

Prognostic Significance of Lactate Dehydrogenase for in Hospital Mortality in Intensive Care Units with Covid-19 in Tertiary Care Level Hospital in Northern Pakistan

HAROON UR RASHEED¹, HAYAT MUHAMMAD KHAN², MOHSIN SHAFI³, NAEEMULLAH⁴, SAEED AHMAD⁵, ROMANA AYUB⁶, ARIF IQBAL⁷, MUHAMMAD ISHTIAQ⁸

¹Department of Pathology, Saidu Medical College Swat, Pakistan

²Department of Community Medicine, Khyber Medical College Peshawar, Pakistan

³Department of Pathology, Khyber Medical College Peshawar, Pakistan

⁴Department of Community Medicine, Saidu Medical College Swat, Pakistan

⁵Department of Community Medicine, Khyber Medical College Peshawar, Pakistan

⁶Department of Community Medicine, Khyber Medical College Peshawar, Pakistan

⁷Specialist Family Medicine, Hallonbergen Vardcentral, Stockholm Sweden

⁸Department of Community Medicine, Nowshera Medical College, Nowshera, Pakistan

Correspondence to: Hayat Muhammad Khan, Email: hayatk786@yahoo.com, Cell: 03339132404

ABSTRACT

Background: Lactate dehydrogenase was found as the prognostic indicator of poor outcomes and severity of COVID-19. In many studies, COVID-19 patients with different LDH showed relationship with disease progression and mortality.

Objectives: To determine prognostic significance of Lactate dehydrogenase (LDH) in critically ill patients with Covid-19 infection.

Material & Methods: A retrospective descriptive cross sectional study was conducted among the Covid-19 ICU admitted patients of Khyber Teaching Hospital Peshawar. Moreover, data regarding n=233 COVID-19 serious infection, confirmed on Polymerase chain reaction (PCR), was analyzed. Prognostic significance of LDH was determined by using SPSS software.

Results: Compared to the survival group, LDH levels among the Covid-19 mortality individuals were significantly higher. A cutoff value of 330 U/L was set for the test results determined spectro-photometrically by chemistry analyzer. Chi-Square test value was 17.23 with P value of 0.004.

Conclusion: LDH is one of the cheap and significant prognostic parameter and is beneficial in forecasting hospital death in severely ill COVID-19 patients; may assist doctors focus on saving the lives of their highest-risk patients and apply new measures to lower mortality rates..

Keywords: Lactate Dehydrogenase, Prognostic Value, Mortality, Intense Care Unit, COVID-19

INTRODUCTION

Globally, the Corona Virus Disease 2019, spread over more than 200 countries and caused millions of death¹. Globally SARS-CoV-2 infected 172.9 million (172910967) persons as of June 2021, resulting in nearly 3.7 million fatalities (3717333)².

Multiple organs express the cytoplasmic enzyme lactate dehydrogenase (LDH)³. Lactate dehydrogenase (LDH) converts pyruvate (the end product of glycolysis) to lactate in the absence of oxygen. Fourth, there are two subunits and five isozymes that make up LDH. Specific organs have a particular type of isozyme: Cardiomyocytes have LDH1, lung tissue has LDH 3 and hepatocytes have LDH 5⁵. High LDH was evaluated in various conditions like hypoxia, tissue injury, necrosis, malignancies, hemolysis etc⁶. Also LDH was correlated with mortality in viral community acquired pneumonia patients⁷. Acute pancreatitis and Acute heart failure are two examples of multi-organ dysfunctions in which LDH has been shown to be a reliable prognostic indicator.⁸

The high C reactive protein (CRP) was reported in SARS in 2002 outbreak which was a cause of respiratory abnormalities and death of these patients⁹. Keeping in view of those observations, several studies were performed in COVID-19 cases hypothesizing CRP to be one of possible biomarkers linked with death of Covid infected patients. However, observations of these reports are contradictory till date.

COVID-19 could affect and damage multiple organ including liver, heart and kidney^{10, 11}. Some studies have linked elevated LDH to increased mortality in COVID-19-infected patients. Death occurred primarily among critically sick covid patients, although in such research, individuals with varying COVID-19 severity were selected and evaluated, which may obscure the true association between illness progression and hospital mortality with LDH.^{7, 12}

Till date limited studies have been conducted on determining relationship between different chemical indicators and outcome of the COVID-19. Therefore, in this retrospective study, we determined correlation of raised LDH and prognosis of COVID-19 in critically ill patients admitted in ICUs.

