Original Research Article

Evaluation of ESR, CRP, LDH, CPK, D-Dimer, BS and FBS levels in hospitalized COVID-19 patients with mucormycosis

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ABSTRACT

Mucormycosis in COVID-19 patients of severe type has been reported. This study was intended to evaluate ESR, CRP, LDH, CPK, D-Dimer, BS and FBS levels in COVID-19 patients with mucormycosis. Information was recorded including gender, age, hospitalization and recovery. The laboratory parameters contained ESR, CRP, LDH, CPK, D-Dimer, BS and FBS levels. There was a significant relationship between LDH and CPK level with hospitalization, and also, between CRP and gender. Finally, there was a significant difference between the age groups in terms of ESR. Our study showed that LDH and CPK, CRP and ESR should be considered as laboratory tests in the hospitalized COVID-19 patients with mucormycosis.

***Keywords*:** COVID-19, Laboratory parameters, mucormycosis

INTRODUCTION

COVID-19 is a key global health problem [1,2]. This infection can affect people of any age and can quickly progress to cardiovascular problems, critical respiratory distress, and acute kidney problem [3-5]. The full symptoms of the

disease and complications are not completely explained [6]. Clinical signs array from asymptomatic to deadly [7]. In spite of COVID-19 vaccination in some areas of the world, public distancing, and more guidelines, the disease is increasing, and will continue for some time, particularly in developing and deprived parts [8].

Severe COVID-19 disease is related to an enhancement in inflammatory biomarkers including IL-6, IL-1, decreased expression of interferon-gamma, and less CD8 and CD4 cells, which enhance the susceptibility rate to infections specially the fungal and bacterial types. One of the most important fungal infections is mucormycosis [9,10] that lately, this infection - produced by Mucorales- has become prevalent in severe type COVID-19 patients [11,12].

Laboratory parameters help clinicians to diagnose, predict, monitor, and treat disease in the patients. COVID-19 disease is no exception to this law and researching about some beneficial parameters is a vital performance [13].

Thus, this study was aimed to assay ESR, CRP, LDH, CPK, D-Dimer, BS and FBS levels in hospitalized COVID-19 patients with mucormycosis.

MATERIALS AND METHODS

This cross-sectional study was performed during March 2021 to February 2022. It was approved in the ethics committee of Yazd Shahid Sadoughi University of Medical Sciences, Iran with the ethics code of IR.SSU.REC.1400.195.

All hospitalized COVID-19 patients (PCR positive test) with mucormycosis were entered in this study. Also, exclusion criteria included patients with incomplete information.

Information recorded included gender, age (below or above 55 years), hospitalization (ward and ICU) and recovery (complete, relative and death).

The tested laboratory parameters included ESR, CRP, LDH, CPK, D-Dimer, BS and FBS levels.

After gathering the data were entered into SPSS software version 22 and Chi-Square test was also used to analyze the data. In all cases, $p<0.05$ was considered as a significant level.

RESULTS

In this study, 33 patients with definitive diagnosis of COVID-19 with positive PCR test and mucormycosis were evaluated.

20 patients admitted to hospital had LDH higher than normal, there was a significant association between LDH level and hospitalization (p=0.04) (Table 1). Out of 33 cases, 31 patients of both sexes had CRP higher than normal and statistically was a significant relation between CRP and gender (p=0.05) (Table 2).

Table 1: Relationship between LDH level with gender, age, hospitalization and recovery

Parameters		**LDH level**			**p-value**
		Normal N (%)	**Above normal N (%)**	**Total N (%)**	
Gender	**Female**	4 (30.8)	8 (40)	12 (36.4)	0.59
	Male	9 (69.2)	12 (60)	21 (63.6)	
	Total	13 (100)	20 (100)	33 (100)	
Age (year)	**Below 55**	7 (53.8)	9 (45)	16 (48.5)	0.61
	Above 55	6 (46.2)	11 (55)	17 (51.5)	
	Total	13 (100)	20 (100)	33 (100)	
Hospitalization	**Ward**	11 (80.6)	10 (50)	21 (63.6)	0.04
	ICU	2 (15.4)	10 (50)	12 (36.4)	
	Total	13 (100)	20 (100)	33 (100)	
Recovery	**Complete**	3 (23.1)	6 (30)	9 (23.3)	0.29
	Relative	8 (61.5)	7 (35)	15 (45.5)	
	Death	2 (14.4)	7 (35)	9 (27.3)	
	Total	13 (100)	20 (100)	33 (100)	

