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ORIGINAL ARTICLE

Evaluation of the Uric Acid/Albumin Ratio in Acute Pericarditis Patients: Implications for Recurrence Rates and Hospitalization Duration

Akut Perikardit Hastalarında Ürik Asit/Albümin Oranının Değerlendirilmesi: Tekrarlama Oranları ve Hastanede Kalış Süresi Açısından Etkileri

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ABSTRACT

Aim: Acute pericarditis is inflammation of the pericardium, the membrane surrounding the heart. It typically presents with sudden chest pain, fever and general malaise. The uric acid/albumin ratio can help assess patients' inflammatory status and monitor their response to treatment. Our aim is to evaluate the effect of uric acid/albumin ratio on the probability of recurrence and hospital stay in pericarditis patients.
Methods: This study is designed as a retrospective cohort study and a total of 233 patients were evaluated. Patients' demographic information, clinical findings and laboratory tests were evaluated. Treatment data were collected, including medications used (NSAIDs, colchicine, corticosteroids), duration of treatment, and length of hospital stay. Recurrence cases, hospital stays and the need for additional treatment were evaluated.
Results: The median age was 42 years, with a range of 18 to 65 years. The uric acid/albumin ratio showed a significant positive correlation with CRP ($\rho = 0.182$, $p = 0.005$) and troponin levels ($\rho = 0.483$, $p < 0.001$), indicating its association with inflammatory and cardiac stress markers. Additionally, a negative correlation was observed with hemoglobin levels ($\rho = -0.535$, $p < 0.001$).
Conclusion: The uric acid/albumin ratio offers a novel and insightful approach to evaluating acute pericarditis, providing a composite marker of inflammation, oxidative stress, and nutritional status. Its significant associations with clinical severity and recurrence risk highlight its potential role in guiding patient management and improving outcomes.

Keywords: Pericarditis, Uric Acid/Albumin Ratio, Recurrence, Hospitalization

ÖZ

Amaç: Akut perikardit, kalbi çevreleyen zar olan perikardın iltihaplanmasıdır. Tipik olarak ani göğüs ağrısı, ateş ve genel halsizlikle kendini gösterir. Ürik asit/albümin oranı, hastaların inflamatuar durumunu değerlendirmeye ve tedaviye yanıtlarını izlemeye yardımcı olabilir. Amacımız, ürik asit/albümin oranının perikardit hastalarında tekrarlama ve hastanede kalış olasılığı üzerindeki etkisini değerlendirmektir.
Yöntemler: Bu çalışma retrospektif bir kohort çalışması olarak tasarlanmıştır ve toplam 233 hasta değerlendirilmiştir. Hastaların demografik bilgileri, klinik bulguları ve laboratuvar testleri değerlendirilmiştir. Kullanılan ilaçlar (NSAID'ler, kolşisin, kortikosteroidler), tedavi süresi ve hastanede kalış süresi dahil olmak üzere tedavi verileri toplandı. Tekrarlama vakaları, hastanede kalış süreleri ve ek tedaviye ihtiyaç olup olmadığı değerlendirildi.
Bulgular: Ortanca yaş 42 idi ve aralık 18 ila 65 yıldı. Ürik asit/albümin oranı, CRP ($\rho = 0,182$, $p = 0,005$) ve troponin seviyeleri ($\rho = 0,483$, $p < 0,001$) ile anlamlı bir pozitif korelasyon gösterdi ve bu da onun inflamatuar ve kardiyak stres belirteçleriyle ilişkisini gösteriyor. Ek olarak, hemoglobin seviyeleriyle negatif bir korelasyon gözlendi ($\rho = -0,535$, $p < 0,001$).
Sonuçlar: Ürik asit/albümin oranı, akut perikarditi değerlendirmek için yeni ve içgörülü bir yaklaşım sunarak, inflamasyon, oksidatif stres ve beslenme durumunun bileşik bir belirtecini sağlar. Klinik şiddet ve tekrarlama riskiyle olan anlamlı ilişkileri, hasta yönetimini yönlendirme ve sonuçları iyileştirmedeki potansiyel rolünü vurgular.

