Short Communication
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The Prevalence of Procalcitonin Positivity in Patients with Severe Covid-19

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Abstract

Objectives: The aims of this paper were to characterize patients with severe Covid-19 and study the prevalence of positive procalcitonin test in those patients.

Methods: In this retrospective cross-sectional study, data were collected in infectious diseases clinic between June 2020 and July 2021. Real time polymerase chain reaction (RTPCR) was conducted to confirm the diagnosis of Covid-19. COBAS system was used to determine procalcitonin positivity following the instructions of manufacturer.

Results: During the study period, 454 Covid-19 confirmed patients were referred to the clinic. Among those, 55/494 (11.13%) had severe Covid-19 infection. Fever (89.1%) was the most common clinical features followed by cough (29.1%) and shortness of breath (20%). In this project, we found 4/55 (7.27%) patients had elevated procalcitonin levels. High procalcitonin was not associated with clinical outcome ($P = 0.99$).

Conclusions: In agreement with other studies, fever was the most common symptom in patients with severe Covid-19. Small number of the patients with severe Covid-19 showed elevated procalcitonin levels. This might indicate that antibiotics should not prescribed empirically to such patients. Further studies are needed to investigate this.

Keywords: Procalcitonin, Covid-19, Iraq

Introduction

Since the discovery of SARS-Cov-2 virus in Wuhan, China in December 2019, Coronavirus disease (COVID-19) spread throughout the planet.[1] The vast majority of countries, including Iraq, decided to take extraordinary measures to stop the spread of COVID-19 and reduce the morbidity and mortality.[2,3] In Iraq, the status of lockdown was declared with the cancellation of gathering and religious rituals, closing schools and education institutes and closing airports and boarders.[4] About 80% of Covid-19 patients have mild to moderate symptoms and may not require specific treatment.[1] However, 20% of Covid-19 patients may require hospitalization and ICU admission.[1] In the absence of agreed guidelines for the treatment of Covid-19 infection, different medications, including antibiotics, have been used to treat such patients.[5] Before the Covid-19 pandemic, antimicrobial resistance was global public health issue that claimed more than half a million lives, annually.[6,7] The pandemic has changed the priorities of health system impacting the management of other diseases and the attention of public health policy makers diverted to combat the pandemic on the expense of other public health projects including antimicrobial resistance.[8] In addition, it is believed that Covid-19 pandemic may escalate the issue of antimicrobial resistance because of the antibiotics abuse that we witness in the treatment of Covid-19 patients, particularly severe cases.[5] This may fuel the issue of antimicrobial resistance in our region that suffering from such an issue for years. Procalcitonin is a peptide precursor that increases significantly in bacterial infections and sepsis that helps to guide antibiotic use.[9] The aims of this paper were to characterize patients with severe Covid-19 and study the prevalence of positive procalcitonin test in those patients.

Materials and Methods

Study Design

This was a retrospective cross-sectional study. The data were collected form infectious diseases clinic, the City of Duhok, Kurdistan Region of Iraq. This study was conducted during the period between June 2020 and July 2021.

Patients

Suspected patients with symptoms and signs of Covid-19 were referred to infectious disease clinic to confirm the diagnosis. Suspected case was defined as a patient who had symptoms of respiratory tract infection plus a close contact with confirmed Covid-19 patients. Confirmed Covid-19 case was defined as a suspected case plus either positive RTPCR results or sings of Covid-19 infection in CT scan of the lungs.[5] Severe Covid-19 was defined as radiological evidence of pneumonia plus respiratory distress, oxygen saturation of ≤93% at rest or arterial partial pressure of oxygen (PaO_2)/fraction of inspired oxygen (FiO_2) ≦ 300 mmHg (l mmHg = 0.133 kPa).

RTPCR

Nasal-pharyngeal swab was taken from each patient and RTPCR was conducted. Each test included two reaction to amplify two genes: E gene and RdRP gene. While the positive test required positive amplification of both genes, with the positivity of one reaction, the test result was considered indeterminate. Negative test result needed negative reaction for both genes.

