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Chest Diseases

Assessment of Risk Factors in Coronavirus 19 Infected Persons

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ABSTRACT

Background: Mortality caused by Covid-19 is more in individuals suffering chronic diseases.
Aim of The Work: To detect if there is any predictor for severe illness in patients with COVID-19 diseases.
Patients and Methods: This retrospective study included 200 cases suffering from COVID-19 pneumonia admitted to Damanhour chest diseases hospital .
The patients had been divided into two groups; the first one had 100 patients (30 men & 70 women) who had manifestations of pneumonia on radiological examination and had risk factors; the second group included 100 controls (53 men & 47 women) who had pneumonia manifestations on radiological examination with no risk factors. Mild Covid-19 cases with no radiological signs of pneumonia as well as pediatric cases were excluded. For all included individuals, a detailed history, clinical examination, COVID19 detection by PCR, arterial blood gases, CBC, liver function tests, blood urea and serum Creatinine , CRP, D-dimer serum ferritin, and CT chest were performed.
Results: Most common comorbid conditions were systemic hypertension (62%), DM (61%), and IHD (48%)). SpO2 below 74% was found to be significantly predictive of invasive respiratory assistance or in-hospital mortality in older age groups; risk factors included myalgia (22%), chest pain, and DCL manifestations (11%). D-dimer identified as an independent risk factor (P value 0.034), serum Cr in the 1st group was higher in comparison with the 2nd group.
Conclusion: Advanced age was more vulnerable to infection with COVID-19. Hypertension, DM and IHD were independently accompanied by a higher risk of in-hospital mortality. COVID19 infected cases with risk factors had poor outcomes. Chronic patients had decreased blood O2 saturation.

Keywords: *corona virus 19; risk factors; chronic diseases.*

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INTRODUCTION

The 2019 new coronavirus (COVID-19) has propagated unabatedly globally, infecting 42 million people and killing > 2.5 million as of February 28, 2021. [1]

COVID-19 is the coronavirus family's seventh member.[2] Mortality caused by Covid-19 is in particular elevated in cases suffering including hypertension, DM, and IHD, and among those who reach the point of co-existing necessitating invasive mechanical ventilation. [3]

COVID-19 has an increased reproduction number, and thus it's highly infectious in comparison with its precursors, leading to a tremendous burden on global health. COVID-19 infections have generally mild clinical symptoms, and the vast majority of cases have a favorable outcome. Nevertheless, in 10–20% of all cases, the situation may worsen, necessitating transfer to an ICU and having an elevated fatality rate. [4]

The goal of this study was to see if there is any predictor of severe illness in COVID-19 individuals.

PATIENTS AND METHODS

A retrospective study was performed on 200 COVID-19 pneumonia cases admitted to Damanhour chest diseases hospital.

The patients were divided into two groups:

The first group: included 100 patients (30 men & 70 women) (mean age ±SD62.45±11.96) who had manifestations of pneumonia on radiological examination and had COVID–19 risk factors for in-hospital fatalities.

The second group: was a control group of 100 patients (53 men & 47 women) (mean age ±SD57.39±11.92) with manifestations of pneumonia

on radiological examination but no risk factors for COVID–19 in-hospital death.

The study included cases diagnosed with COVID-19 and having pneumonia manifestations on radiological examination. These included moderate cases (accompanied by symptoms and/or leucopenia or lymphopenia), severe cases (RR exceeded 30, SaO2 less than 92 at room air, PaO2/FiO2 ratio < 300, chest radiography showing > 50% lesion or increasing lesion within 24-48 hrs.) and critically ill patients if SaO2 was less than 92 at room air, or RR exceeded 30, or PaO2/FiO2 ratio less than 200 in spite of O2 therapy and hemodynamic instability and required mechanical ventilation.

Mild Cases of Covid 19 which were characterized by symptomatic cases with lymphopenia or leucopenia without radiological signs of pneumonia and Pediatric cases of Covid 19 were ruled out.

Past history, general and chest examination, detection of the Covid19 by RT-PCR (Nasopharyngeal & oral swap for Covid19)

Laboratory investigations: CBC, Liver function tests Blood urea and serum Cr, (CRP), D-dimer and serum ferritin. Chest imaging (CT):.Images were examined for signs of pneumonia if unilaterally or bilaterally involvement and included ≥ 1 lobe.

Statistical analysis

The IBM SPSS software package version 20.0 (Armonk, NY: IBM Corp) was used to analyze the data that was supplied to the computer. "Number and percent" have been employed to describe qualitative data. The Kolmogorov-Smirnov test has been employed to verify that the distribution is normal. Quantitative data has been expressed employing the following terms: range (min and max), mean, standard deviation, median, and interquartile range (IQR). The obtained findings have been determined to be significant at the 5% level.