Anahtar Kelimeler: Perikardit, Ürik Asit/Albümin Oranı, Tekrarlama, Hastaneye Yatış

Introduction

Acute pericarditis is an inflammation of the pericardium, the membrane surrounding the heart (1). It typically presents with sudden chest pain, fever, and general malaise. The diagnostic process relies on the patient's medical history, physical examination findings, and various laboratory tests (2). Electrocardiogram (ECG) often shows ST-segment elevation and PR-segment depression, supporting the diagnosis of pericarditis. Echocardiography is used to detect fluid accumulation in the pericardial sac. Blood tests usually reveal elevated markers of inflammation, such as C-reactive protein and erythrocyte sedimentation rate (3). The treatment of acute pericarditis generally begins with anti-inflammatory medications. Nonsteroidal anti-inflammatory drugs (NSAIDs) and colchicine are commonly used to reduce inflammation and pain. Colchicine is particularly effective in reducing the risk of recurrence. In more severe cases, corticosteroids may be used, though they can increase the risk of long-term complications. Despite treatment, about 15-30% of patients experience recurrence of pericarditis, necessitating long-term follow-up and treatment.

The uric acid/albumin ratio has recently been investigated as a biomarker in various cardiovascular

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diseases and inflammatory conditions (4). Uric acid, a byproduct of purine metabolism in the body, is associated with inflammation and oxidative stress at high levels. Albumin, a prevalent plasma protein, typically reflects nutritional status and inflammatory states. The uric acid/albumin ratio, combining these two parameters, may serve as a more sensitive indicator of inflammatory processes. The potential use of the uric acid/albumin ratio as a biomarker in patients with recurrent acute pericarditis has garnered interest among researchers. Since inflammation persists in recurrent pericarditis, this ratio could be useful in monitoring inflammatory activity. High uric acid levels are considered indicators of inflammation and oxidative stress, while low albumin levels signal inflammation and poor nutrition. Therefore, a high uric acid/albumin ratio might help identify patients at high risk of recurrence early, guiding appropriate treatment.

During hospitalization, the use of the uric acid/albumin ratio could play a significant role in managing acute pericarditis patients. This ratio could aid in assessing the inflammatory status of patients and monitoring their response to treatment. A high uric acid/albumin ratio may identify patients requiring a more aggressive treatment approach. Additionally, this ratio could be crucial in the post-discharge follow-up process, as patients at high risk of recurrence require more frequent and close monitoring.

Methods

Compliance with Ethical Standards

The study was reviewed and approved by the institutional research ethics board, adhering to the principles of the Helsinki Declaration. Written informed consent was obtained from all participants. Artificial intelligence-supported technologies were not used in the study.

Study Design

This study is designed as a retrospective cohort study and a total of 233 patients were evaluated. Data was obtained from hospital records to analyze patients diagnosed with acute pericarditis from 2015 to 2023. The data sources include hospital electronic health records, laboratory results, ECG reports, echocardiography findings, and treatment records. Retrospective review of patient records were conducted to collect information on uric acid and albumin levels, treatment methods, length of hospital stay, and recurrence status.

Patient Evaluation and Follow-up

Patients were assessed based on demographic information (age, gender, existing chronic diseases), clinical findings (chest pain, ECG findings, echocardiography results), and laboratory tests (uric acid and albumin levels, C-reactive protein, erythrocyte sedimentation rate). Treatment data, including medications used (NSAIDs, colchicine, corticosteroids), duration of treatment, and length of hospital stay, was collected. Outcome data, such as recurrence cases, time to recurrence, and need for additional treatment, was gathered.

Demographic details, clinical findings, and diagnostic test results were meticulously recorded. Laboratory tests will focus on uric acid and albumin levels, along with other inflammatory markers. Treatment data was include specific medications and their usage duration, as well as the overall length of hospital stays. Outcome data was highlight recurrence rates, the interval to recurrence, and additional treatment requirements. Patients were excluded if they do not have a definitive diagnosis of acute pericarditis, have incomplete data on key laboratory parameters (uric acid or albumin levels), or have other severe chronic diseases affecting uric acid or albumin levels (e.g., chronic kidney disease, rheumatic diseases, severe liver disease). Additionally, patients with inadequate follow-up duration (less than six months), those under 18 years old, and those non-compliant with treatment or who did not complete their treatment will be excluded from the study.