Procalcitonin

COBAS system (ROCHE) was utilized to measure the procalcitonin levels. Elecsys BRAHMS PCT kit was used following the instructions of manufacturer.

Statistics

Binary logistic regression was utilized to study the relationship between clinical outcomes and factors. All calculations were performed using Minitab 17 software.

Ethics

The study methodology was approved by the Ethics Committee in the College of Medicine, University of Zakho, Kurdistan Region of Iraq. Written consent was obtained for recruited patients.

Results

Patients' Characteristics

During the study period, 1084 patients were referred to the clinic. Among them, 454 patients were confirmed as Covid-19. Among those, 55/494 (11.13%) had severe Covid-19 infection. The average age of patients with severe Covid-19 was 67 ± 14 years and 27/55 (49.09%) of them were males. Fever was the most common clinical features followed by cough and shortness of breath (Table 1).

Procalcitonin and Clinical Outcomes

The average duration of treatment was 10.9 ± 5.1 days. The average duration before treatment was 7.25 ± 4.1 days. In this project, we found 4/55 (7.27%) patients had elevated procalcitonin. Among our 55 patients, 3 (4.45%) patients passed away.

Table 1. **Symptoms of patients with Severe Covid-19 patients**

Symptoms	Number	%
Fever	49	89.1
Cough	16	29.1
Shortness of breath	11	20.0
Fatigue	11	20.0
Myalgia	10	18.2
Loss of appetite	10	18.2
Loss of smell	4	7.3
Epigastric pain	3	5.5
Diarrhea	2	3.6
Vomiting	2	3.6
Loss of taste	1	1.8

Factor Associated with Clinical Outcomes

The factor associated with clinical outcomes was studied. Binary logistic regression was utilized to investigate the impact of gender, chronic diseases, smoking, duration of symptoms and age. No significant association was found between those factors and clinical outcome (Table 2).

Discussion

In this study, among those who diagnosed with Covid-19, 11.13% had severe disease. This is in agreement with other studies that showed the percentage of severe disease is around 10% among diagnosed patients.[1,10] It was shown previously that fever, myalgia, cough, shortness of breath, sore throats, diarrhea were the most common symptoms in patients with Covid-19.[10] In this study, the vast majority of patients with severe Covid-19 had fever and cough. This is in agreement with studies previously conducted in the region and elsewhere.[11] In contrast to other studies, diarrhea and vomiting were uncommon in our patients.[12] This might be explained by different variants that caused the disease.

Procalcitonin remains negative in patients with viral infections including Covid-19.[9] Increased procalcitonin levels may reflect bacterial coinfection and is associated with increase severity and high mortality rate in patients with Covid-19.[9] Antibiotic has been used in the treatment of severe Covid-19 without evidence of bacterial infection.[5,13] This may cause unnecessary side effect for such patients with severe illness. In addition, the burden is already doubled on the health system due to the high number of patients. Using unnecessary medications such as antibiotics, increase the economic burden on the health system. Testing for procalcitonin may help determining which patients may need antibiotics and help understanding the progress of the disease. In our study, 4/55 (7.27%) of our patients showed positive procalcitonin test that might indicate bacterial coinfection. In contrast to other studies,[9] no association was found between procalcitonin positivity and clinical outcome. This might be due to the small sample size used in this study. More studies recruiting larger sample size is recommended to explore the impact of procalcitonin positivity on clinical outcomes. In contrast to other studies that found associations between age or gender and clinical outcomes,[5] no association was found between age or gender and clinical outcomes in this study. In this project, the case fatality rate in severe Covid-19 was 5.45% which was lower than that reported in other studies.[14,15] This might be explained

Table 2. **Factor associated with clinical outcomes in patients with severe Covid-19 patients**

	Cured	Died	*P*	OR	CI
Gender (Male)	23/51	4/4 (100%)	0.99	87	0
Chronic diseases	43/51 (84.3%)	3/4 (75%)	0.64	0.56	0.0514–6.0650
Positive procalcitonin	4/4 (100%)	0/100 (0%)	0.99	0	0
Smoking	4/51 (7.8%)	1/4 (25%)	0.33	3.83	0.3200–45.9171
Duration of symptoms	7.47 ± 4.1	4.5 ± 3.2	0.12	0.79	0.5502–1.1207
Age	61 ± 12.3	56 ± 28.4	0.5	0.98	0.9164–1.0427

partially by the difference in patients genetic makeup and the variations in virus variants.

