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Evaluation of the relationship between lactate dehydrogenase level and clinical status of patients with COVID-19 in terms of disease severity in patients admitted to Shahid Sadoughi Hospital in Yazd

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Abstract

There are many evidences suggesting that the serum lactate dehydrogenase (LDH) levels reflect the extent of various pathophysiological processes. However, the current information about dynamic change of LDH in COVID-19 pneumonia has not been well investigated. This study aimed to evaluate the relationship between LDH level and clinical status of patients with COVID-19 in terms of disease severity in patients. This study included all COVID-19 patients admitted to the wards and ICU of Shahid Sadoughi Hospital in Yazd and the sampling method in this study is census. Patients' information will be extracted from their file and entered into a predefined checklist. This information was entered into SPSS.V21 software. Of 4346 patients whose LDH test is available, 2364 (54.4%) are male and 1982 (45.6%) are female. 487 (11.2%) of patients in intensive care unit and 3859 (88.8%) were hospitalized in other wards. The mean serum LDH level was significantly different between patients admitted to the intensive care unit and other wards of the hospital (p -value <0.001). Increased LDH serum levels were associated with poor prognosis in patients with COVID-19.

Keywords: COVID-19, LDH, Severity.

INTRODUCTION

COVID-19 is one of the most common diseases that is now spreading more slowly than before [1,2]. Studies have shown that the disease can cause symptoms such as fever, dry cough, shortness of breath and fatigue in infected patients [1,3]. Although most patients with COVID-19 have only mild symptoms, a significant proportion of patients become significantly worse, and organ failure often leads to death [4,5]. Effective biomarkers enable physicians to allow prudent allocation of resources based on classifying patient risk rate [6].

Lactate dehydrogenase (LDH) catalyzes the final stage of aerobic glycolysis, the conversion of pyruvate to lactate [7]. This enzyme is a suitable biomarker for predicting prognosis in patients with COVID-19 [8,9].

A variety of disorders can increase LDH levels, such as heart failure, infectious diseases, hypothyroidism and cancer [10]. Inflammatory responses in the mentioned subjects reflect nonspecific responses to hypoxia, tissue damage, and necrosis, indicating an association between infected cells, the immune system, and the inflammatory response [11]. The degree of tissue damage and inflammation is associated with increased LDH levels [12].

The present study intended to evaluate the relationship between LDH level and clinical status of patients with COVID-19 in terms of disease severity in patients.

MATERIALS AND METHODS

This cross-sectional study was performed to investigate the relationship between LDH serum levels and clinical status of patients with COVID-19 in terms of disease severity from March 2020-March 2021. The sampling method in this study was as census.

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This study was done after the agreement of the ethics committee of Shahid Sadoughi University of Medical Sciences of Yazd.

Patients admitted to the wards and intensive care unit (ICU) of Shahid Sadoughi Hospital whose COVID-19 disease was confirmed by PCR test and for whom lactate dehydrogenase levels were measured, included in the study.

Patients' information was extracted from their files and entered into a predetermined checklist.

This information included age, sex and levels of LDH, Cr, AST and ALT.

Finally, the data were entered into SPSS (version 21), by statistical examinations were analyzed. $p < 0.05$ was a significant level in all of statistical analyses.

RESULTS

Out of 4346 patients who had LDH blood test, 2364 (54.4%) were male and 1982 (45.6%) were female.

487 patients (11.2%) were admitted to the ICU and 3859 patients (88.8%) were admitted to other wards. The minimum age was under one year and the maximum was 110 years.

The mean serum level of LDH biomarker was 634.11 ± 382.57 .

There is a significant difference between the serum LDH levels mean in men and women (p -value <0.001) (Table 1).

Table 1: Serum LDH levels based on sex

Sex	Serum LDH level (mean \pm SD) U/L
Male	399.68 ± 661.36
Female	358.52 ± 601.62

Serum LDH level mean was significantly different between patients admitted to the ICU and other wards of the hospital (p -value <0.001) (Table 2).

Table 2: Mean of serum LDH level in patients admitted to wards and ICU

Hospitalization status	Serum LDH level (mean \pm SD) U/L
ICU	987.61 ± 638.34
Other wards	589.59 ± 309.59

Serum ALT level mean was significantly different between patients admitted to the ICU and other wards of the hospital (p -value <0.001) (Table 3).

Table 3: Mean of serum ALT level in patients admitted to wards and ICU

Hospitalization status	Serum ALT level (mean \pm SD)
ICU	68.45 ± 24.75
Other wards	54.79 ± 21.07

Also, serum AST level mean was significantly different between patients admitted to the ICU and other wards of the hospital (p -value $=0.025$) (Table 4).

Table 4: Mean of serum AST level in patients admitted to wards and ICU

Hospitalization status	Serum AST level (mean \pm SD)
ICU	64.26 ± 37.85
Other wards	57.48 ± 26.78

Serum creatinine level mean was not significantly different between patients admitted to the ICU and other wards of the hospital (p -value $=0.078$).

DISCUSSION

At present study, there was a significant difference between the serum LDH levels mean of patients based on sex and ward type of hospitalization.

In one study, serum biomarkers of 485 patients with Covid-19 were analyzed. The results showed that serum lactate dehydrogenase level was associated with mortality and disease severity [13].

The results of a study in the United States showed that an increase in LDH levels was associated with a 6-fold increase in the severity of COVID-19. Most importantly, an increase in LDH was associated with a more than 16-fold increase in the chance of death [14].

In the present study, a significant increase in the serum LDH mean in ICU patients compared to other hospitalized patients showed a poor prognosis in patients with high LDH levels.

A study showed that LDH levels could be used as a survival predictor in COVID-19 patients [9].

In another study, it was proved that LDH is related to a poor prognosis in patients with COVID-19 [15].

CONCLUSION

Serum LDH level is a potentially useful parameter for tracking and predicting the prognosis of COVID-19 disease, which may help diagnosis of disease progression and thus risk classification and early intervention.

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Conflicts of interest

None declared.

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