RESULTS

	Group I (n = 100)		Group II (n = 100)		Test of Sig.	p
	No.	%	No.	%		
Sex						
Male	30	30.0	53	53.0	χ^2=	0.001*
Female	70	70.0	47	47.0	10.895*	
Age (years)						
<65	52	52.0	100	100.0	χ^2=	<0.001*
≥65	48	48.0	0	0.0	63.158*	
Min. – Max.	24.0 – 90.0		23.0 – 64.0		t=	<0.001*
Mean ± SD.	62.45 ± 11.96		47.39 ± 11.92		8.916*	
Median (IQR)	63.0(56.0 – 70.50)		48.0 (36.0 – 57.0)			

IQR: Inter quartile range SD: Standard deviation
χ2: Chi square test t: Student t-test
p: p-value for comparing the two groups under study
*: Statistically significant at $p \leq 0.05$
Group I: Patient group with COVID-19-related mortality risk factors
Group II: Control group without COVID-19-related mortality risk factors

Table 1: Demographic characteristics of the studied patients

Risk factor	No.	%
Age ≥65 years	48	48.0
Cardiovascular diseases	48	48.0
Hypertension diseases	62	62.0
Diabetes diseases	61	61.0
Chronic chest diseases	18	18.0
Cancer	2	2.0
Hepatic diseases	5	5.0
Renal diseases	2	2.0
Others diseases	12	12.0

Table 2: Distribution of the examined cases in group 1 (n = 100) based on the risk factor

	Group I (n = 100)	Group II (n = 100)	U	p
Serum creat				
Min. – Max.	0.40 – 10.0	0.50 – 10.0	2075.0*	<0.001*
Mean ± SD.	2.38 ± 1.48	1.21 ± 0.99		
Median (IQR)	2.40 (1.10 – 2.90)	1.0 (0.90 – 1.20)		
Blood urea				
Min. – Max.	17.0 – 141.0	15.0 – 237.0	3722.5*	0.002*
Mean ± SD.	50.96 ± 26.65	41.74 ± 28.55		

Median (IQR)	41.0 (33.50 – 60.0)	36.0 (30.0 – 45.0)		
ALT				
Min. – Max.	11.0 – 259.0	13.0 – 212.0	3983.5*	0.013*
Mean ± SD.	85.56 ± 77.29	41.74 ± 31.68		
Median (IQR)	41.50 (23.0 – 133.5)	33.0 (24.0 – 45.0)		
AST				
Min. – Max.	10.0 – 500.0	8.0 – 206.0	4704.0	0.469
Mean ± SD.	47.76 ± 69.93	40.24 ± 26.65		
Median (IQR)	32.50(24.50 – 45.0)	35.0 (27.0 – 43.50)		

IQR: Inter quartile range SD: Standard deviation U: Mann Whitney test
p: p-value for comparing the two groups under study
*: Statistically significant at $p \leq 0.05$
ALT: Alanine aminotransferase
AST: Aspartate aminotransferase

Table 3: Comparison of the two examined groups based on organ function tests

CT features	**Group I (n = 100)**		**Group II (n = 100)**		χ^2	**p**
	No.	%	No.	%		
Ground glass opacity (GGO)						
One lobes	14	14.0	28	28.0	8.363*	0.015*
Two lobes	30	30.0	34	34.0		
More than two lobes	56	56.0	38	38.0		
Consolidations	30	30.0	15	15.0	6.452*	0.011*
Interstitial fibrosis	10	10.0	3	3.0	4.031*	0.045*

χ2: Chi square test
p: p-value for comparing the two groups under stud *: Statistically significant at $p \leq 0.05$

Table 4: Comparison of the two examined groups based on CT features

Treatment	**Outcome**				χ^2	**P**
	Improved (n = 93)		Died (n = 7)			
	No.	%	No.	%		
Antiviral						
Ivermectin (Iverzine)	37	39.8	0	0.0	4.421*	FEp=0.044*
Remdesivir	54	58.1	7	100.0	4.812*	FEp=0.041*
Hydroxychloroquine	10	10.8	0	0.0	0.836	FEp=1.0
Favipirvair	1	1.1	0	0.0	0.076	FEp=1.0
Anti-cytokines (tocilizumab) (IL-6 antagonist)	1	1.1	0	0.0	0.076	FEp=1.0
Corticosteroid						
Dexamethone	62	66.7	0	0.0	12.281*	FEp= 0.001*
Methylpredensiolone	31	33.3	7	100.0		
Anticoagulant						
Prophylactic	35	37.6	0	0.0	4.053	FEp= 0.093
Therapeutic	58	62.4	7	100.0		
Oxygen therapy	93	100.0	7	100.0	–	–
Noninvasive MV (CAPAP mode)	4	4.3	4	57.1	24.698*	FEp= 0.001*
Invasive MV (SIMV VCV mode)	3	3.2	4	57.1	29.070*	FEp <0.001*

