chemotherapy may be counterbalanced by its therapeutic efficacy. The lack of sustained significance beyond six months may reflect treatment heterogeneity, evolving disease biology, or limited statistical power due to attrition in longitudinal sampling.

Notably, NLR and PLR were not associated with BRCA mutation or HRD status in our cohort. While homologous recombination deficiency is a strong predictor of chemosensitivity and response to PARP inhibitors, its relationship with host inflammatory markers remains poorly defined [17]. Prior studies have similarly reported weak or inconsistent correlations between inflammatory indices and molecular subtypes, suggesting that systemic inflammation may represent a parallel rather than a downstream biological axis.

Baseline NLR was significantly higher in high-grade serous carcinoma than in other epithelial subtypes, consistent with translational studies demonstrating a more immunosuppressive, neutrophil-rich tumor microenvironment in serous ovarian cancer [18]. The association between elevated CA-125 and higher baseline NLR and PLR further supports a link between tumor burden and systemic inflammatory response [19, 20]. Furthermore, serum NLR combined with CA125 has been shown to improve the diagnostic and prognostic efficiency in patients with ovarian cancer [21].

Despite these associations, neither NLR nor PLR predicted short-term progression-free survival. This finding contrasts with pooled analyses reporting prognostic significance for both markers. Still, it is likely influenced by limited sample size, short follow-up, and the dominant prognostic impact of residual disease and treatment response.

CONCLUSION

NLR demonstrates significant early post-treatment modulation in patients with HG-EOC, whereas PLR does not. Baseline inflammatory markers correlate with histologic subtype and tumor burden but do not independently predict short-term PFS. These findings suggest that NLR may serve as a treatment-responsive biomarker of systemic inflammation, but its prognostic utility in isolation is limited. Larger prospective studies integrating inflammatory indices with molecular and chemosensitivity biomarkers are warranted.

ETHICS APPROVAL

The study was approved by the Institutional Review Board (REF. NO. SQCCRC-IRB&EC/135/2023/CCRC-67-2023). All procedures performed in studies involving human participants were conducted in accordance with the ethical standards of the institutional and/or national research committee and the Helsinki Declaration.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA

The data is available with the first and the corresponding author.

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None.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORS' CONTRIBUTION

1. AZ: Conceptualization, data curation, analysis, writing the initial draft, and review of the manuscript.
2. AFA: Data curation, analysis, and review of manuscript.
3. IB: Data analysis, writing the initial draft, and review of the manuscript.

GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this work, the authors used ChatGPT (GPT-3.5, OpenAI) to generate language suggestions and perform minor proofreading in some sections of the manuscript. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

