IJACT, Volume 2, Issue 5, 2024 ISSN: 2995-5378
http://medicaljournals.eu/index.php/IJACT

INTERNATIONAL JOURNAL OF ALTERNATIVE AND CONTEMPORARY THERAPY

Evaluating the results of treatments used in the management of Covid-19 patients

Dr. Murooj Luai Majeed Altimimi
Assistant Professor in Pharmacology in the Pharmacology Department at Kufa Medical College, Al-Najaf, Iraq.
murooj.altameemi@uokufa.edu.iq

Annotation. **Background:** One of the most significant global health crises is the Coronavirus 2019 infection, which results from the SARS-Cov-2 virus. **Objective**: The purpose of this study is to evaluate the clinical outcomes of COVID-19 treatments in Baghdad-Iraq hospitals. **Patients and methods:** Between the 8th of April 2022 and the 19th of October 2023, 120 patients who were documented as medical records of SARS-CoV-2 were received at hospitals in Baghdad, Iraq. All demographic as well as clinical data for these patients, including laboratory examinations, were compiled and evaluated. **Results:** The age group of 41 to 50 years constituted 45% of the total number of patients. Males were found to have the highest rate, with 72 cases compared to 48 cases in females. The most prevalent diseases among the patients were hypertension (60 cases), diabetes (45 cases), chronic respiratory disease (35 cases), and cardiovascular disease (28 cases).

Additionally, 50 patients were found to be smokers. Additionally, the most prevalent symptoms observed in the patients were cough (90 cases), fever (48 cases), shortness of breath (36 cases), and sore throat (30 cases). The diagnostic techniques employed included polymerase chain reaction (PCR) tests (45 cases) and antigen tests (4 cases). Antibody tests were performed on 20 patients, while chest X-rays were conducted on 51 patients. Treatments included Remdesivir (11 patients), corticosteroids (23 patients), and oxygen therapy with SpO2 monitoring (86 patients). Of the patients, 23 were classified as having mild COVID-19, 30 as moderate, and 29 as severe. The average length of hospital stay was 11 days, with six days or less for six patients, 9 to 15 days for 30 patients, and more than 15 days for 84 patients. Six patients died. A total of 30 cases were classified as severe, 29 as critical, and 38 as critical. The length of hospital stay was less than nine days in six cases, between nine and 15 days in 30 cases, and greater than 15 days in 84 cases. Six cases resulted in death. **Conclusion:** The study reveals that comorbidities increase the risk of severe COVID-19 symptoms and complications, leading to higher hospitalizations and mortality rates. Treatment effectiveness is crucial in preventing and reducing disease severity, but individual factors like age and health can affect effectiveness. Early detection and prompt medical intervention are essential for improved outcomes.

Keywords: COVID-19 symptoms, Comorbidities, Treatment effect, Hospitalization time, and Mortality rate.

Introduction

Coronaviruses are a type of virus that is known to cause mild to moderate upper respiratory tract infections in humans [1]. The most common symptoms include fever and coughing. These viruses also belong to the group of viruses that cause the common cold, which is one of the reasons why they are not considered dangerous when compared to other types of infections, such as influenza or SARS-CoV [2 – 5]

The first case of COVID-19 in Vietnam was reported on January 22, 2020, with the country entering

its fourth wave in late April 2021 [6,7]. The fourth wave, in terms of numbers, came as a result of exponential growth, largely due to the fast spread of the delta and omicron variants. On January 25, 2023, the Vietnam Ministry of Health stated the following: As of January 25, 2023, Vietnam has reported a total of 11.52 million cases of COVID-19, with 10.61 million individuals fully recovering [8 -10]. Of these, 43,186 have succumbed to the disease, resulting in a case fatality rate of approximately 0.37%. Globally, numerous studies have been conducted to investigate the diagnosis and treatment of patients with COVID-19. [11]

Richardson and colleagues demonstrated that there are various forms of COVID-19 infection, including mild coronavirus pneumonia, which affects only the large airways. Patients with hypersensitivity pneumonitis, which is known to be caused by fungal spores, often respond well to corticosteroids but quickly deteriorate when therapy ends [12 - 14]. Conversely, fibreoptic bronchoscopy may still be employed despite its reduced yield if routine microbiological or virological tests have not covered everything during further evaluation [15]. Kurihara et al. [16]. Conducted research on 500 patients in the US with acute respiratory distress syndrome (ARDS) secondary to COVID-19 at one hospital. Additionally, the outcome of COVID-19 patients associated with ARDS in the transplant group was also assessed. In the early months of 2020, Wang et al. conducted a study examining the medical histories of 421 patients diagnosed with COVID-19 at a mobile cabin hospital located within Wuhan, China [17]. Concurrently, Okogbenin et al. presented a study on the clinical characteristics, therapeutic options, and prognosis of cases infected with the novel coronavirus at a quarantine and treatment facility in Nigeria. Prior to these studies, research on the subject of COVID-19 infection had been conducted in Vietnam and published. [18,19]

In fact, the research provided insights into the factors contributing to prolonged hospital stays among patients with COVID-19. It also examined Vietnam's efforts to combat the pandemic, including the organization of its health system to control SARS-CoV-2 infections [20]. Additionally, it described the clinical features, isolation, and complete genome sequence of SARS-CoV-2 from the first two patients in Vietnam. It is regrettable that, to date, no comprehensive study has been conducted to ascertain the full range of potential symptoms and asymptomatic manifestations, as well as the various therapeutic approaches employed in the treatment of patients with COVID-19 at Vietnamese hospitals. Some studies have reported on the clinical characteristics, treatment outcomes, and other associated factors among patients with COVID-19 [21]. However, the reported results differed significantly across various studies due to demographic differences between patients themselves, their access to healthcare, the quality of the healthcare infrastructure, and the readiness of the regions in question to deal with such situations. [22]

Patients and methods

A cross-sectional study was conducted on patients infected with COVID-19 who were admitted to hospitals in Baghdad, Iraq, between 8 April 2022 and 19 October 2023. The samples included 120 patients, with ages ranging from less than 30 years to over 50 years. We excluded people from this investigation who had experienced surgeries before or contracted an infection. Severe illnesses include acute lung failure, cancer patients, and patients with serious symptoms those may be caused by the HIV virus.

All patients' demographic and clinical data were recorded, including age, sex, and body mass index, that were classified into underweight and normal weight. Also considered were the following variables: overweight and obesity, comorbidities, smoking, educational level and monthly income per capita.

This study adopted an all-inclusive tactic in investigating laboratory tests and symptoms to determine the patients’ rates of these diseases. Part of this was looking into how many instances occurred as well as what forms they were in, such as fevers or sore throats, among others, like vomiting without actually seeing anything come from the mouth.

The disease was classified by the harshness; the scale was designed for this purpose so that we could see how dangerous the virus is. It was put into four groups: low, medium, high, and critical.

All patients admitted to hospitals in Baghdad, Iraq, underwent diagnostic testing, which employed four distinct techniques: polymerase chain reaction (PCR) tests, antigen tests, antibody tests, and chest X-

rays. Laboratory tests were conducted on all patients to determine their risk level, which included assessments of blood pressure and cholesterol levels (low, medium, normal, and high), as well as heart rate. Consequently, we have conducted or are working to implement a range of treatments specified by the World Health Organization, including remdesivir, corticosteroids, and oxygen therapy, SpO2, which was classified as less than 94%, 94 to 96%, and greater than 96%. