Original Article

Assessment of Selected Cardiac Enzymes to Find out Cardiac Damage in Admitted COVID 19 Patients in Tertiary Care Hospital, Kolkata

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Abstract

Introduction: The systemic inflammatory response of SARS COV2 virus affects cardiovascular system too along with the respiratory system. The prediction of prognosis & though unclear still it can be assessed by CRP level. The cardioselective biomarkers of LDH & CPK (CKMB & LDH1) has been seen to be elevated in covid infection which is more profound in severity of infection

The study was done to find any association of cardioselectiveisoenzyemes of LDH & CPK with the inflammatory marker (CRP) in admitted covid patients

Materials & methods: 88 admitted covid patients in CMSDH having LDH 663 U/L to 955 U/L (as 95% CI) were assessed for LDH1 by heat inactivation method at 65^0C & total CPK, CKMB & CRP were measured using standardized kits.

Result: LDH1: LDH is significantly correlated with total CPK (r=0.387 & P<0.05) & CKMB (r=0.55 & p<0.05) in covid patients. By Chi- square test significant association has been found between CRP withLDH1: total LDH ratio2 value= 5.934 & p=0.03) and between CRP with CK-MB (2 value= 11.37 & p<0.001).

Conclusion: in our study there was significant myocardial involvement indicated by increased cardioselective biomarkers (LDH1 & CKMB) which threaten the possibility of adverse cardiovascular complications in patients suffering & recovered from covid infection.

Key words: Lactate dehydrogense, Creatine phosphokinase, Covid 19.

Introduction

COVID-19 infection has been a global pandemic for 2 years, affecting more than a million patients worldwide. Though it is very much evident from 2 years' statistics that SARS COV-2 virus mainly affects

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the lung tissue but we cannot ignore the involvement of cardiovascular system.

The affection of myocardium in covid infection is still unclear. the widespread systemic inflammation, can directly affect the myocardium leading to weakening the cardiacmuscles, which affects the heart rhythm, disturbance in the contraction & clot formation in blood vessels. The virus may also invade ACE2 receptors over myocardium, cause myocardial damage.[1] According to the researchers, the amount of damage inflicted on the heart depends on the amount of viral inoculum, a person's immune response, and the presence of comorbidities.[2] Though the risk is higher in people with underlying heart conditions, even healthy people have reported heart damage after beating COVID-19.

Various biomarkers have been currently under investigation for their role in determination of prognosis in patients with COVID-19. Lactate dehydrogenase (LDH), C- reactive Protein(CRP) are such biomarker of interest, especially elevated LDH levels have been associated with worse outcomes in patients with other viral infections in the past. [3,4,5] Early data in COVID-19 patients have also been suggested significant differences in LDH levels between patients with and without severe disease.[6]

The cardioselective isoenzyme of LDH is LDH1 which is also the most heat stable & it is increased myocardial damage & LDH1: total LDH ratio is also increasd.[7]

Creatine kinase is another biomarker which is seen to be increased in covid. CPK is seen inthe muscles (striated, cardiac & smooth muscles) and the brain, and it is important regulation of high-energy phosphate production and utilization within the contractile tissues. CK-MB is the cardio specific isoenzyme which increasesin any damage of the myocardium[8,9]

CRP is a positive acute phase reactant synthesized by liver which is increased following interleukin-6 secretion by macrophages and T cells.[10] Recent research suggests that patients with elevated basal levels of CRP are at an increased riskof diabetes, hypertension and cardiovascular disease.[11]

Objectives: the study was doneto find any association of cardioselectiveisoenzyemes of LDH (LDH1) & CPK (CKMB) and the inflammatory marker (CPK) in admitted covid patients

Materials and Methods

This observational cross-sectional descriptive study was conducted at college of Medicine and Sagore Dutta hospital (CMSDH), KOLKATA, West Bengal involving COVID ward and department of Biochemistry from August 2021 to February 2022 after obtaining approval of Institutional Ethics Committee (Memo No. COMSDH/IEC/2021/069 dated 6/7/2021).

All the patients admitted in COVID ward having total LDH value within 663 U/l -955 U/l considering 95% confidence interval were included in the study after obtaining the written consent. (200 total LDH values were taken for determining the 95% CI.).[7]

Patient with history of microvascular complications, recent myocardial infarction, acute coronary syndrome, cancer, renalfailure, known liver disease, viral hepatitis, and any type of hemolytic diseases were excluded

The serum of patients included in the study were further analysed for heat stable LDH fraction, CPK, CPK MB utilizing Standard reagent kits supplied by Transasia Biomed in Autoanalyser (XL640). All kits are approved by CMS bearing CAT No.

LDH 1 estimation was done after incubating the patients' serum at 65^0C for 30 minutes &using same kit & method as for total LDH estimation.

Result

A total number of 88 admitted Covid patients befitted with inclusion and exclusion criteria were included in this study. Descriptive details of study variables are expressed in tabular format. (Table -1).

Table 1: Descriptive statistics of Study Variables.

Study Variables	Mean±SD
CRP	51.89±35.80
Total LDH	870.07±91.70
LDH-1	667.22±134.62
TOTAL CK	416.88±46.61
CK-MB	58.54±17.67
LDH1: total LDH	0.63±0.24

Table 2: Correlation between LDH-1: total LDH ratio with Total CK and CK-MB in admitted patient.

