Original Article

Lactate Dehydrogenase as a Predictor of Disease Severity in Coronavirus Disease (Covid-19)

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Abstract

Objective: To find out association between serum lactate dehydrogenase levels and coronavirus disease severity.

Methods: It was a cross sectional study done at mayo hospital Lahore for six months.100 patients of age 15-80 years of either gender having COVID-19 PCR positive were included. Serum LDH levels were sent at the time of admission, day 7 & day 14 to the pathology laboratory KEMU.To assess clinical severity of coronavirus disease, all the enrolled patients were categorized as mild, moderate, severe & critical cases on the basis of oxygen/mechanical ventilation requirement .Data was analyzed using SPSS-26.

Results: A very strong positive correlation observed between serum LDH level a severity of corona virus disease i.e. r = 0.906, p-value < 0.00001. LDH showed Sensitivity 59.52%, Positive Predictive Value 30.12% and Diagnostic Accuracy 25%.

Conclusion: LDH is a strong predictor of COVID-19 disease severity. Thereforein future LDH can be used to see disease severity.

Key Words: Lactate Dehydrogenase, Predictor, Severity, COVID-19

Introduction

Coronavirus disease (COVID-19) outbreak was detected in China in December 2019, which affected 215 countries later on.[1] It has affected over 680 million individuals worldwide till date.[2] Initial data on the subject suggested that seafood marketwas the main reservoir of disease.[3]

The pathogen responsible for the disease was suspected to be from the family of enveloped, positive sense RNA viruses. There are a number of markers being studied like LDH that is an enzyme present in all body tissues.[4] There are several clinical features of the disease like fever, cough, flu, fatigue, sore throat. Almost 50% patients develop shortness of breath at the end of first weeksince the first day of illness which rapidly progresses to acute respiratory distress syndrome (ARDS) just one day after it. Most of the patients had mild disease and however 8–30% patients eventually end up in severe disease. The Severely ill patients had a 28-days mortality rate of over 60%.[5]

This high mortality and morbidity of the disease puts huge burden on the healthcare delivery system and infrastructure more than any other respiratory illness. Hence, it is very important to identify disease severity markers for disease course monitoring and intervention in order to achieve better clinical outcome. Several biomarkers are being studied in COVID-19. Lactate dehydrogenase (LDH) an enzyme biomarker has been associated with worse outcomes in viral infections patients hence its raised levels may be beneficial in covid-19 disease as well.[6-8]

Therefore this study was designed to correlate LDH & disease severity so that the disease mortality and morbidity can be reduced. This will help out in better disease outcome prediction of the patient & better utility of healthcare resources. Objective of this study was to find out association between serum lactate dehydrogenase levels and coronavirus disease severity.

Methods

This cross sectional study was carried out at corona dedicated wards of Mayo Hospital,Lahore from 16th August 2020 to 15th February 2021. A sample size of 100 patients

was calculated by non-probability purposive sampling. Patients of age 15-80 years of either gender having COVID-19 PCR positive were included. Patients below 15 and above 80 yearsage with prior acute or chronic comorbidities effecting LDH level such as liver disease, lung disease, anemia, muscular dystrophy and acute or chronicinfections were the major exclusions. Informed consent was taken from every patient before enrolment. Demographic details and clinical features of every patient were recorded in a predesigned proforma. Serum LDH levels were sent at the time of admission, day 7 & day 14 to the college pathology laboratory and were recorded in proforma in Units/L(Normal LDH=140-280U/L). Patients were then divided in mild, moderate, severe & critical cases on the basis of oxygen/mechanical ventilation requirement &were followed till the final outcome of covid19 i.e. hospitalization with or without oxygen requirement, ICU admission & mechanical ventilation, recovery with PCR -Ve or death of the patient. SPSS-26 was used to analyze the data. Mean ± standard deviation was used to depict quantitative variables like age, LDH. Similarly frequency and percentages were used to represent qualitative variables like gender and disease severity.

