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Original Article

Diagnostic value of NLR, PLR and SIRI in peritoneal dialysis-associated peritonitis

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Abstract: Objective: To evaluate the diagnostic value of neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR), and systemic immune-inflammation index (SIRI) in peritoneal dialysis-associated peritonitis (PDAP). Methods: In this retrospective study, the clinical data from 130 patients who underwent peritoneal dialysis (PD) for the first time at the Cangzhou Central Hospital from January 2019 to January 2022 were rigorously reviewed and analyzed. Based on the occurrence of PDAP during treatment, patients were classified into the peritonitis group (n=31) and the non-peritonitis group (n=99). The expression levels and diagnostic value of NLR, PLR, and SIRI were analyzed in the contest of PDAP. Pearson correlation analysis was performed to examine the correlations between NLR, PLR and SIRI in PDAP patients, and the joint diagnostic value of NLR, PLR, and SIRI was evaluated. Additionally, risk factors associated with PDAP were identified. Results: Patients in the peritonitis group were older than those in the non-peritonitis group, and experienced longer duration of dialysis ($P<0.05$). The peritonitis group exhibited significantly higher NLR, PLR and SIRI levels than the non-peritonitis group ($P<0.001$). Pearson correlation analysis revealed significant positive corrections between NLR, PLR and SIRI in PDAP patients. Logistic regression analysis identified NLR, PLR, and SIRI as independent influencing factors for the occurrence of PDAP. ROC curve analysis revealed that the combined use of NLR, PLR, and SIRI for diagnosing PDAP yielded an AUC of 0.935, significantly higher than their individual predictions, along with superior diagnostic accuracy. Conclusion: NLR, PLR, and SIRI are independent risk factors for the occurrence of PDA. These indices hold significant diagnostic value for PDAP, and their combined utilization can enhance diagnostic accuracy.

Keywords: NLR, PLR, SIRI, peritoneal dialysis-associated peritonitis

Introduction

Chronic kidney disease (CKD) is a kidney disorder caused by various factors, characterized by changes in the estimated glomerular filtration rate and abnormalities in blood or urine [1]. The global prevalence of CKD is approximately 13.4%, with an estimated 120 million adults affected in China [2]. End-stage CKD necessitates renal replacement therapy, which includes dialysis and kidney transplantation. Given the escalating prevalence of type 2 diabetes and an aging population, CKD is evolving into a significant global health and economic concern.

In peritoneal dialysis (PD), the peritoneum acts as a natural semi-permeable membrane, using its selective permeability to remove waste and excess fluid from the blood [3]. Peritoneal dialysis-associated peritonitis (PDAP) is a critical complication of PD treatment that can trigger peritoneal fibrosis or sclerosis [4]. The International Society for Peritoneal Dialysis (ISPD) guidelines state that the incidence of peritonitis in each dialysis regimen should not exceed 0.5 episodes per patient per year. Although most cases of peritonitis can be managed without removing the catheter, PDAP remains a major cause of hospitalization and death in PD patients, with up to 25% requiring catheter removal or conversion to hemodialysis, and a mortality rate of 8.6% [5]. The medical community generally believes that the pathogenesis of PDAP is related to immune dysfunction of the peritoneum, increased risk of exogenous infections, and dysbiosis of the intestinal microbiota in patients [6]. The systemic inflammation and immune deficiency specific to end-stage renal disease can lead to atherosclerosis, cardiovascular disease, cachexia, and anemia [7]. In addition, immune system defects can also lead

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to dysregulation of the immune response, increasing the risk and severity of microbial infections [8].

The neutrophil/lymphocyte ratio (NLR) reflects the balance between neutrophils and lymphocytes, providing insight into a patient's infection and immune status [9]. The platelet/lymphocyte ratio (PLR) reflects platelet and lymphocyte counts, providing a reflection of a patient's thrombotic and coagulation status [10]. The systemic inflammation response index (SIRI) is a comprehensive index calculated from peripheral blood parameters, including neutrophils, lymphocytes, monocytes, and platelets [11]. As a comprehensive indicator reflecting systemic inflammation and immune status, SIRI is less influenced by individual factors such as age, sex, and comorbidities compared to other single routine blood parameters, demonstrating greater stability [12].

The novelty of this study lies in the systematic evaluation of the clinical value of NLR, PLR, and SIRI in PDAP being evaluated together for the first time. Through the analysis of these comprehensive blood indices, this study aims to gain a deeper understanding of the pathological and physiological mechanisms of PDAP and explore the potential applications of these indices in predicting and monitoring the progression of PDAP.