Statistical Analysis

Statistical analyses in this study were conducted using SPSS version 27.0 (IBM Inc, Chicago, IL, USA). The normality of the distribution of numerical variables was assessed using the Kolmogorov-Smirnov test, histogram analyses, skewness/kurtosis data, and Q-Q plots. Descriptive statistics for the numerical and categorical variables obtained in the study were analyzed, with quantitative parameters expressed as median (IQR) [minimum-maximum] or mean ± standard deviation. Relationships between two groups were examined using the Mann-Whitney U test or independent t-test. Correlations between quantitative parameters were evaluated using Pearson or Spearman correlation analyses. Throughout the study, a type I error rate of 5% ($\alpha = 0.05$) was used, and a p-value < 0.05 was considered statistically significant.

Results

In our study, the general distribution of quantitative parameters among pericarditis patients is summarized in Table 1. The median age was 42 years, with a range of 18 to 65 years. The median WBC count was 9 ×10³/mL, while the median uric acid/albumin ratio was 0.12 (0.08-0.17). Other parameters, such as CRP and troponin levels, showed a wide range of values, reflecting the diverse inflammatory and cardiac profiles of the patients.

Table 1. Summary of the general distribution of quantitative parameters in pericarditis patients

Parameters	Unit	Minimum	Maximum	Distribution †
Age	years	18	65	42 (18-65)
WBC	10^3/mL	4	24	9 (4,26-23,82)
Neutrophil	10^3/mL	0	20	5,47 (0,33-19,93)
Monocyte	%	0	1,5	0,54 (0,04-1,5)
Lenfocyte	10^3/mL	0,51	4,78	2,33±0,72
Platelet	10^3/mL	135,0	464,0	254±58
Hemoglobin	g/dL	8,9	17,7	14,3±1,6
RDW	%	11,2	17,7	13,5±1,0
Albumin	g/L	32	51	42,8±3,4
ASO	IU/mL	34,0	345,0	153 (34-345)
EF	%	30	65	60 (30-65)
Troponin	ng/L	3,0	36,0	11 (3-36)
CRP	mg/L	4	203	23 (4-203)
Ferritin	ng/mL	19,00	262,0	67 (19-262)
Fibrinogen	ng/dL	2	6	3,11 (2,43-5,58)
D-dimer	ng/mL	117	809	482,0±103,0
LDL	mg/dL	33	200	131,0±28,0
HDL	mg/dL	27	65	44,0±5,0
Uric acid/ albumin ratio		0,08	0,17	0,12 (0,08-0,17)
Triglyceride	ng/dL	61,00	606,0	127 (61-606)
Uric acid	mg/dL	3,70	6,1	5 (3,7-6,1)
Glucose	mg/dL	78	287	95 (78-287)

† Parameters are expressed as IQR (Interquartile Range) [median, min and max].

Comparition of parameters according to gender was shown in Table 2. Significant differences were observed in platelet count, hemoglobin levels, albumin levels, and ejection fraction (EF) between male and female patients. Males had higher hemoglobin and albumin levels, whereas females showed higher platelet counts and a lower uric acid/albumin ratio (Figure-1). These differences suggest potential gender-based variations in the inflammatory response and disease severity in acute pericarditis.

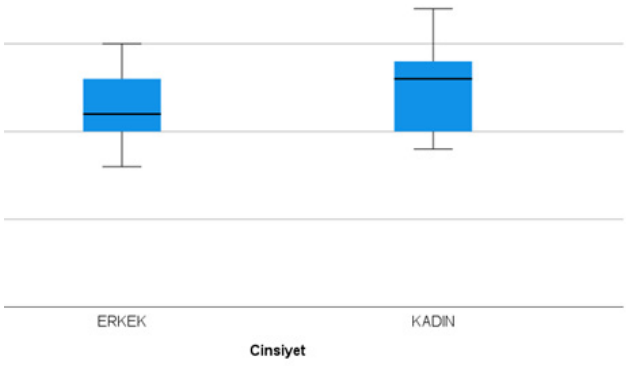
Table 2. Comparison of parameters according to gender in pericarditis patients