Table 2: Relationship between CRP with gender, age, hospitalization and recovery

Parameters		CRP			p-value
		Normal N (%)	**Above normal N (%)**	**Total N (%)**	
Gender	**Female**	2 (100)	10 (32.2)	12 (36.4)	0.05
	Male	0 (0)	21 (67.7)	21 (63.6)	
	Total	2 (100)	31 (100)	33 (100)	
Age (year)	**Below 55**	0 (0)	16 (51.6)	16 (48.5)	0.15
	Above 55	2 (100)	15 (48.4)	17 (51.5)	
	Total	2 (100)	31 (100)	33 (100)	
Hospitalization	**Ward**	1 (50)	20 (64.5)	21 (63.6)	0.67
	ICU	1 (50)	11 (35.5)	12 (36.4)	
	Total	2 (100)	31 (100)	33 (100)	
Recovery	**Complete**	0 (0)	9 (29)	9 (27.3)	0.27
	Relative	2 (100)	13 (41.9)	15 (45.5)	
	Death	0 (0)	9 (29)	9 (27.3)	
	Total	2 (100)	31 (100)	33 (100)	

Also, there was a significant difference between the two age groups of the present study in terms of ESR factor (p=0.03) (Table 3).

There was a significant association between CPK and hospitalization (p=0.05) (Table 4).

No significant differences were observed for D-Dimer, BS and FBS based on the 4 factors mentioned in the study (gender, age, hospitalization and recovery).

DISCUSSION

In the current study, there was a significant relationship between LDH and CPK level

with hospitalization. Also, statistically was observed a significant relation between CRP and gender. Finally, there was a significant difference between the two age groups in terms of ESR. Also, no significant differences were observed for D-Dimer, BS and FBS.

In a study conducted in Tehran in 2020, there was a significant difference between the patient and control groups with LDH levels. In the present study, there was also a significant relationship between LDH levels with hospitalization of patients [14]. A study on COVID-19 patients between 2020 and 2021 found that patients with more severe illness had higher CRP [15]. Also, the results of a study in Tabriz, Iran showed that patients with COVID-19 had higher CRP [16].

The Tehran study also showed that patients had higher ESR [14].

The results of Tabriz study also showed that patients had higher CPK than the healthy group [16].

In the Tehran study, there was a significant difference between the control and patient groups in terms of D-Dimer factor [14]. But, in the study of Egypt, no significant difference was observed between the two comparative groups in terms of this factor [15].

In one study, a higher FBS showed a higher disease severity [17]. In another study, there was a significant difference between outpatients and ICU patients in terms of FBS [18].

Table 3: ESR difference based on gender, age, hospitalization and recovery

Parameters		ESR (%)			p-value
		Normal	**Above normal**	**Total**	
Gender	**Female**	0 (0)	11 (39.3)	11 (34.4)	0.12
	Male	4 (100)	17 (60.7)	21 (65.5)	
	Total	4 (100)	28 (100)	32 (100)	
Age (year)	**Below 55**	4 (100)	12 (42.9)	16 (50)	0.03
	Above 55	0 (0)	16 (57.1)	16 (50)	
	Total	4 (100)	28 (100)	32 (100)	
Hospitalization	**Ward**	2 (50)	19 (67.9)	21 (65.6)	0.56
	ICU	2 (50)	9 (32.1)	11 (34.4)	
	Total	4 (100)	28 (100)	32 (100)	
Recovery	**Complete**	1 (25.5)	8 (28.6)	9 (28.1)	0.48
	Relative	1 (25)	13 (46.4)	14 (43.8)	
	Death	2 (50)	7 (25)	9 (28.1)	
	Total	4 (100)	28 (100)	32 (100)	

Table 4: CPK difference based on gender, age, hospitalization and recovery

Parameters		CPK (%)			p-value
		Normal	Above normal	Total	
Gender	**Female**	5 (29.4)	4 (40)	9 (33.3)	0.57
	Male	12 (70.6)	6 (60)	18 (66.7)	
	Total	17 (100)	10 (100)	27 (100)	
Age (year)	**Below 55**	11 (64.7)	3 (30)	14 (51.9)	0.08
	Above 55	6 (35.3)	7 (70)	13 (48.1)	
	Total	17 (100)	10 (100)	27 (100)	
Hospitalization	**Ward**	13 (76.5)	4 (40)	17 (63)	0.05
	ICU	4 (23.5)	6 (60)	10 (37)	
	Total	17 (100)	10 (100)	27 (100)	
Recovery	**Complete**	5 (29.4)	2 (20)	7 (25.9)	0.20
	Relative	9 (52.9)	3 (30)	12 (44.4)	
	Death	3 (17.6)	5 (50)	8 (29.6)	
	Total	17 (100)	10 (100)	27 (100)	

CONCLUSION

According to a significant relationship between LDH and CPK level with hospitalization, CRP and gender, finally, between the age groups and ESR, these factors should be considered as vital parameters in the hospitalization of patients that their controlling will be essential.

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