Results

The mean age of patients was 43.88 ± 12.74 years. Out of 100 cases, 50 (50%) males and 50 (50%) females, showing 1: 1 ratio. The major symptoms were fever (80%), followed by cough (50%), sore throat (50%), body aches (38%), shortness of breath (10%), flu (10%), myalgia (6%) and headache (4%). The mean LDH level of patients was 396.10 ± 168.30 IU. Out of 100 patients, 42 (42%) had normal LDH level while 58 (58%) had raised LDH level. Out of 100 patients, 17 (17%) had mild condition, 49 (49%) had moderate condition, 21 (21%) were severe and 13 (13%) were critical. (Table 1)
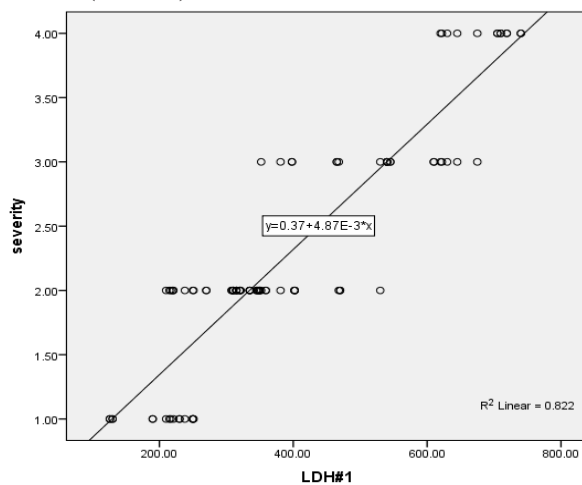

Fig 1: *Showing correlation between LDH level and severity of COVID-19 (Pearson' correlation coefficient*

value = 0.906, p-value < 0.00001)

A positive correlation was observed between LDH levels and severity of disease i.e. r = 0.906, p-value < 0.00001. (Fig 1)

For prediction of severity of disease, LDH showed Sensitivity 59.52%, Specificity 0.0%, Positive Predictive Value 30.12%, Negative Predictive Value 0.0% and Diagnostic Accuracy 25%. (Table 2)

Table 1: *Basic information of COVID-19 patients enrolled in the study*

CHARACTERISTICS	F (%), mean ± SD
n	100
Age (in years)	43.88 ± 12.74
Gender	
Male	50 (50%)
Female	50 (50%)
Symptoms	
Fever	80 (80%)
Cough	50 (50%)
Sore throat	50 (50%)
Body aches	38 (38%)
Shortness of breath	10 (10%)
Flu	10 (10%)
Myalgia	6 (6)
Headache	4 (4%)
Laboratory findings	
LDH level	396.10 ± 168.30
Normal (<333 IU)	42 (42%)
Raised (>333 IU)	58 (58%)
Severity of COVID-19	
Mild	17 (17%)
Moderate	49 (49%)
Severe	21 (21%)
Critical	13 (13%)

Table 2: *Accuracy of LDH level to predict severity of disease*

		LDH		Total
		Normal	**Raised**	
Severity	Mild	17	0	17
	Moderate	25	24	49
	Severe	0	21	21
	Critical	0	13	13
	Total	42	58	100

Sensitivity 59.52%, Specificity 0.0%, Positive Predictive Value 30.12%, Negative Predictive Value 0.0%, Accuracy 25%

Discussion

In this study we found that a positive correlation existed between LDH and disease severity (p=<0.00001). LDH showed Sensitivity 59.52%, Positive Predictive Value 30.12%and Diagnostic Accuracy 25%. This was supported by a number of studies.

Henry and colleagues showed that higher LDH levels were found to be associated with 6-fold increased severity of COVID-19[9]. Fialek B et.al. in their meta-analysis concluded that higher LDH levels were directly proportional to poor outcome of the disease. It further proved that LDH levels were statistically significantly lower in survivors group as compared to die ones.[10] Jelassi and his colleagues concluded that higher LDH levels resulted in complicated disease and higher oxygen requirement (p=0,034). As a result more antibiotics usage was reported in this group and hence end up in more deaths (p=0,049).[11]

Martha JW and colleagues showed similar results. Elevated LDH was related with 44% related to poor outcome and normal or low LDH was 11% related to poor outcome[12]. Another study Haung Y and colleagues concluded that LDH was an independent risk factor and predictor of mortality in patients of COVID-19.[13] In another study LDH levels were increased directly with increasing severity of COVID-19.[14] Another study by Wu and colleagues concluded that LDH is useful marker for risk stratification and early intervention.[15]

Conclusion

LDH is a strong predictor of COVID-19 disease severity. Therefore in future LDH can be used to see disease severity.

Conflict of Interest: None

Funding Source: None

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