MATERIAL & METHODS

It was a retrospective descriptive cross sectional study conducted among severe COVID-19 patients admitted to ICUs of Khyber Teaching Hospital Peshawar, Khyber Pakhtunkhwa, Pakistan between January and May, 2021. The data regarding n=233 Covid-19 patients, confirmed on PCR, was analyzed. LDH was evaluated from plasma of COVID-19 patients spectrophotometrically by Roch Cobas Autochemistry analyzer. Moreover, Covid-19 patients with any one of the following signs were included in the study i.e. Respiratory Rate \geq 30 times per min, oxygen saturations $<$ 93%, patients having comorbidities like myocardial infarction, liver disease, chronic renal disease negative Covid-19 PCR or de-compensated heart failure were excluded from the study. Data on demography and biochemical investigations was collected and analyzed on SPSS version 20.

RESULTS

In this study, total n=233 ICU admitted COVID-19 patients were assessed for LDH levels. Moreover, the continuous variables were presented in terms of means and \pm standard deviation, and categorical variables were presented in form of percentages. A cutoff value of 330 U/L for LDH was used for Chi-square analysis.

Table 1: Gender wise Prognosis

		Prognosis		Total	Chi-Square test	P value
		Recovery	Death			
Gender	Male	52	17.23	132 (56.7 %)	0.498	0.481
	Female	44	56	100 (42.9 %)		
Total		96	136	232		

Table 2: LDH Counts

Mean	584.73	Total Patients
Std. Deviation	309.028	233
Minimum	180	
Maximum	2385	

Table 3:

		Prognosis		Total	Chi-Square test	P value
		Recovery	Death			
LDH	>330 U/L	62	119 (66 %)	181	17.23	0.004
	<330 U/L	34	17 (33 %)	51		
Total		96	136	232		

DISCUSSION

The mortality among the serious COVID-19 ICU admitted patients was high i.e. 66% in COVID-19 patients with raised level of LDH; as was found in an international study showing 40% mortality rate¹³. Several research studies so far in this pandemic show high LDH levels in Covid patients^{6, 14, 15}. In this study, LDH association was established in hospital ICU covid-19 patients. LDH level of 330 U/L was used as a cutoff point between raised and normal LDH level.

From our study results, moreover, there was a significant association of raised LDH level and poor prognosis. It was established from this study that LDH >330 U/L increases mortality rate in critically ill COVID-19 ICU patients. Our study results are compatible with another study which demonstrated increase LDH levels as independent risk parameter for exacerbation in severe COVID-19 patients⁴. Poggiali et al. found LDH association with respiratory function and a predictor of failure of respiration in patients of COVID-19⁶. Another study concluded that LDH could be a powerful predictor for initial stage of lung injury in critically ill COVID-19 patients⁷. However, LDH association has not been particularly evaluated in critically ill covid-19 ICU patients among survivor and dead patients. Therefore, LDH >330 U/L could be used as an alarming sign for doctors concerned to prepare for more aggressive managements and prioritize such COVID-19 patients. The same recommendations were also mentioned in another international study¹⁷. As also demonstrated by meta-analysis, prognosis was not significantly influenced by gender and age¹⁶. We excluded patients with liver diseases from our study as raised LDH level can also be a sequelae of liver diseases as highlighted in a study¹⁸. Studying the predictive abilities of LDH and CRP for severely ill COVID-19 patients, the former was found to be more reliable than the latter⁶. Based on our results, we can confidently assess the correlation between LDH and clinical deterioration and hospital mortality in COVID-19 patients who were admitted for treatment.

CONCLUSION

From our results, it was concluded that LDH is an excellent prognostic biomarker having high accuracy in predicting in-hospital ICU mortality in critical COVID-19 admitted patients. Moreover, low cost, easily available parameter will play a pivotal role in the management of serious Covid-19 admitted ICU patients and thus will assisting in appropriate management and lowering the death rate for Covid-19 admitted patients.

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