Methods and data

Clinical data

A retrospective analysis was conducted on 130 patients who received PD for the first time at Cangzhou Central Hospital from January 2019 to January 2022. The study was conducted with the approval of the Medical Ethics Committee of Cangzhou Central Hospital.

Inclusion and exclusion criteria

Inclusion criteria: (1) Patients aged 18 years or older; (2) Patients requiring dialysis treatment who had undergone at least 4 weeks of PD; (3) Patients with complete microbiological investigation results; (4) Patients with available, complete clinical and follow-up data.

Exclusion criteria: (1) Patients who have undergone hemodialysis before treatment or had switched dialysis modalities during the treatment course; (2) Patients with a history of abdominal surgery before initiating dialysis or with other sources of infection, such as skin infections; (3) Patients with malignant tumors or severe impairment of cardiac, pulmonary, or hepatic function; (4) Patients with peritonitis caused by environmental or operational factors.

Diagnostic criteria

According to the diagnostic criteria established by the ISPD in 2016, the diagnosis of peritonitis includes the following [13]: cloudy dialysis fluid, abdominal pain, fever, nausea, vomiting; presence of pathogens in the dialysis fluid; white blood cell count in the dialysis fluid exceeding 100×10^6/L, with neutrophils accounting for more than 50%. Peritonitis can be confirmed if any two of these criteria are met.

Patient grouping

Based on the occurrence of PDAP during the treatment, the patients were divided into the peritonitis group (n=31) and the non-peritonitis group (n=99).

Data gathering

Patient data were collected from medical records, follow-up information, and laboratory records. The collected data included age, sex, duration of dialysis, primary kidney disease, history of diabetes, history of hypertension, history of smoking, NLR, PLR and SIRI. NLR = neutrophil count/lymphocyte count; PLR = platelet/lymphocyte count; SIRI = (neutrophil count × monocyte count)/lymphocyte count.

Outcome measures

1. Baseline characteristics of the two groups were compared. 2. The expression and diagnostic value of NLR, PLR, and SIRI in PDAP patients were analyzed. 3. The correlations between NLR, PLR and SIRI in PDAP patients were analyzed with Pearson correlation analysis. 4. Risk factors contributing to PDAP were identified. 5. The diagnostic value of NLR, PLR, and SIRI and their combination was evaluated (**Figure 1**).

Statistical analyses

SPSS 26.0 software package was used for statistical analyses. Measurement variables were