χ2: Chi square test FE: Fisher Exact
p: p value for comparing between improved and died
*: Statistically significant at $p \leq 0.05$

Table 5: Relation between outcome and treatment in patients group with risk factors (n = 100)

Treatment	**Group I (n = 100)**		**Group II (n = 100)**		χ^2	**p**
	No.	%	No.	%		
Antiviral						
Ivermectin (Iverzine)	37	37.0	49	49.0	2.938	0.087
(Remdesivir)	61	61.0	51	51.0	2.029	0.154
Hydroxychloroquine	10	10.0	32	32.0	14.587*	<0.001*
Favipirvair	1	1.0	0	0.0	1.005	FEp=1.0

Anti-cytokines (Tocilizumab) (IL-6 antagonist)	1	1.0	0	0.0	1.005	FE p=1.0
Corticosteroid						
Dexamethone	62	62.0	82	82.0	9.921*	0.002*
Methylpredensiolone	38	38.0	18	18.0		
Anticoagulant						
Prophylactic	35	35.0	57	57.0	9.742*	0.002*
Therapeutic	65	65.0	43	43.0		
Oxygen therapy	100	100.0	66	66.0	40.964*	<0.001*
Noninvasive MV (CAPAP mode)	8	8.0	1	1.0	5.701*	FE p= 0.035*
Invasive MV (SIMV VCV mode)	7	7.0	0	0.0	7.254*	FE p= 0.014*

χ^2: Chi square test FE: Fisher Exact
p: p value for comparing between the two studied groups
*: Statistically significant at $p \leq 0.05$

Table 6: Comparison between the two studied groups according to treatment

	Group I (n = 100)	Group II (n = 100)	Test of Sig.	p
Hospital stay				
Min. – Max.	4.0 – 20.0	2.0 – 13.0	U=	<0.001*
Mean ± SD.	8.53 ± 3.47	4.62 ± 2.54	1411.5*	
Median (IQR)	8.0 (6.0 – 10.0)	4.0 (3.0 – 6.0)		
Outcome				
Improved	93 (93.0%)	100 (100.0%)	χ^2=	FE p=
Died	7 (7.0%)	0 (0.0%)	7.254*	0.014*

IQR: Inter quartile range SD: Standard deviation U: Mann Whitney test
χ2: Chi square test FE: Fisher Exact
p: p value for comparing between the two studied groups
*: Statistically significant at $p \leq 0.05$

Table 7: Comparison between the two studied groups according to hospital stay and outcome

DISCUSSION

In this study, the commonest comorbid conditions were systemic hypertension 62 patients (62%), DM 61 patients (61%), and IHD 48 patients (48%).

As a result of the quick increase in crucially ill patients and restricted health resources during the pandemic of COVID 19, in particular ICU beds and ventilation systems, efficient triage techniques for detecting patients at the highest risk of the worst outcomes are required to ensure an efficient allocation of resources for both outpatients and inpatients .[5]

According to our findings, older age and a SpO2 of less than 74% were important indicators of invasive respiratory assistance and in-hospital mortality during the present outbreak. In two earlier identical investigations, older age was proven to be one of the independent diagnostic variables for mortality in verified COVID-19 pneumonia cases.[6]

In an initial study of 121 patients admitted to an intensive care unit in the United States, eighty percent of those who died were 65 or older. [7] Comorbidities, particularly CVS and chronic respiratory diseases, are more prevalent among the elderly. In elderly people, several comorbidities may play a role in the development of ARDS and severe pneumonia.[8]

Our study results exhibited that advanced age was accompanied by higher risk of infection with COVID-19, as concluded by Zhou et al. (2020a). For infections like SARS and MERS, advanced age has been determined to be a crucial indicator of fatality. [9, 10]

Myalgia (22%), chest pain, and DCL symptoms (atypical presentation,11 percent) were among the symptoms that were more frequent in the first group, according to our findings. It's possible that the start and persistence of symptoms indicate a poor prognosis. Non-survivors had a shorter time from disease beginning to admission and mortality, implying a faster disease progression.

