THE INFLAMMATORY STATUS OF PATIENTS ON HEMODIALYSIS ACCORDING TO THE RELATION BETWEEN POSITIVE ACUTE PHASE REACTANT FERRITIN LEVEL AND NEGATIVE ACUTE PHASE REACTANT ALBUMIN LEVEL

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ABSTRACT:

Introduction: Chronic inflammation is common among hemodialysis patients and it can have a significant impact on their general health and quality of life. These patients' inflammatory condition can be better understood by using inflammatory indicators such as acute phase reactants (Ferritin, as a positive acute phase reactant, and albumin, as a negative acute phase reactant) which have been identified as two of the most important markers of inflammation. The purpose of this study is to investigate the inflammatory status of patients on hemodialysis according to the balance between ferritin and albumin levels,

Objective: The main objective of this study is to ascertain the correlation between ferritin and albumin levels in hemodialysis patients and assess how this correlation reflects the inflammatory status of these individuals. If there is an imbalance between these acute phase reactants, we seek to understand if that may be used as a predictive marker for inflammation in this patient population.

Methodology: A retrospective study using lab data results obtained over a period of one month from Hakeem Health System used at King Hussein Medical Center one of The Jordanian Royal Medical Services (JRMS) Hospitals for 42 hemodialysis Patients.

Simple statistical analysis will be carried out to investigate the relationships between patients' ferritin and albumin levels and their inflammatory status.

KEYWORDS: Albumin, Ferritin, Hemodialysis, Inflammatory Status, Chronic Inflammation, Hemodialysis Patients.

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1. INTRODUCTION:

Patients receiving hemodialysis are plagued by chronic inflammation, a persistent and frequently undetected health issue that adversely affects their general health and quality of life. Hemodialysis is a life-saving procedure for people with chronic renal disease; however it has the unfavorable side effect of frequently causing inflammation. It is consequently crucial to monitor inflammatory indicators in these patients [1,2].

Albumin (Alb), a crucial protein in the blood that regulates blood volume and composition, is one important participant in this context. Albumin levels tend to decrease during inflammation, which may be a sign of the body's continuous inflammatory response [3,4].

Ferritin levels can also be impacted by inflammation, ferritin a protein which is essential for the body's storage of iron, is another important biomarker. As the body's processes for managing iron are frequently compromised during times of chronic inflammation[5,6].

This shows significant promise to use albumin and ferritin together as possible biomarkers to evaluate the degree of inflammation in hemodialysis patients. But a thorough examination is required due to the ambiguity surrounding their functions and interactions in this situation.

In this study, we seek to learn more about the connection between albumin and ferritin levels in hemodialysis patients. Our goal is to comprehend the interactions between these two biomarkers in the complex setting of chronic inflammation. By doing this, we hope to clarify their value as accurate markers of inflammation in this particular patient population.

We are using a multidisciplinary strategy that combines clinical evaluations, lab results, and statistical modeling to achieve our goal. We collected data from a varied group of hemodialysis patients and by carefully examining these results, we want to unravel the complex relationships between albumin and ferritin and how they relate to inflammation.

2. METHOD:

This is a retrospective study using lab results data obtained over a period of one month from Hakeem Health System used at King Hussein Medical Center one of The Jordanian Royal Medical Services (JRMS) Hospitals for 42 hemodialysis Patients exhibiting the clinical presentation of the Inflammatory Status.

Alb and ferritin levels were obtained with the normal ranges are 35 to 50 g/L and 20 to 300 ng/mL, respectively. Using SPSS 26.0 software descriptive statistics were obtained in our research to provide a thorough overview of the dataset and provide information on the distribution of values across the patient group, including the typical Alb and ferritin levels and the ranges associated with each alongside other descriptive analysis result (Table 1).

Table 1: The levels of albumin and ferritin among study participants

Group			Statistic	Std. Error
Alb	Mean		36.5714	.68850
	95% Confidence Interval for Mean	Lower Bound	35.1810	
		Upper Bound	37.9619	
	5% Trimmed Mean		36.5820	
	Median		36.5000	
	Variance		19.909	
	Std. Deviation		4.46200	
	Minimum		28.00	
	Maximum		45.00	
	Range		17.00	
	Interquartile Range		7.00	
	Skewness		-.013	.365
	Kurtosis		-.842	.717
Ferritin	Mean		644.6190	178.93124
	95% Confidence Interval for Mean	Lower Bound	283.2601	
		Upper Bound	1005.9780	
	5% Trimmed Mean		474.7698	
	Median		453.5000	

Variance	1344688.290	
Std. Deviation	1159.60696	
Minimum	5.00	
Maximum	7698.00	
Range	7693.00	
Interquartile Range	439.25	
Skewness	5.740	.365
Kurtosis	35.439	.717

We employed a straightforward t test analysis to examine the relationship between Alb and ferritin levels and their possible association with inflammation (Table 2 and 3).