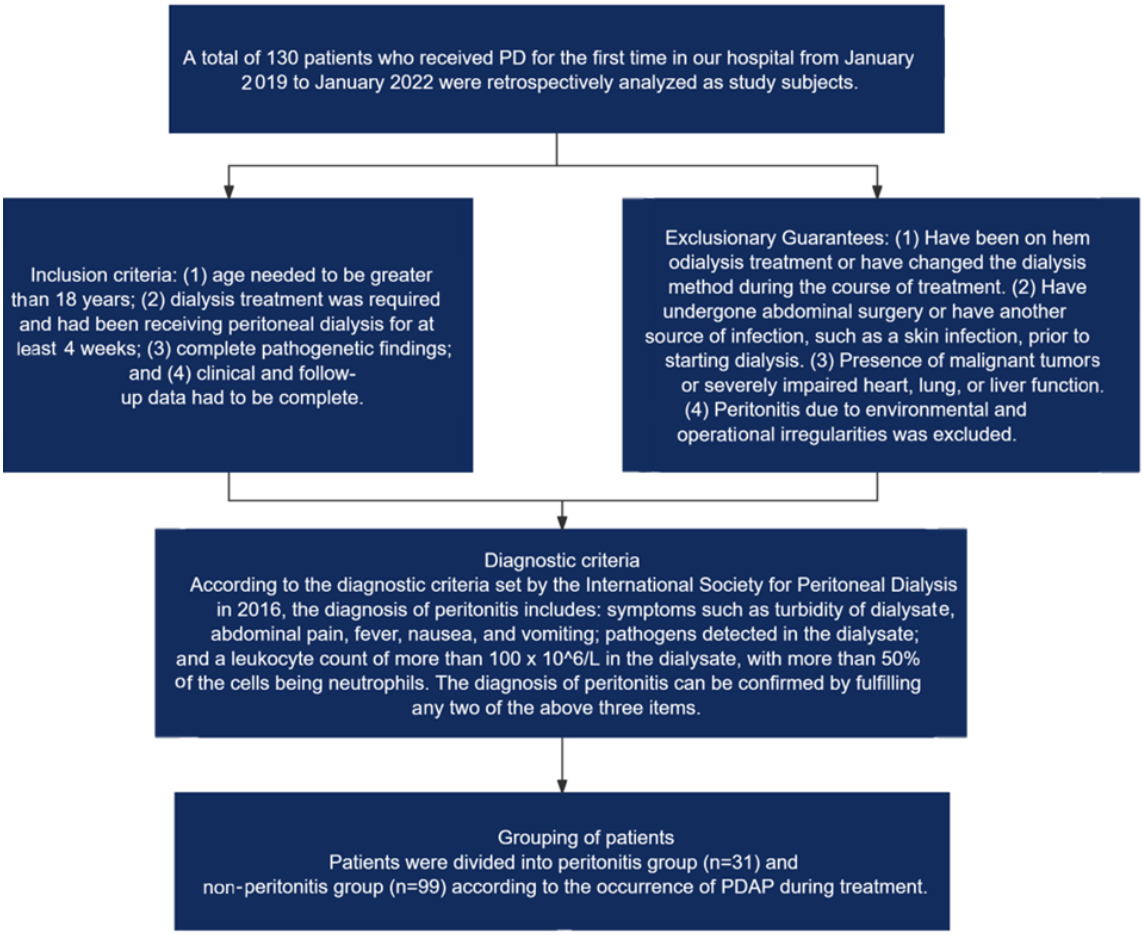

Figure 1. Flow chart of this study. Notes: NLR: neutrophil-to-lymphocyte ratio; PLR: platelet-to-lymphocyte ratio; SIRI: systemic immune-inflammation index; PDAP: peritoneal dialysis-associated peritonitis.

normally distributed and expressed as mean ± standard deviation; the independent samples t-test was used for inter-group comparisons. Counting variables were presented as n (%) and compared using the chi-square test. Pearson correlation analysis was used to explore the correlations of NLR and PLR with SIRI in PDAP patients. Logistic regression analysis was conducted to identify risk factors associated with the occurrence of PDAP. The diagnostic value of NLR, PLR, SIRI and their combination for PDAP was assessed using receiver operating characteristic (ROC) curves. $P<0.05$ was considered statistically significant.

Results

Comparison of baseline data between the peritonitis group and non-peritonitis group

Inter-group comparison of baseline characteristics revealed significantly higher age and longer duration of dialysis in the peritonitis group compared to the non-peritonitis group ($P<0.05$, **Table 1**). However, there were no significant differences between the two groups in sex, primary renal disease, history of diabetes, history of hypertension, and history of smoking ($P>0.05$, **Table 1**).

Comparison of NLR, PLR and SIRI between the peritonitis group and non-peritonitis group

Inter-group comparison revealed significantly higher NLR, PLR, and SIRI in the peritonitis group compared to the non-peritonitis group (all $P<0.001$, **Figure 2**).

Correlations between NLR, PLR and SIRI in PDAP patients

Pearson correlation analysis revealed significant positive correction between NLR and SIRI

Table 1. Comparison of baseline data between the peritonitis and non-peritonitis groups

Factors		Peritonitis group (n=31)	Non-peritonitis group (n=99)	χ^2/t	*P* value
Age (years)		59.84±4.68	57.18±6.03	2.562	0.013
Sex	Male/Female	19/12	57/42	0.134	0.714
Duration of dialysis (month)		12.61±2.09	10.25±3.35	4.677	<0.001
Primary renal disease	Nephrotic syndrome/Diabetic nephropathy	17/14	48/51	0.381	0.537
History of diabetes	Yes/No	6/25	18/81	0.022	0.883
History of hypertension	Yes/No	6/25	25/74	0.452	0.501
History of smoking	Yes/No	20/11	69/30	0.293	0.588

