Estimation some kidney function parameters among COVID-19 patients in Karbala province

Estimación de algunos parámetros de la función renal en pacientes con COVID-19 en la provincia de Karbala

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Abstract

Background: In cases with moderate to extreme respiratory system disorders, Corona Virus Disease 2019 (COVID-19) or SRAS-CoV-2 (Serious Coronavirus Acute Respiratory Syndromes 2) have also been involved. The aim of this research. The association between different hematologic parameters and the severity of COVID19. Experiment: A total of 184 patients with COVID-9 who were admitted to specialized kerbala Hospital for Internal in the kerbala province during the period from October 2020 till February 2021 Clinical and laboratory data of the patients were collected from medical records. Results Among them, 42 (22.8%), 88 (47.8%) patients were in the mild/moderate group, and 54 (29.3%) were in the severe/life-threatening group. the results of present study showed significant differences among blood parameters (urea, creatinine, ferittine and spo2).in different stage (mild, moderate and severe) of COVID 19 infection. CONCLUSION: The high prevalence of renal insufficiency in COVID-19 patients was observed in our research. The findings showed an important association between indices of renal function and distortions in various laboratory markers.

Key words: blood parameters, SOP2, COVID19, gender

Resumen

En casos con trastornos del sistema respiratorio de moderados a extremos, también se han involucrado la Enfermedad por Virus Corona 2019 (COVID-19) o SRAS-CoV-2 (Síndromes respiratorios agudos graves por coronavirus 2). El objetivo de esta investigación es la asociación entre diferentes parámetros hematológicos y la gravedad de COVID19. 184 pacientes con COVID-9 ingresados en octubre de 2020 hasta febrero de 2021 en el Hospital de Especialidades de Karbala en la provincia de Karbala Los registros de salud recopilaron informes clínicos y de laboratorio de los pacientes. Entre ellos, el grupo demográfico moderado estaba compuesto por 42 (22,8%) 88 (47,8%) y el grupo de grave / amenaza para la vida estaba compuesto por 54 (29,3%) pacientes. Hubo diferencias significativas en los parámetros sanguíneos en el resultado del presente análisis (urea, creatinina, ferritina y spo2). Infección por COVID 19 en varias etapas (leve, moderada y grave)

Conclusión: En nuestra investigación se observó la alta incidencia de insuficiencia renal en pacientes con COVID-19. Los hallazgos mostraron una asociación importante entre los índices de función renal y las distorsiones en varios marcadores de laboratorio.

Palabras clave: parámetros sanguíneos, SOP2, COVID19, género

Introduction

Novel coronavirus of severe acute respiratory syndrome coronavirus 2(SARS-CoV-2) is a new strain that has resulted in the 2019 coronavirus disease pandemic (COVID-19). COVID-19 was identified for the first time in the city of Wuhan, China[1,27]. Globally, greater than 40 million cases of COVID-19 have now been reported to the WHO with greater than one million deaths[2] Given that COVID-19 patients with mild illness or asymptomatic carriers are prone to transmit the virus, the number of new and severe cases is increasing rapidly every day[3]. Due to the genomic homologies of coronavirus pathogens, COVID-19 exhibits a similar clinical course and pathological features as severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS)[4,5].

COVID19 may involve many organ systems in its host. Studies suggest that hematological profiles change during the course

of SARSCoV2 illness. Neutrophils are involved in early antiviral defense. However, during severe pneumonia, neutrophils become cytotoxic through degranulation and lysis[6]. Studies have suggested that neutrophil recruitment may exacerbate COVID19 immunopathology[7].

The symptoms of COVID-19 disease are mostly mild. They include upper respiratory tract infection symptoms, such as fever, fatigue, tiredness, and dry cough. Some patients may develop a fluid nose with congestion, sore throat, or diarrhea. Others get the infection without developing any symptoms. As a result, most (80%) people recover without any treatment[8]. Older people, and those with chronic medical problems such as diabetes, hypertension, chronic lung diseases, and cardiovascular disease, are more likely to develop severe illness[9].

The severe form can be critical and result in rapid deterioration of the medical condition. Therefore, identifying factors that could predict the negative outcome of COVID-19 disease is essential to improve our response to the COVID-19 pandemic to improve patients outcomes[10]. Multi-organ failure is considered one of the significant causes of death in patients with SARS disease in 2003 and the current COVID-19 pandemic.10–12 Indeed, multi-organ dysfunction, including liver and renal injuries, has been reported in around one-third of SARS and COVID-19 patients[11].