Table 2: Levels of albumin and ferritin

	Group	N	Mean	Std. Deviation	Std. Error Mean
Value	Alb	42	36.5714	4.46200	.68850
	Ferritin	42	644.6190	1159.60696	178.93124

Table 3: Independent Samples Test of albumin and ferritin

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Value	Equal variances assumed	8.133	.005	-3.398	82	.001	-608.04762	178.93256	-964.00149	-252.09375
	Equal variances not assumed			-3.398	41.001	.002	-608.04762	178.93256	-969.40893	-246.68630

3. RESULTS:

Our analysis showed that this population of hemodialysis patients had an average of Alb levels around 36.57 g/L which is well within the normal range, whereas the average ferritin levels were typically around 644.62 ng/mL, which is above the top limit of the normal range. Importantly, with a p-value of 0.002 (p < 0.05), our independent t test analysis showed a statistically significant negative relationship between Alb and ferritin levels. This indicates that ferritin levels tended to rise when Alb levels dropped, indicating a strong link between the inflammatory status and these biomarkers (albumin, as negative acute phase reactant, and ferritin, as positive acute phase reactant). Which demonstrates the potential utility of Alb and ferritin, as markers of inflammation in hemodialysis patients.

4. DISCUSSION:

Our research shows that the levels of Alb and ferritin in hemodialysis patients have a complicated relationship. A negative correlation, or the tendency for ferritin levels to rise as Alb levels fall, characterizes this complexity. It's significant that this association persists even when Alb levels are within the typical reference range. Thosefindings emphasize the importance of those biomarkers interplay in the setting of hemodialysis [7,8,9].

This only stresses on the importanceof this negative relationship and implies that alterations in these biomarkers may act as indications of the presence of inflammation. In other words, a decrease in Alb levels and an increase in ferritin levels may indicate the presence of inflammation therefor in order to assess the health status of hemodialysis

patients[1]; healthcare providers can use this dynamic interaction as a useful tool. The results of our study point to the possibility of routine ferritin and Alb level monitoring in clinical practice for the treatment of hemodialysis patients, assessing medical experts to spot inflammation early on in the course of treatment with the use of this monitoring, with the goal in mind to improve the overall care and lifequality for this specific patient population.

5. CONCLUSION:

The findings of our study suggests the consideration of routine monitoring of Alb and ferritin levels in clinical practice for determining the status of inflammation in hemodialysis patients, albumin and ferritin levels are useful and accessible markers. Alb and ferritin have an inverse association, which highlights their potential as early markers of inflammation in this patient cohort.

This work adds depth to the evaluation of the

inflammatory status in hemodialysis patients by shedding light on the interaction between Alb and ferritin levels. Healthcare providers can identify those at risk of inflammation and better personalize treatment plans by keeping an eye on these biomarkers[8,9]. We advise further investigation into these findings with larger patient cohorts, taking into account long-term effects in the setting of hemodialysis.

Limitations of the Study: The small sample size is one of the drawbacks of our study,future studies with larger populations of patients are needed to support and confirm our findings. Prospective research should also be explored to assess the indicative accuracy of Alb and ferritin levels in predicting long-term inflammatory outcomes for hemodialysis patients.

6. REFERENCES:

1. Heidari B. C-reactive protein and other markers of inflammation in hemodialysis patients. Caspian J Intern Med. 2013;4(1):611–616
2. Ikizler TA, Wingard RL, Harvell J, Shyr Y, Hakim RM. Association of Morbidity With Markers of Nutrition and Inflammation in Chronic Hemodialysis Patients: A Prospective Study. Kidney Int (1999) 55:1945–51. doi: 10.1046/j.1523-1755.1999.00410.x
3. Levitt DG, Levitt MD. Human serum albumin homeostasis: a new look at the roles of synthesis, catabolism, renal and gastrointestinal excretion, and the clinical value of serum albumin measurements. International journal of general medicine. 2016;9:229- 255
4. Gabay C, Kushner I. Acute-phase proteins and other systemic responses to inflammation. The New England journal of medicine. 1999;340(6):448-454.
5. Konijn, A. M., Carmel, N., Levy, R. and Hershko, C. 1981. Ferritin synthesis in inflammation. II. Mechanism of increased ferritin synthesis. Br. J. Haematol. 49:361.
6. Suchdev, P.S.; Williams, A.M.; Mei, Z.; Flores-Ayala, R.; Pasricha, S.R.; Rogers, L.M.; Namaste, S.M. Assessment of iron status in settings of inflammation: Challenges and potential approaches. Am. J. Clin. Nutr. 2017, 106 (Suppl. 6), 1626S–1633S.
7. Gabay C., Kushner I. Acute-phase proteins and other systemic responses to inflammation. N. Engl. J. Med. 1999;340(6):448–454.
8. Shankar A, Sun L, Klein BE, Lee KE, Muntner P, Nieto FJ, et al. Markers of Inflammation Predict the Long-Term Risk of Developing Chronic Kidney Disease: A Population-Based Cohort Study. Kidney Int (2011) 80:1231–8. doi: 10.1038/ki.2011.283
9. Stenvinkel P, Chertow GM, Devarajan P, Levin A, Andreoli SP, Bangalore S, et al. Chronic Inflammation in Chronic Kidney Disease Progression: Role of Nrf2. Kidney Int Rep (2021) 6:1775–87. doi: 10.1016/j.ekir.2021.04.023