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Comparative study between LDH, ferritin, and D-dimer in Iraqi patients with COVID-19

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ABSTRACT

Background: Viruses are obligate intracellular pathogens that depend entirely on host-cell machinery for replication. In SARS-CoV-2 infection, elevated biomarkers like D-dimer, ferritin, lactate dehydrogenase (LDH), and other inflammatory mediators are strongly associated with increased disease severity and poorer prognosis. These markers enable early risk stratification in COVID-19 patients. *Aim:* This study evaluates LDH, ferritin, and D-dimer levels as prognostic biomarkers for COVID-19 severity in Iraqi patients. *Methodology*: This research was designed as a case-control study and conducted at Al-Karkh General Hospital. Venous blood samples were collected to assess the biochemical levels of D-dimer, Ferritin, and LDH. *Results*: A higher infection rate was observed in males compared to females, with the 40–50 age group most affected. Significant positive correlations among LDH, Ferritin, and D-dimer levels. *Conclusion*: Elevated levels of LDH, ferritin, and D-dimer are closely associated with COVID-19 severity and may serve as reliable biomarkers for disease progression. This study demonstrates a significant positive correlation between these parameters in Iraqi patients.

KEYWORDS
COVID-19, LDH, D-dimer, ferritin, biomarkers

1. INTRODUCTION

SARS-CoV-2 is a highly pathogenic virus responsible for COVID-19, characterized by severerespiratory complications [1]. Elevated biomarkers such as D-dimer, ferritin, and lactate dehydrogenase (LDH) are critical indicators of disease severity. D-dimer, a fibrin degradation product, reflects thromboembolic risk. Ferritin is a shell protein that has a critical role in iron metabolism [2], and patients with moderate to severe COVID-19 exhibit significantly increased ferritin levels, while LDH a cellular enzyme indicates tissue damage [3]. Viral inflammation and endothelial injury jointly drive coagulopathy by triggering overlapping mechanisms of tissue damage and systemic inflammation [4]. This study investigates the correlation between LDH, ferritin, and D-dimer serum levels and COVID-19 severity in Iraqi patients.

2. METHODOLOGY

2.1. Study design

This study employed a case-control design and was conducted at Al-Karkh General Hospital, which is located in Baghdad, Iraq, from August to October 2023.

2.2. Data collection methods

Blood samples were collected from 50 patients group using standard phlebotomy techniques and also 50 sample from the control group.

2.3. Inclusion criteria

Patients with confirmed COVID-19 infection, as determined by standard diagnostic protocols, and a control group comprising 50 clinically healthy volunteers.

2.4. Exclusion criteria

Patients with chronic comorbidities (e.g., malignancies, renal impairment, autoimmune disorders) or those receiving agents known to alter D-dimer, ferritin, or LDH levels.

2.5. Ethical considerations

This study was approved by the Institutional Review Board of Al-Karkh General Hospital. Written informed consent was obtained from all participants, and all procedures complied with the Declaration of Helsinki.

2.6. Statistical analysis

The data analysis was done using Excel 2016 and the SPSS programme, version 20.0. To compare the groups' differences, a t-test was used. It was deemed significant when the *p*-value was less than 0.05.

3. RESULTS

The research findings are displayed in Table 1. Among COVID-19 cases, individuals aged 30–50, particularly those 40–50, showed the highest infection rates in both patients and controls. Gender distribution revealed a slight male predominance (52% males and 48% females) as shown in Table 1C. Patients exhibited significantly elevated ferritin, D-dimer, and LDH levels compared to controls (*p*=0.0001, Tables 1A and 1B).

Table 1. Research findings.

A. Levels of ferritin, D-dimer, and LDH			
Parameters	Mean±S.E		*p*-value
	Control N.O=50	Patients N.O=50	
Ferritin(мg/L)	104.17±15.44	430.46±32.20	0.0001
D-dimer (мgFEU/mL)	±0.020.25	2.77±0.42	0.0001
LDH(U/L)	±5.31191.76	472.63±42.68	0.0001

B. Correlations among the parameters, analyzed using Pearson's correlation coefficient				
Parameters		Ferritin	D-dimer	LDH
Ferritin	R	1	0.104	0.387**
	p-value		0.472	0.005
D-dimer	R	0.104	1	0.308*
	p-value	0.472		0.030
LDH	R	0.387**	0.308*	1
	p-value	0.005	0.030	

C. Demographic characteristics			
	Category	Ratio of patients	Ratio of controls
1-Age	30 - 40	46%	44%
	40-50	54%	56%
2-Gender	male	52%	62%
	female	48%	38%

4. DISCUSSION

Consistent with previous reports identifying the 20–60 age range as most affected [5]. Aligning with studies linking male sex to higher COVID-19 mortality due to biological and behavioral factors [6] supporting their roles as markers of inflammation, coagulopathy, and tissue damage, and confirming their association with disease severity and progression [7,8,9].

5. CONCLUSION

In Iraqi COVID-19 patients, LDH, ferritin, and D-dimer serum levels are markedly elevated relative to healthy controls and display strong positive correlations. These results substantiate the joint utility of these biomarkers for evaluating disease severity and monitoring progression. Regular measurement may enhance early risk stratification and inform clinical decision-making in comparable cohorts.

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