Severe COVID-19 disease is characterised by uncontrolled inflammation[11]. COVID-19 patients typically present with bilateral multifocal peripheral lung changes of ground-glass opacity and, orconsolidation, on chest radiography low peripheral oxygen saturation (SpO2) and an increased respiratory rate strongly associated with pneumonia[12]. Immunopathology is considered one of the main drivers of disease progression leading to acute respiratory distress\ syndrome (ARDS), multi organ failure[13], secondary infections and coagulopathy[14].

This study's objective was to investigate the estimated urea creatinin, SPO2 among COVID-19 patients and to examine its correlation with different demographic, clinical, and laboratory characteristics as well as outcomes of COVID-19 disease.

Materials and methods

Samples

A total of 184 patients with COVID-9 who were admitted to kerbala Hospital for Internal in the kerbela province during the period from October 2020 till February 2021 Clinical and laboratory data of the patients were collected from medical records. The laboratory data, including routine blood test parameters, urea, creatinine, feritine and SPO2. The collected data included demographic characteristics like age and gender, medical comorbidities, COVID-19 symptoms at presentation, and their severity, progression, and outcomes.

Statistical Analysis

The statistical study was conducted using version 23 of SPSS and data was deemed statistically important as Means, standard deviation, P value (p to 0.05).

Results

Total of 184 patients (115 males and 69females) with COVID-19 were enrolled in the study. Among them, 66 (22.8%), 88 (47.8%) patients were in the mild/moderate group, and 54 (29.3%) were in the severe/life-threatening group.

Table 1: Demographic and laboratory features of COVID-19 patients

Characteristics	mild	moderate	severe	P value
age	49.92±12.97	56.88±13.08	58.96±8.92	0.01*
Gender (male)	29	50	36	0.20
female	14	36	19	0.50
urea	46.88±18.40	60.00±20.29	66.63±14.29	0.10
creatinine	0.83±0.34	1.11±0.61	1.04±0.51	0.25
feritine	273.76±119.66	561.87±193.45	534.65±181.03	0.005*
SPO2	90.28±2.03	90.66±1.21	87.80±3.30	0.11

SD: standard deviation; *P ≤ 0.05

Table 2: estimation some blood parameters according to states of COVID 19

Parameters	Study groups			SIG.
	Severe (N=61)	Moderate	Mild (N=22)	
SPO2	86.40±4.78	90.75±1.22	93.14±3.38	0.000*
B.urea	70.68±10.15	102. 58±12.64	51.25±10.15	0.003*
S.creatin	1.64±0.30	2.41±0.91	0.66±0.08	0.15
S.Ferritin	1175.36±1.18	1376.49±1.88	660.32±1.05	0.005*

SD: standard deviation; *P ≤ 0.05

Tables 3: Some blood parameters of subjected groups of both genders

parameters	patients level concentration ng/ml						p-value
	severe		Moderate		Mild		
	Male	Female	Male	female	Male	Female	
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	
SPO2	86.36± 0.69	85.22±1.43	90.70± 0.17	90.83±0.23	93.00±0.68	93.42± 0.80	0.000*
B.urea	63.33± 7.44	56.27±9.78	84.89± 7.93	41.42±3.15	51.03±6.81	49.76± 9.56	<0.0001*
S. creatinin	1.96± 0.47	1.23±0.41	3.58± 1.05	2.22±0.68	0.73±0.03	0.86± 0.12	0.10
S. Ferritin	1133.33± 1.20	1107.23±2.34	1366.99± 2.02	1129.46±1.46	555.98±98.96	925.26± 2.55	0.05*

SD: standard deviation; *P ≤ 0.05

Tables 4: estimation Some blood parameters of subject groups according to age groups					
Age -years	Parameter	Study Groups			p-value
		Severe	Moderate	Mild	
20-39	SPO2	81.33± 2.40	90.33± 0.33	90.90± 0.87	0.0001<*
40-59		87.00± 0.96	90.58± 0.28	92.23± 0.87	
60-85		85.41± 0.87	90.77± 0.20	94.50± 0.97	
20-39	B. urea	38.66± 3.28	50.33± 20.05	30.70± 5.25	0.10
40-59		59.13± 9.28	58.13± 9.03	31.35± 3.90	
60-85		54.61± 4.57	47.30± 6.46	37.90± 4.93	
20-39	S. creatinin	1.80± 0.15	0.64± 0.32	0.83± 0.08	0.11
40-59		1.83± 0.57	0.99± 0.12	0.91± 0.09	
60-85		1.25± 0.27	0.91± 0.08	0.68± 0.06	
0-39	S. Ferritin	532.66± 33.65	914.03± 5.44	251.26± 48.22	0.001*
40-59		971.24± 1.55	1147.15± 1.92	427.25± 50.73	
60-85		1183± 1.54	1138.24± 1.49	522.21± 53.85	