In admitted cases, reduced blood O2 saturation has been used to determine the severity of COVID-19 pneumonia. SpO2 had previously been shown to be an important predictive method in community-acquired pneumonia, with a higher specificity for negative outcomes.[11,12]

Also, GGO observed in the CT chest was proved to be one of the frequent results in COVID-19 pneumonia, with 100% of diagnosed cases validated by RT-PCR having such a result in an Italian investigation of 58 patients. The authors demonstrated that none of the CT criteria (GGO, pneumonia distributed bilaterally, involvement in > 2 lobes, consolidation, as well as lymphadenopathy) were considerably distinct between COVID-19 cases

that needed hospitalization versus those who were discharged for home isolation .[13]

In this research, a statistically significant difference between both groups was observed. These outcomes were in harmony with the outcomes obtained in the previous studies.

Our study agrees with those of another study that comprised 73 COVID-19 patients, 25 of whom had severe or critical conditions, and employed a CT scoring system in which elevated scores were correlated with greater severity of the disease .[14]

Reduced lymphocyte count was postulated to be an independent risk factor for in-hospital mortality in the multivariable logistic regression assay, and additional investigation demonstrated that lymphocyte count was a crucial predictor in the prediction of COVID-19 pneumonia in-hospital mortality detected via the ROC assay. Prior research found that lymphopenia represented a risk factor for higher SARS and COVID-19 fatality rates.[15] Adults with critically ill SARS have short-term outcomes as well as risk factors for death.[16]

In our study, we agree with the previous studies as statistically significant differences between the 2 examined groups were determined in regards to more lymphopenia in the 1st group.

Another study found that the percentage of lymphocytes (LYM) [percent] was an important predictor of the severity of COVID-19. [17]

The decreased LYM (%) could be attributed to the fact that coronavirus can cause lymphocyte damage during the acute process. The reduced LYM% might indicate that the immune system is under-activated and/or over-exhausted, rendering it unable to contain COVID-19 infection. [18]

According to prior research, ~90% of cases with severe pneumonia exhibited higher coagulation activity, as denoted by a high D-dimer concentration. [19]

Increased D-dimer levels were shown to be associated with elevated fatality rates in emergency room cases of sepsis. [20]

In addition, a prior study revealed that D-dimer >1 µg/ml was accompanied by deadly COVID-19 outcomes. [15]

In this research, D-dimer has also been determined as an independent risk factor (P value 0.034) for in-hospital death.

Increased CRP on admission in cases with risk was accompanied by higher risk of mortality. CRP in the 1st group with Mean ± SD. 82.42 ± 71.69 was elevated when compared to the 2nd group with Mean ± SD 45.24 ± 23.05. We are in accordance with earlier studies that revealed a positive association of CRP level with the lung lesions as well as the severity of illness. Sahu et al demonestrated higher CRP concentration in cases died due to COVID-19 infections in comparison with survivors. Positive CRP was considered a predictor in Ruan study [21.- 24]

In a cohort study, SARS-CoV-2 infections were associated with a higher morbidity rate, which was consistent with earlier research.[25-30] Noteworthy, AKI was the commonest complication. Grasselli et al. revealed that AKI occurred in ~ 55% of 3988 consecutive severely sick patients with proven COVID-19 from an Italian Intensive Care Unit in Lombardy. The exhaustion of healthcare resources, combined with the relatively higher admission rate during the period of this research, might explain the relatively increased mortality and morbidity rates in comparison to following cohorts.[27, 31]

Previous studies have shown that increased serum Cr is associated with frequent COVID-19 cases. Increased serum Cr on admission might denote the initial stages of renal destruction and easy progression to AKI. Early intervention in cases having increased serum Cr on admission that might occur prior to the occurrence of clinical manifestations of renal failure may produce better outcomes when compared to treatment of only established AKI cases. [32]

In this study in serum Cr in the first group is 2.38 ± 1.48, whereas in the second group is 1.21 ± 0.99 with while p value <0.001 statistically significant).

CONCLUSION

Advanced age was more liable for COVID-19 infection**.**

Patients suffering COVID-19 infection in conjunction with risk factors had poor outcome when compared to others without **.**

Systemic hypertension, DM, and IHD were independently accompanied by a greater risk of in-hospital mortality**.**

A statistically significant difference was detected in terms of more lymphopenia and increased inflammatory parameters in the first group**.**

The severity of COVID-19 pneumonia in hospitalized patients has been determined by reduced blood O2 saturation.

Conflict of interest : none

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