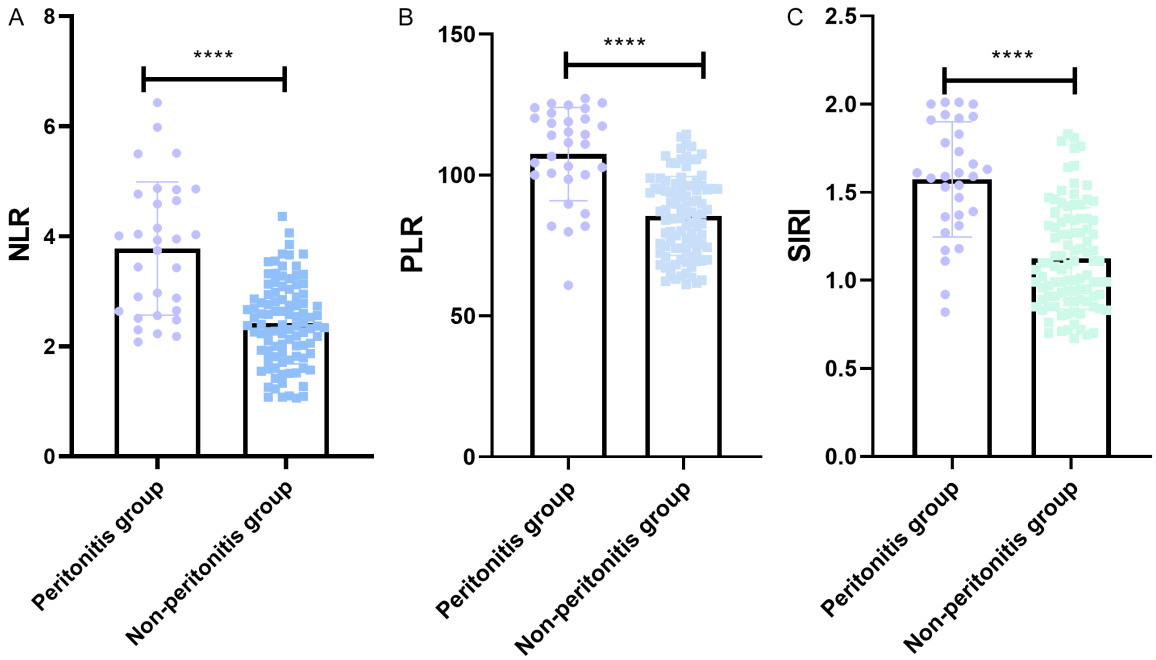

Figure 2. Comparison of NLR (A), PLR (B), and SIRI (C) between peritonitis and non-peritonitis groups. ****, P<0.0001. Notes: NLR: neutrophil-to-lymphocyte ratio; PLR: platelet-to-lymphocyte ratio; SIRI: systemic immune-inflammation index; PDAP: peritoneal dialysis-associated peritonitis.

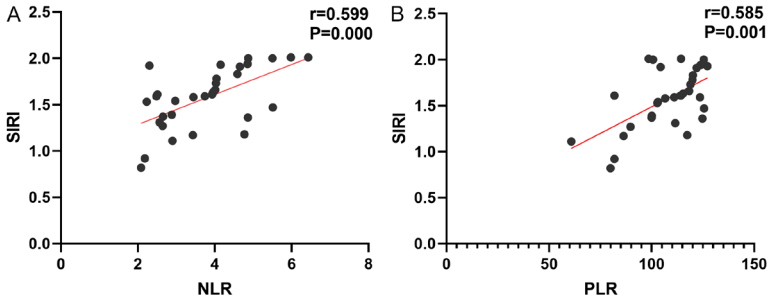

Figure 3. Correlations between NLR, PLR and SIRI in PDAP patients. A: Correlation of NLR with SIRI in PDAP patients; B: Correlation of PLR with SIRI in PDAP patients. Notes: NLR: neutrophil-to-lymphocyte ratio; PLR: platelet-to-lymphocyte ratio; SIRI: systemic immune-inflammation index; PDAP: peritoneal dialysis-associated peritonitis.

in PDAP patients (P<0.05), as well as a positive correction between PLR and SIRI (P<0.05, **Figure 3**).

Identification of factors contributing to the occurrence of PDAP

Based on the above findings, notable distinctions in age, duration of dialysis, NLR, PLR, and SIRI were observed between the two groups (P< 0.05). The indicators were assigned values (**Table 2**) and subjected to multifactorial analysis. Logistic regression analysis identified NLR, PLR, and SIRI as independent factors influencing the occurrence of PDAP, as shown in **Table 3**.

Table 2. Assignment table

Factors	Assignment	
	0	1
Age	<57.3 years old	≥57.3 years old
Duration of dialysis	<11.19 months	≥11.19 months
NLR	<2.75	≥2.75
PLR	<90.72	≥90.72
SIRI	<1.23	≥1.23
PDAP	No	Yes

Notes: NLR: neutrophil-to-lymphocyte ratio; PLR: platelet-to-lymphocyte ratio; SIRI: systemic immune-inflammation index; PDAP: peritoneal dialysis-associated peritonitis.