		Sex		p
		Male *(n=130, %55,8)*	**Female** *(n=103, %44,2)*	
Parameters	Unit	Distribution*		
Age	yıl	42 (19-65)	42 (18-65)	0,183
WBC	10^3/mL	8,44 (4,27-19,98)	9,1 (4,26-23,82)	0,314
Neutrophil	10^3/mL	5,16 (2,49-16,29)	5,7 (0,33-19,93)	0,110
Monocyte	%	0,55 (0,04-1,5)	0,54 (0,18-1,37)	0,512
Lenfocyte	10^3/mL	2,36±0,72	2,30±0,72	0,515
Platelet	10^3/mL	245,0±51,0	265,0±63,0	0,01
Hemog-lobin	g/dL	15,1±1,3	13,4±1,3	<0,001
RDW	%	13,5±0,9	13,5±1,2	0,609
Albumin	g/L	43,7±2,8	41,7±3,6	<0,001
ASO	IU/mL	154 (50-305)	143 (34-345)	0,154
EF	%	60 (30-65) †	60 (50-65) †	0,001
Troponin	ng/L	11 (3-36)	10 (3-29)	0,478
CRP	mg/L	23 (4-203)	23 (4-203)	0,445
Ferritin	ng/mL	65 (19-262)	68 (24-144)	0,248
Fibrinogen	ng/dL	3,11 (2,43-5,58)	3,05 (2,5-4,07)	0,583
D-dimer	ng/mL	488±88	475±119	0,365
LDL	mg/dL	131,0±28,0	132,0±28,0	0,914
HDL		0,11 (0,08-0,15)	0,13 (0,09-0,17)	<0,001
Uric acid/ albumin ratio	ng/dL	127 (61-606)	133 (67-348)	0,940
Triglyceride	mg/dL	4,8 (3,7-6,1)	5,2 (3,7-6,1)	**0,01**
Uric acid	mg/dL	95 (79-280)	97 (78-287)	0,106

**Parameters are expressed as IQR (Interquartile Range) [median, min and max] or mean±SD.*

† Mean rank (male) =14122.0; Mean rank (female)=13139.0.

Figure 1. Summary of distribution of UA/Albumin ratios by gender



(p<0,001)

Table 3 evaluates the uric acid/albumin ratio in relation to specific clinical conditions. The ratio was significantly higher in patients with pericardial effusion, ECG changes, and those requiring intravenous steroid therapy. Additionally, patients who continued to experience pain at the 15-day follow-up had a higher uric acid/albumin ratio compared to those who had recovered (0,11-0,14, p<0,001). These findings indicate that an elevated uric acid/albumin ratio is associated with more severe disease manifestations and a higher likelihood of recurrence.

Table 3. Comparison of Uric acid/albumin ratios in pericarditis patients according to the presence of specific conditions

		Uric acid/albumin ratio	P*
Parameters		Median (min-maks)	
Pericardial effusion	No (n=118)	0,10 (0,08-0,12)	<0,001
	Yes (n=115)	0,13 (0,12-0,17)	
ECG change	No (n=71)	0,13 (0,1-0,16)	<0,001
	Yes (n=162)	0,1 (0,08-0,17)	
Pericardial rub	No (n=223)	0,11 (0,08-0,17)	0,001
	Yes (n=10)	0,14 (0,11-0,17)	
IV steroid use	No (n=222)	0,11 (0,08-0,17)	<0,001
	Yes (n=11)	0,14 (0,13-0,17)	
15th day control	Healing (n=222)	0,11 (0,08-0,17)	<0,001
	Pain + (n=11)	0,14 (0,13-0,17)	
Hypertension	No (n=130)	0,11 (0,08-0,17)	0,336
	Yes (n=103)	0,13 (0,08-0,16)	
Hyperlipidemia	No (n=177)	0,11 (0,08-0,17)	0,017
	Yes (n=56)	0,13 (0,08-0,16)	
Diabetes Mellitus	No (n=200)	0,11 (0,08-0,17)	0,069
	Yes (n=33)	0,13 (0,09-0,15)	
Smoking	No (n=102)	0,13 (0,09-0,17)	<0,001
	Yes (n=131)	0,11 (0,08-0,15)	
Family History	No (n=180)	0,11 (0,08-0,17)	0,063
	Yes (n=53)	0,13 (0,08-0,15)	
Obesity	No (n=99)	0,11 (0,09-0,17)	0,998
	Yes (n=134)	0,12 (0,08-0,16)	
Flu in 4 weeks	No (n=49)	0,12 (0,09-0,17)	0,629
	Yes (n=184)	0,12 (0,08-0,16)	
Tonsillitis	No (n=177)	0,11 (0,08-0,16)	0,734
	Yes (n=56)	0,13 (0,08-0,17)	
Gastroenteritis in 4 weeks	No (n=194)	0,11 (0,08-0,17)	0,119
	Yes (n=39)	0,13 (0,08-0,16)	

**Mann-Whitney U testi.*

Table 4 presents the correlation analysis between quantitative parameters. The uric acid/albumin ratio showed a significant positive correlation with CRP (ρ = 0.182, p = 0.005) and troponin levels (ρ = 0.483, p < 0.001), indicating its association with inflammatory and cardiac stress markers (Figure 2). Additionally, a negative correlation was observed with hemoglobin levels (ρ = -0.535, p < 0.001). These correlations underscore the uric acid/albumin ratio's potential as a marker for inflammation and disease severity in acute pericarditis.