To conclude, fever was the most common symptom in subjects with severe Covid-19. Few patients with severe Covid-19 showed elevated procalcitonin levels. This might indicate that antibiotics should not prescribed empirically to such patients. Further studies are needed to investigate this.

Conflict of Interest

None.

References

1. Geng M-J, Wang L-P, Ren X, Yu J-X, Chang Z-R, Zheng C-J, et al. Risk factors for developing severe COVID-19 in China: an analysis of disease surveillance data. Infectious Diseases of Poverty. 2021;10(1):48.
2. Kraemer MUG, Yang C-H, Gutierrez B, Wu C-H, Klein B, Pigott DM, et al. The effect of human mobility and control measures on the COVID-19 epidemic in China. Science. 2020;368(6490):493.
3. Xiao Y, Torok ME. Taking the right measures to control COVID-19. The Lancet Infectious Diseases. 2020;20(5):523–4.
4. Hussein NR, Naqid IA, Saleem ZSM, Dildar HM, Ibrahim N. The impact of breaching lockdown on the spread of COVID-19 in Kurdistan region, Iraq. Avicenna Journal of Clinical Microbiology and Infection. 2020;7(1):34–5.
5. Hussein NR, Naqid IA, Saleem ZSM. A retrospective descriptive study characterizing coronavirus disease epidemiology among people in the Kurdistan Region, Iraq. Mediterranean Journal of Hematology and Infectious Diseases. 2020;12(1):e2020061.
6. Murray CJL, Ikuta KS, Sharara F, Swetschinski L, Robles Aguilar G, Gray A, et al. Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis. The Lancet. 2022;399(10325):629–55.
7. Rasheed NA, Hussein NR. *Staphylococcus aureus*: an overview of discovery, characteristics, epidemiology, virulence factors and antimicrobial sensitivity. European Journal of Molecular & Clinical Medicine. 2021;8(3):1160–83.
8. Stevens MP, Doll M, Pryor R, Godbout E, Cooper K, Bearman G. Impact of COVID-19 on traditional healthcare-associated infection prevention efforts. Infect Control Hosp Epidemiol. 2020;41(8):946–7.
9. Lippi G, Plebani M. Procalcitonin in patients with severe coronavirus disease 2019 (COVID-19): a meta-analysis. Clin Chim Acta. 2020;505:190–1.
10. Verity R, Okell LC, Dorigatti I, Winskill P, Whittaker C, Imai N, et al. Estimates of the severity of coronavirus disease 2019: a model-based analysis. The Lancet Infectious Diseases. 2020;20(6):669–77.
11. Çalıca Utku A, Budak G, Karabay O, Güçlü E, Okan HD, Vatan A. Main symptoms in patients presenting in the COVID-19 period. Scottish Medical Journal. 2020;65(4):127–32.
12. Han C, Duan C, Zhang S, Spiegel B, Shi H, Wang W, et al. Digestive symptoms in COVID-19 patients with mild disease severity: clinical presentation, stool viral RNA testing, and outcomes. Am J Gastroenterol. 2020;115(6):916–23.
13. Mustafa L, Tolaj I, Baftiu N, Fejza H. Use of antibiotics in COVID-19 ICU patients. Journal of Infection in Developing Countries. 2021;15(4):501-5.
14. Mahendra M, Nuchin A, Kumar R, Shreedhar S, Mahesh PA. Predictors of mortality in patients with severe COVID-19 pneumonia - a retrospective study. Adv Respir Med. 2021;89(2):135–44.
15. Shi C, Wang L, Ye J, Gu Z, Wang S, Xia J, et al. Predictors of mortality in patients with coronavirus disease 2019: a systematic review and meta-analysis. BMC Infectious Diseases. 2021;21(1):663.