Diagnostic value of NLR, PLR, SIRI and their combination in PDAP patients

The diagnostic performance of NLR, PLR, and SIRI, both individually and in combination, was evaluated. ROC curve analysis revealed that the combined use of NLR, PLR, and SIRI for diagnosing PDAP yielded an AUC of 0.935, significantly higher than the AUCs of the individual indices. This combination also demonstrated greater accuracy compared to the individual predictions (**Figure 4** and **Table 4**).

Discussion

Peritoneal dialysis-associated peritonitis (PDAP) is a major complication of PD [14]. The annual incidence of peritonitis in the United States, Japan, and Canada is approximately 0.26 to 0.29 episodes, while in Australia, New Zealand, the United Kingdom, and Thailand, it ranges from 0.35 to 0.40 episodes [15]. Advancements in PD technology have reduced complications and improved the survival rate of PD patients, making it comparable to that of hemodialysis patients [16]. Early diagnosis of PDAP typically relies on clinical symptoms, laboratory testing, and microbiological examination [17]. However, in primary care hospitals and outpatient settings, screening for PDAP is often limited due to high equipment costs and complex operations [18]. Therefore, it becomes particularly important to develop low-cost and simple methods to assess the prognosis of PDAP patients.

Inflammation is known to be a significant factor influencing the mortality rate in PD patients and is associated with various physiological changes [19]. While markers such as C-reactive protein and interleukin-6 can predict the risk in PD and hemodialysis patients, their application in primary healthcare is limited due to cost and operational constraints [20]. In this study, we focused on evaluating NLR, PLR, and SIRI levels in patients with PD. PLR, the ratio of platelets to lymphocytes, reflects the primary cellular components in the blood [21]. NLR, the ratio of neutrophils to lymphocytes, serves as an indicator of infection defense and immune response [12]. SIRI comprehensively evaluates the immune and inflammatory status of the body according to the count of neutrophils, monocytes and lymphocytes [22]. Our findings revealed notably higher NLR, PLR, and SIRI in the peritonitis group compared to the non-peritonitis group, suggesting that these indices reflect the intensity of the inflammatory response, activation status of the immune system, and severity of the pathological process in PDAP. Moreover, we observed significant positive correlations between NLR, PLR and SIRI in PDAP patients, primarily reflecting the inflammatory processes associated with PDAP. The inflammatory response trigger by PDAP leads to an increase in neutrophils and a decrease in lymphocytes, which is reflected in the elevated NLR [12]. Additionally, platelets play a crucial role in inflammation and disease progression, with increased platelet count in peritoneal dialysis patients possibly associated with elevated PLR [21], indicating a potential link between platelet activation, inflammation, and disease development. Additionally, SIRI integrates neutrophils, lymphocytes, and monocytes, providing a comprehensive reflection of both systemic inflammation and nutritional status of PDAP patients [22]. The positive correlation between NLR, PLR and SIRI further suggests that these inflammatory markers collectively reflect the pathological process in PDAP patients.

In this study, logistic regression analysis identified NLR, PLR, and SIRI as independent factors for PDAP. Neutrophils and monocytes are important components of white blood cells. Neutrophils serve as the first line of defense against acute infections, primarily responsible for eliminating pathogens, especially bacteria

Table 3. Logistic regression analysis of factors influencing the occurrence of peritonitis

	β	S.E.	Wals	df	Sig.	Exp (β)	95% CI for EXP (β)	
							Lower limit	Upper limit
Age	0.915	0.621	2.171	1	0.141	2.497	0.739	8.434
Duration of dialysis	1.023	0.569	3.226	1	0.072	2.780	0.911	8.486
NLR	2.044	0.575	12.633	1	<0.001	7.722	2.501	23.839
PLR	2.428	0.616	15.521	1	<0.001	11.335	3.387	37.930
SIRI	2.001	0.630	10.104	1	0.001	7.400	2.154	25.420

Notes: NLR: neutrophil-to-lymphocyte ratio; PLR: platelet-to-lymphocyte ratio; SIRI: systemic immune-inflammation index; PDAP: peritoneal dialysis-associated peritonitis.