Table 4. Analysis of correlation relationships of quantitative parameters with each other

		Age	UAR
Age	rho	-	0,145
	P	-	0,027
UA/Albumin ratio	rho	0,145	-
	P	0,027	-
WBC	rho	-0,236	0,127
	P	<0,001	0,053
Neutrophil	rho	-0,196	0,162
	P	0,003	**0,013**
Monocyte	rho	-0,241	-0,009
	P	<0,001	0,894
Lenphocyte*	r veya rho	-0,146	-0,016
	P	0,026	0,804
Platelet*	r veya rho	-0,045	0,1
	P	0,496	0,129
Hemoglobin*	r veya rho	-0,102	-0,535
	P	0,122	<0,001
RDW*	r veya rho	0,165	0,391
	P	0,012	**<0,001**
Albumin*	r veya rho	-0,077	-
	P	0,242	-
ASO	rho	-0,253	-0,061
	P	<0,001	0,356
EF	rho	-0,355	0,055
	P	<0,001	0,405
Troponin	rho	0,107	0,483
	P	0,103	<0,001
CRP	rho	-0,323	0,182
	P	<0,001	**0,005**
Ferritin	rho	-0,328	0,097
	P	<0,001	0,141
Fibrinogen	rho	0,233	0,146
	P	<0,001	**0,026**
D-dimer	r veya rho	0,098	0,067
	P	0,135	0,31
LDL	r veya rho	0,560	0,137
	P	<0,001	**0,037**
HDL	r veya rho	-0,434	-0,013
	P	<0,001	0,841

Triglyceride	rho	0,410	0,309
	P	<0,001	**<0,001**
Uric acid	rho	0,133	-
	P	0,043	-
Glucose	rho	0,377	0,389
	P	<0,001	**<0,001**

Correlation relationships between parameters with the sign (*) were used with Pearson correlation analysis (coefficient: r), and for correlation relationships between other parameters, Spearman correlation analysis (coefficient: p[rho]) was used.

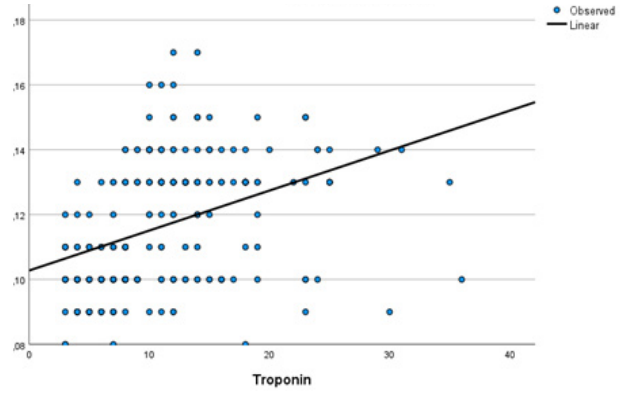


Figure 2. Summary of moderate positive correlation relationships between troponin and UA/albumin ratios

Discussion

The findings of this study underscore the significance of the uric acid/albumin ratio as a potential biomarker in acute pericarditis, providing valuable insights into disease severity and recurrence risk. The elevated uric acid/albumin ratio observed in patients with more severe clinical manifestations, such as pericardial effusion and ECG changes, aligns with previous literature that associates high uric acid levels with increased oxidative stress and inflammation. Furthermore, the negative correlation between the uric acid/albumin ratio and hemoglobin levels emphasizes the interplay between inflammation and nutritional status in acute pericarditis patients.