	R_s value	P value
LDH1: total LDH & total CK	0.387	0.04
LDH1: total LDH & CKMB	0.557	0.009

*significant at the level p =/< 0.05 &**significant at the level p =/< 0.01.

Table 3: Showing association of inflammatory markers (CRP) with independent markers CK-MB and LDH1: Total LDH ratio in admitted covid patients.

C-Reactive protein	Independent paramters	Categories	No of patients in defined categoried	Chi- square value (2) (Table probability)	P value (2- tailed)
	LDH1: total LDH ratio	>0.5	54	2 value(DF)= 5.934(1)	0.03*
		</=0.5	34		
	CK-MB	>24 U/lt	50	2 value(DF)= 11.37(1)	0.001**
		< 24 U/lt	38		

* Significant at the level p =/< 0.05.&** Significant at the level p =/<0.01

Discussion

The worldwide pandemic covid 19 infection is considered to involve almost all organs of the body. The cardiac involvement is not very uncommon. The extent & severity of involvement depends upon the severity of infection. The cardiac damage often remains undetected or it is detected in advanced stage of disease which frequently causes a poor outcome. There is also possibility of permanent cardiac damage even if the patient recovers from the covid. So early detection & treatment of the cardiac involvement is very important to prevent the mortality & morbidity in covid 19 infection.

In our study, serum CRP, LDH, LDH1, CPK & CKMB level had been measured in patients suffering from covid infection. Serum CRP & LDH level had been increased as predicted & as like all other acute infections. (table 1)

The cardio selective isoenzyme of LDH, LDH-1 had also been found to be in higher level in covid 19 infection. The cardio selective isoenzyme of CPK (CKMB) had been found to be increased in covid infection.

The spearman correlation coefficient (R_s) between LDH1: total LDH & CKMB was 0.557. it was also statistically significant (p<0.05) (table 2)

Statistically significant associations were found of both LDH-1: LDH ratio & CKMB with the inflammatory marker CRP. Which had been indicative of the degree of cardiac damage corresponding to these verity of infection. (table 3)

Multiple studies have been done to establish the association of cardiovascular risk factors with COVID-19 mortality& morbidity till date. The initial large studies were done inChina and later in Italy and USA. Those studies confirmed the association of COVID-19 mortality with cardiovascular risk factors.

In a recent series of 5700 patients of COVID-19 in the New York City, USA, the most common cardiovascular disease was hypertension in 56.6 per cent of patients, coronary artery disease (CAD) in 11.1 per cent of patients, congestive heart failure in 6.9 per cent, obesity in 41.7 per cent of patients and diabetes in 33.8 percent of patients. [12]

Another study done in China analyzed the demographic profile of 44,672 confirmed cases of COVID-19 and showed that 4.2 per cent patients had cardiovascular diseases &12.8 per cent had hypertension. [13]

In other two small single-centered studies on COVID-19, the cardiovascular disease was present in 15 and 14.5 per cent of patients respectively.[14, 15].

The study of 144 patients with COVID-19 from India reported diabetes mellitus in 11.1 per cent, hypertension in 2.1 per cent and CAD in 0.7 per cent patients [16].

The spectrum of cardiovascular manifestations of COVID-19 had been highly variable from asymptomatic myocardial injury to out-of-hospital cardiac arrest. In the COVID-19 pandemic, the cumulative incidence of out-of-hospital cardiac arrest has increased significantly in Italy [17].

According to the study done by Lui Y et al SARS-CoV-2 affects not only the respiratory system but also the myocardium & cause acute myocarditis& ischemia. There is infiltration of mononuclear inflammatory cells which causes fulminant myocarditis which leaves permanent myocardial damage of covid survivors which can often be detrimental in future.[18]

Cardiovascular complications apart from myocarditis are myocardial infraction, arrhythmia, hypertension & congestive cardiac failure. [19]

In the study done by Chen CY et al it was seen that inflammatory markers like CRP &CPK were increased in all acute severe infections as in covid. The increase of cardioselective isoenzymes (LDH1 & CKMB) also increased in covid infection which was due to the effect of cytokine strome, myocarditis, pulmonary & coronary embolism which ultimately lead to myocardial ischemia. [3]

In the study done by Tao R.J. et al the inflammatory marker CRP was positively correlated with CPK in severe systemic infection as seen in covid. In our study also, there was significant associations of CRP& CKMB and CRP & LDH1: LDH ratio. The severity of cardiac damage varies with severity of disease process as more severe myocardial involvement causes more damage.[5]

Conclusion

Our study showed significant myocardial involvement indicated by increased cardioselective biomarkers (LDH1 & CKMB) which can be threatening of adverse cardiovascular complications in patients suffering & recovered from covid infection.

Limitation: due to time constrains & difficulty to follow up of the patients survived from covid infections, long term complications of cardiac damage were not observed.

Sources of funding: self

Conflict of interest: Nil

Ethical clearance: taken from Institutional ethics committee of College of Medicine and Sagore Dutta Hospital vide memo no COMSDH/IEC/2021/069 dated 6/7/2021

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