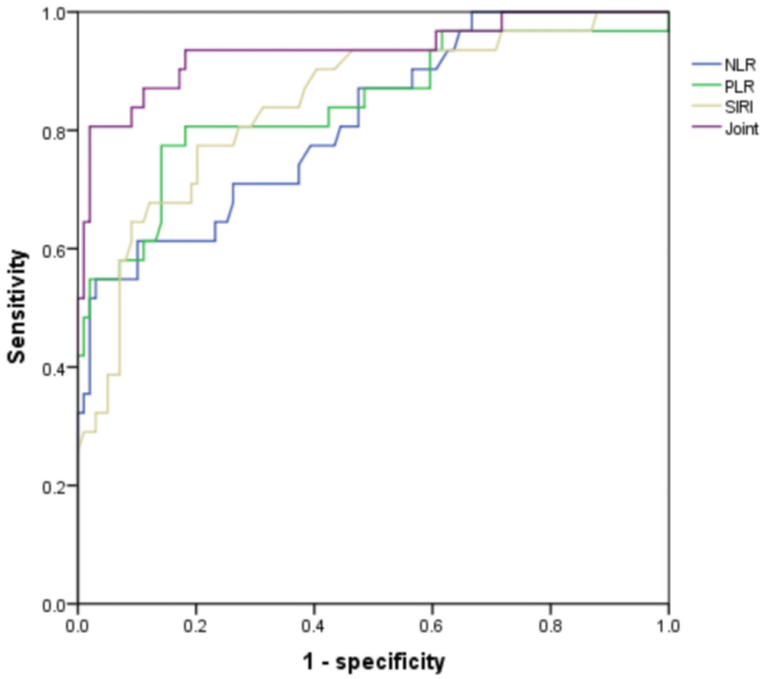

Figure 4. ROC curves of NLR, PLR, SIRI and their combination in diagnosing PDAP. Notes: NLR: neutrophil-to-lymphocyte ratio; PLR: platelet-to-lymphocyte ratio; SIRI: systemic immune-inflammation index; PDAP: peritoneal dialysis-associated peritonitis.

Table 4. ROC parameters of NLR, PLR, SIRI and their combination in diagnosing peritonitis

Marker	AUC	Specificity	Sensitivity	Accuracy
NLR	0.815	54.80%	97.00%	86.90%
PLR	0.844	77.40%	85.90%	83.80%
SIRI	0.845	77.40%	79.80%	79.20%

Notes: ROC: receiver operating characteristic; NLR: neutrophil-to-lymphocyte ratio; PLR: platelet-to-lymphocyte ratio; SIRI: systemic immune-inflammation index.

and fungi [23]. Monocytes circulate in the blood and, upon migration to tissues, differentiate into macrophages or dendritic cells. These cells play an essential role in pathogen engulfment, production of inflammatory mediators, and antigen presentation, contributing significantly to chronic inflammatory responses and tissue repair [24]. Platelets are also essential in sterile inflammatory processes, responding to tissue damage and cell death, especially in pathological conditions such as ischemia, atherosclerosis, and gout [25]. Inflammatory conditions can lead to alterations in protein metabolism, promoting protein breakdown while inhibiting protein synthesis. This imbalance affects the patient's nutritional status, stimulates the intestinal microbiota, and facilitates the transfer of bacteria and toxins from the intestines into the bloodstream, resulting in an inflammatory state and creating a vicious cycle [26]. This inflammatory state can further lead to the activation of the immune system, releasing more inflammatory mediators such as cytokines and chemokines, thereby exacerbating the inflammatory response. Moreover, when coupled with a bacterial infection, this heightened inflammatory state makes the body more susceptible to infections, particularly in the peritoneal cavity. The heightened inflammatory response alters body's internal environment, impairing immune system functionality, causing tissue damage, and influencing the release of inflammatory mediators. These factors collectively

create a more conducive environment for bacterial growth and reproduction, thereby increasing the risk of infection [27]. Bacterial infections are more prone to spreading and triggering inflammation-related complications, such as peritonitis, in an environment where the inflammatory response is intensified [28]. Therefore, a bacterial infection, combined with an exacerbated inflammatory state, can trigger an inflammatory reaction in the peritoneal region, ultimately culminating in the development of peritonitis.

Finally, our study revealed that a comprehensive assessment incorporating NLR, PLR, and SIRI provides a more robust diagnostic approach for PDAP. This outcome implies that while individual indicators offer valuable diagnostic insights for PDAP, their collective integration leads to a more precise and nuanced diagnostic profile. These results underscore the importance of integrating diverse inflammation and immune markers in PDAP diagnosis, highlighting the potential for enhanced diagnostic accuracy and personalized treatment strategies.

This study still has a few limitations. The small sample size, retrospective design, and single-center setting may restrict the generalizability and validity of our findings. To overcome these constraints, future research should focus on increasing the sample size, adopting a prospective design, and conducting multi-center studies. These steps would enhance the external validity and provide a more accurate representation of the diagnostic value of NLR, PLR, and SIRI in broader clinical settings.