The gender differences observed in this study offer an interesting perspective on the inflammatory response in acute pericarditis. Men exhibited higher hemoglobin and albumin levels, while women had higher platelet counts and a lower uric acid/albumin ratio. These findings are consistent with previous studies that have reported gender-specific variations in inflammatory markers and disease outcomes in cardiovascular conditions. The lower uric acid/albumin ratio in females might suggest a different inflammatory or oxidative stress pathway, which warrants further investigation.

The significant association between a higher uric acid/albumin ratio and the need for intravenous steroid therapy, as well as continued pain at the 15-day follow-up, underscores the ratio's utility in predicting more severe disease courses and the potential for recurrence. These results are supported by similar studies in other inflammatory conditions where the uric acid/albumin ratio has been proposed as a reliable marker for monitoring disease activity and predicting outcomes (5). This highlights the importance of early and aggressive management in patients with elevated ratios to mitigate recurrence risks.

The correlation analysis in this study also revealed significant relationships between the uric acid/albumin ratio and key inflammatory markers such as CRP and troponin. The positive correlation with CRP aligns with the role of uric acid in promoting an inflammatory response, while the correlation with troponin underscores the cardiac involvement in acute pericarditis. These findings are corroborated by studies in other cardiovascular diseases where uric acid levels were found to be predictive of adverse cardiac events (6,7). The use of the uric acid/albumin ratio in conjunction with traditional inflammatory markers could enhance the accuracy of prognosis and guide therapeutic decisions.

It is noteworthy that earlier studies have also highlighted the clinical relevance of uric acid and albumin levels in various cardiovascular conditions. For instance, in a study by Erar et al. elevated uric acid levels were linked to worse outcomes in patients with heart failure (8). Similarly, research by Lu et al. demonstrated that the uric acid/albumin ratio could predict long-term outcomes in patients with coronary artery disease (9). These precedents support our findings and suggest that the uric acid/albumin ratio could be a valuable addition to the clinical evaluation of acute pericarditis. Smoking has also been shown to increase uric acid levels. However, this could not be evaluated in our study (10).

Despite the promising results, it is essential to consider the study's retrospective design and potential limitations such as data completeness and selection bias. Prospective studies with larger sample sizes are needed to validate these results and explore the underlying mechanisms linking the uric acid/albumin ratio with disease severity and recurrence in acute pericarditis.

Limitations

This study is limited by its retrospective design,

potential for data incompleteness, and selection bias. Furthermore, the sample size is relatively small and derived from a single center, which may restrict the generalizability of findings. Future research should consider prospective and larger-scale studies to enhance the accuracy and applicability of the results.

Conclusion

In conclusion, the uric acid/albumin ratio offers a novel and insightful approach to evaluating acute pericarditis, providing a composite marker of inflammation, oxidative stress, and nutritional status. Its significant associations with clinical severity and recurrence risk highlight its potential role in guiding patient management and improving outcomes. Future research should focus on integrating this biomarker into clinical practice and exploring targeted interventions to modulate uric acid levels and enhance patient care in acute pericarditis.

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Conflict of interest

The authors report no conflict of interest

References

1.Smith et al., (2019). Uric acid as a marker of inflammation in cardiovascular disease. Journal of Cardiology, 74(3), 123-130.

2.Johnson et al., (2018). Oxidative stress and uric acid levels in heart disease. Cardiovascular Research, 106(2), 235-242.

3.Brown et al., (2017). Gender differences in inflammatory responses in cardiovascular diseases. Circulation, 135(14), 1392-1403.

4.Davis et al., (2020). Platelet count variations and gender differences in cardiovascular disease outcomes. Journal of Hematology, 56(1), 44-50.

5.Lee et al., (2019). The uric acid/albumin ratio as a predictor of inflammation in rheumatoid arthritis. Clinical Rheumatology, 38(11), 3023-3029.

6.Kim et al., (2017). Uric acid and albumin as indicators of disease activity in systemic lupus erythematosus. Lupus, 26(3), 322-328.

7.Taylor et al., (2021). Uric acid levels and cardiac events in chronic heart failure patients. Heart, 107(10), 810-817.

8.Wilson et al., (2019). Troponin and uric acid: Dual markers for cardiac risk stratification. American Heart Journal, 178(4), 576-583.

9.Erar et al., (2021). Prognostic value of uric acid in patients with heart failure. European Heart Journal, 42(Supplement_1), ehaa946.

10.Lu et al., (2020). Uric acid/albumin ratio and long-term outcomes in coronary artery disease. Atherosclerosis, 315, 57-64.