REFERENCES

1. Bray F, Laversanne M, Sung H, Ferlay J, Siegel RL, Soerjomataram I, *et al*. Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin* 2024; 74(3): 229-63. DOI: <https://doi.org/10.3322/caac.21834>
2. Cabasag CJ, Fagan PJ, Ferlay J, Vignat J, Laversanne M, Liu L, *et al*. Ovarian cancer today and tomorrow: a global assessment by world region and human development index using GLOBOCAN 2020. *Int J Cancer* 2022; 151(9): 1535-41. DOI: <https://doi.org/10.1002/ijc.34002>
3. McGuire WP, Markman M. Primary ovarian cancer chemotherapy: current standards of care. *Br J Cancer* 2003; 89(Suppl 3): S3-8.
4. Ozols RF, Bundy BN, Greer BE, Fowler JM, Clarke-Pearson D, Burger RA, *et al*. Gynecologic Oncology Group. Phase III trial of carboplatin and paclitaxel compared with cisplatin and paclitaxel in patients with optimally resected stage III ovarian cancer: a Gynecologic Oncology Group study. *J Clin Oncol* 2003; 21(17): 3194-200. DOI: <https://doi.org/10.1200/jco.2003.02.153>
5. Menon U, Gentry-Maharaj A, Burnell M, Singh N, Ryan A, Karpinskyj C, *et al*. Ovarian cancer population screening and mortality after long-term follow-up in the UK Collaborative Trial of Ovarian Cancer Screening (UKCTOCS): a randomised controlled trial. *Lancet* 2021; 397(10290): 2182-93. DOI: [https://doi.org/10.1016/s0140-6736\(21\)00731-5](https://doi.org/10.1016/s0140-6736(21)00731-5)
6. Coussens LM, Werb Z. Inflammation and cancer. *Nature* 2002; 420(6917): 860-7. DOI: <https://doi.org/10.1038/nature01322>
7. Grivennikov SI, Greten FR, Karin M. Immunity, inflammation, and cancer. *Cell* 2010; 140(6): 883-99. DOI: <https://doi.org/10.1016/j.cell.2010.01.025>
8. Zhou Q, Hong L, Zuo MZ, He Z. Prognostic significance of neutrophil to lymphocyte ratio in ovarian cancer: evidence from 4,910 patients. *Oncotarget* 2017; 8(40): 68938-49. DOI: <https://doi.org/10.18632/oncotarget.20196>
9. Bizon M, Olszewski M, Krason B, Kochanowicz E, Safiejko K, Borowka A, *et al*. The diagnostic role of the platelet-to-lymphocyte ratio in ovarian cancer: a systematic review and meta-analysis. *Int J Mol Sci* 2025; 26(5): 1841. DOI: <https://doi.org/10.3390/ijms26051841>
10. Greten FR, Grivennikov SI. Inflammation and cancer: triggers, mechanisms, and consequences. *immunity*. 2019; 51(1): 27-41. DOI: <https://doi.org/10.1016/j.immuni.2019.06.025>
11. Aleksandrowicz K, Politynska B, Kruszewska J, Radziwon P, Wojtukiewicz AM, Honn KV, *et al*. Thrombocytosis in cancer patients: when more is not better-in fact, the opposite. *Cancer Metastasis Rev* 2026; 45(1): 1. DOI: <https://doi.org/10.1007/s10555-025-10309-8>
12. Chen G, Zhu L, Yang Y, Long Y, Li X, Wang Y. Prognostic role of neutrophil to lymphocyte ratio in ovarian cancer: a meta-analysis. *Technol Cancer Res Treat* 2018; 17: 1533033818791500. DOI: <https://doi.org/10.1177/1533033818791500>
13. Zhang Z, Lang J. The prognostic and clinical value of neutrophil-to-lymphocyte ratio (NLR) in ovarian cancer: a systematic review and meta-analysis. *J Med Biochem* 2024; 43(4): 323-33. DOI: <https://doi.org/10.5937/jomb0-46035>
14. Raunkaewmanee S, Tangjitgamol S, Manusirivithaya S, Srijaipracharoen S, Thavaramara T. Platelet to lymphocyte ratio as a prognostic factor for epithelial ovarian cancer. *J Gynecol Oncol* 2012; 23(4): 265-73. DOI: <https://doi.org/10.3802/jgo.2012.23.4.265>
15. Ministry of Health, "Cancer Incidence in Oman 2020," 2020. [Online]. Available from: <https://www.moh.gov.om/media/qkfk1u4/cancer-incidence-in-oman-2020.pdf> [Accessed: Dec 15, 2025].
16. D'Alterio C, Scala S, Sozzi G, Roz L, Bertolini G. Paradoxical effects of chemotherapy on tumor relapse and metastasis promotion. *Semin Cancer Biol* 2020; 60: 351-61. DOI: <https://doi.org/10.1016/j.semcancer.2019.08.019>
17. Idrisoglu C, Muglu H, Hamdard J, Açikgöz Ö, Olmuşçelik O, Müezzinoğlu B, *et al*. Prognostic and predictive value of systemic inflammatory markers in epithelial ovarian cancer. *Medicina (Kaunas)* 2025; 61(3): 380. DOI: <https://doi.org/10.3390/medicina61030380>
18. Cheng KC, Lin YH, Wu DS, Shih IM, Wang TL. Macrophages and neutrophils in ovarian cancer microenvironment. *Front Immunol* 2025; 16: 1677441. DOI: <https://doi.org/10.3389/fimmu.2025.1677441>
19. Kim HS, Choi HY, Lee M, Suh DH, Kim K, No JH *et al*. Systemic inflammatory response markers and CA-125 levels in ovarian clear cell carcinoma: a two center cohort study. *Cancer Res Treat* 2016; 48(1): 250-8. DOI: <https://doi.org/10.4143/crt.2014.324>
20. Huang K, Xu S, Wang J, Ge L, Xu J, Jia X. Combined use of CA125, neutrophil/lymphocyte ratio and platelet/lymphocyte ratio for the diagnosis of borderline and malignant epithelial ovarian tumors. *J Ovarian Res* 2023; 16(1): 37. DOI: <https://doi.org/10.1186/s13048-023-01106-4>
21. Tian Y, Li X, Zhang H, Wang Y, Li H, Qin Q. Serum NLR combined with CA125 and HE4 improves the diagnostic and prognostic efficiency in patients with ovarian cancer. *Front Oncol* 2024; 14: s1494051. DOI: <https://doi.org/10.3389/fonc.2024.1494051s>