Conclusion

NLR, PLR, and SIRI are independent factors influencing the occurrence of PDAP. These indices hold significant diagnostic value, and their combined use can improve diagnostic accuracy. Future studies, incorporating larger and more diverse patient populations, will be essential to further validate these findings and refine diagnostic strategies for PDAP.

Disclosure of conflict of interest

None.

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References

[1] The EMPA-KIDNEY Collaborative Group, Herrington WG, Staplin N, Wanner C, Green JB, Hauske SJ, Emberson JR, Preiss D, Judge P, Mayne KJ, Ng SYA, Sammons E, Zhu D, Hill M, Stevens W, Wallendszus K, Brenner S, Cheung AK, Liu ZH, Li J, Hooi LS, Liu W, Kadowaki T, Nangaku M, Levin A, Cherney D, Maggioni AP, Pontremoli R, Deo R, Goto S, Rossello X, Tuttle KR, Steubl D, Petrini M, Massey D, Eilbracht J, Brueckmann M, Landray MJ, Baigent C and Haynes R. Empagliflozin in patients with chronic kidney disease. N Engl J Med 2023; 388: 117-127.

[2] Lv JC and Zhang LX. Prevalence and disease burden of chronic kidney disease. Adv Exp Med Biol 2019; 1165: 3-15.

[3] Chesnaye NC, Schaefer F, Bonthuis M, Holman R, Baiko S, Baskın E, Bjerre A, Cloarec S, Cornelissen EAM, Espinosa L, Heaf J, Stone R, Shtiza D, Zagozdzon I, Harambat J, Jager KJ, Groothoff JW and van Stralen KJ; ESPN/ERA-EDTA Registry Committee. Mortality risk disparities in children receiving chronic renal replacement therapy for the treatment of end-stage renal disease across Europe: an ESPN-ERA/EDTA registry analysis. Lancet 2017; 389: 2128-2137.

[4] Perl J, Harel Z and Nessim SJ. Peritoneal fluid analysis in peritoneal dialysis-associated peritonitis. JAMA 2022; [Epub ahead of print].

[5] Szeto CC and Li PK. Peritoneal dialysis-associated peritonitis. Clin J Am Soc Nephrol 2019; 14: 1100-1105.

[6] Perl J, Fuller DS, Boudville N, Kliger AS, Schaubel DE, Teitelbaum I, Warady BA, Neu AM, Patel PR, Piraino B, Schreiber M and Pisoni RL. Optimizing peritoneal dialysis-associated peritonitis prevention in the United States: from standardized peritoneal dialysis-associated peritonitis reporting and beyond. Clin J Am Soc Nephrol 2020; 16: 154-161.

[7] Martins JM and Magriço R. Uremic frost in end-stage renal disease. N Engl J Med 2018; 379: 669.

[8] Qiu Y, Tang J, Zhao Q, Jiang Y, Liu YN and Liu WJ. From diabetic nephropathy to end-stage renal disease: the effect of chemokines on the immune system. J Diabetes Res 2023; 2023: 3931043.

[9] Qian B, Zheng Y, Jia H, Zheng X, Gao R and Li W. Neutrophil-lymphocyte ratio as a predictive marker for postoperative infectious complications: a systematic review and meta-analysis. Heliyon 2023; 9: e15586.