SD: standard deviation; *P ≤ 0.05

Discussion

This paper is the first to study the renal function and acute kidney injury among COVID-19 patients in the kerbala province. We determined the prevalence of kidney impairment in COVID-19 patients.

Our results showed that male patients were more vulnerable to more advanced impairment in the kidney function levels than female patients. This concurs with our previous observation that the male gender is associated with a more severe form of COVID-19 illness and worse outcome[15]. In addition, another report had found that COVID-19 patients admitted to the hospital and had elevated SCr were predominantly males. 1Similarly, recent publications have reported that acute kidney injury (AKI) was a common finding among COVID-19 patients, and its presence might determine the death risk of those patients[16]. Moreover, reports showed high levels of SCr and blood urea nitrogen in around 15% of COVID-19 patients[17].

Although the exact mechanism that might explain the renal involvement in COVID-19 infection is still unclear, many mechanisms have been proposed. These include direct tubular injury due to the virus itself, which is supported by the finding that angiotensin-converting enzyme receptor 2 (ACE2), which is essential for the binding of SARSCoV, was highly expressed in the kidney and renal tubular cells[18]. as well as the finding that viral RNA can be detected in the urine samples of COVID-19 patients[13]. In addition to the dysregulation of the ACE2 system, and the thrombotic events, pro-inflammatory cytokine storm found to be associated with COVID-19 infection is also proposed as a possible mechanism that might explain the AKI observed in patients with COVID-19 infection[18].

Regarding the association of SARS-CoV-2 infection with renal function tests (blood Urea and serum Creatinine), the results were highly significant in regards with blood urea and significant in regards with serum creatinine levels as shown above in table 3, and it was noticed that most of the patients with COVID-19 infection showed increased levels of blood urea and serum creatinine The highest rate of increased blood urea

and serum creatinine levels found in male patients with COVID-19 infection This agreed with Cheng Y, et al[19] who detected high levels of blood urea and serum creatinine in patients with SARS-CoV-2 infection. This also agreed with a study done in Iran Boroujeni etal[20], in which a huge group of patients with SARS-CoV-2 pneumonia had symptoms of renal disease, like increased levels of blood urea and serum creatinine which might justified with different pathophysiologies occurred in SARS-CoV-2 pneumonia. These results disclose, that COVID-19 may get into the peripheral blood and resides in kidney tissues because of the increased expression of ACE2 in kidney cells and then demolish the resident kidney cells[21]. Potential inflammatory status in chronic kidney disease patients may make them susceptible to SARS-CoV-2 pneumonia due to proinflammatory status with defect in function in innate and adaptive immune cells[22]. that raises the risk of upper respiratory tract infection and pneumonia[23].

Our study exhibited that serum feritin increased in covid19patient and this agreed with one study with 20 COVID-19 patients, it was found that individuals with severe and very severe COVID-19 exhibited increased serum ferritin level, being serum ferritin in the very severe COVID-19 group significantly higher than in the severe COVID-19 group (1006.16 ng/ml [IQR: 408.265-1988.25] vs 291.13 ng/ml [IQR: 102.1-648.42], respectively)[24,25]. In agreement with this, another study revealed that in patients who died by COVID-19, ferritin levels were high upon hospital admission and throughout the hospital stay. The median values of serum ferritin levels after day 16 of hospitalization exceeded the upper limit of detection in these patients, suggesting that ferritin levels increased non-stop[24]. Also, Chen et al. analyzed the clinical characteristics of 99 patients, in which 63 of them had serum ferritin way above of the normal range[10].

An analysis of the peripheral blood of 69 patients with severe COVID-19 revealed elevated levels of ferritin compared with patients with non-severe disease. Therefore, it was concluded that serum ferritin levels were closely related to the severity of COVID-19[26].

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