[10] Balta S and Ozturk C. The platelet-lymphocyte ratio: a simple, inexpensive and rapid prognostic marker for cardiovascular events. Platelets 2015; 26: 680-681.
[11] Lin KB, Fan FH, Cai MQ, Yu Y, Fu CL, Ding LY, Sun YD, Sun JW, Shi YW, Dong ZF, Yuan MJ, Li S, Wang YP, Chen KK, Zhu JN, Guo XW, Zhang X, Zhao YW, Li JB and Huang D. Systemic immune inflammation index and system inflammation response index are potential biomarkers of atrial fibrillation among the patients presenting with ischemic stroke. Eur J Med Res 2022; 27: 106.
[12] Wang RH, Wen WX, Jiang ZP, Du ZP, Ma ZH, Lu AL, Li HP, Yuan F, Wu SB, Guo JW, Cai YF, Huang Y, Wang LX and Lu HJ. The clinical value of neutrophil-to-lymphocyte ratio (NLR), systemic immune-inflammation index (SII), platelet-to-lymphocyte ratio (PLR) and systemic inflammation response index (SIRI) for predicting the occurrence and severity of pneumonia in patients with intracerebral hemorrhage. Front Immunol 2023; 14: 1115031.
[13] Liakopoulos V, Nikitidou O, Kalathas T, Roumeliotis S, Salmas M and Eleftheriadis T. Peritoneal dialysis-related infections recommendations: 2016 update. What is new? Int Urol Nephrol 2017; 49: 2177-2184.
[14] Hamada S, Takata T, Kitaura T, Teraoka C, Aono A, Taniguchi S, Mae Y, Isomoto H, Chikumi H and Mitarai S. Peritoneal dialysis-associated peritonitis caused by Mycobacteroides massiliense: the first case and review of the literature. BMC Nephrol 2021; 22: 90.
[15] Ommen SR, Gibbons RJ, Hodge DO and Thomson SP. Usefulness of the lymphocyte concentration as a prognostic marker in coronary artery disease. Am J Cardiol 1997; 79: 812-814.
[16] Mehrotra R, Devuyst O, Davies SJ and Johnson DW. The current state of peritoneal dialysis. J Am Soc Nephrol 2016; 27: 3238-3252.
[17] Guo S, Yang L, Zhu X, Zhang X, Meng L, Li X, Cheng S, Zhuang X, Liu S and Cui W. Multidrug-resistant organism-peritoneal dialysis associated peritonitis: clinical and microbiological features and risk factors of treatment failure. Front Med (Lausanne) 2023; 10: 1132695.
[18] Ni C, Yang LM, Zhu XY, Zhang XX, Zhou WH, Xie SY, Yu MY, Zhuang XH, Luo P and Cui WP. Clinical characteristics and treatment outcome of pseudomonas peritoneal dialysis-associated peritonitis. Zhongguo Yi Xue Ke Xue Yuan Xue Bao 2022; 44: 45-52.
[19] Mikhalchik EV, Borodina IV, Vlasova IV, Vakhrusheva TV, Gorbunov NP, Panasenko OM, Titkova SM, Anurov MV, Ivakhov GB, Ermakov IV, Teplyshev AV and Klinov DV. Biomarkers of system inflammation in local and diffuse peritonitis. Biomed Khim 2020; 66: 411-418.
[20] Alfano G, Fontana F and Varani M. Elevation of Interleukin-6 (IL-6) in a case of icodextrin-associated peritonitis. Ther Apher Dial 2023; 27: 182-183.
[21] Seyhanli Z, Bayraktar B, Baysoz OB, Karabay G, Sucu ST, Ulusoy CO, Aktemur G, Bucak M, Cakir BT, Kurt D, Ergani SY and Iskender CT. The role of first trimester serum inflammatory indexes (NLR, PLR, MLR, SII, SIRI, and PIV) and the β-hCG to PAPP-A ratio in predicting preeclampsia. J Reprod Immunol 2024; 162: 104190.
[22] Melinte RM, Arbănaşi EM, Blesneac A, Zolog DN, Kaller R, Mureşan AV, Arbănaşi EM, Melinte IM, Niculescu R and Russu E. Inflammatory biomarkers as prognostic factors of acute deep vein thrombosis following the total knee arthroplasty. Medicina (Kaunas) 2022; 58: 1502.
[23] Soehnlein O, Steffens S, Hidalgo A and Weber C. Neutrophils as protagonists and targets in chronic inflammation. Nat Rev Immunol 2017; 17: 248-261.
[24] Saito E, Kuo R, Pearson RM, Gohel N, Cheung B, King NJC, Miller SD and Shea LD. Designing drug-free biodegradable nanoparticles to modulate inflammatory monocytes and neutrophils for ameliorating inflammation. J Control Release 2019; 300: 185-196.
[25] Ho-Tin-Noé B, Boulaftali Y and Camerer E. Platelets and vascular integrity: how platelets prevent bleeding in inflammation. Blood 2018; 131: 277-288.
[26] Chen Z, Deng H, Sun K, Huang Z, Wei S, Lin Y, Song Z and Liu Y. Prevalence of chronic periodontitis in patients undergoing peritoneal dialysis and its correlation with peritoneal dialysis-related complications. BMC Nephrol 2023; 24: 71.
[27] Miyata Y, Obata Y, Mochizuki Y, Kitamura M, Mitsunari K, Matsuo T, Ohba K, Mukae H, Nishino T, Yoshimura A and Sakai H. Periodontal disease in patients receiving dialysis. Int J Mol Sci 2019; 20: 3805.
[28] Tang J, Wang D, Chen Y and Feng J. The association between new inflammation markers and frequent peritoneal dialysis-associated peritonitis. BMC Nephrol 2024; 25: 81.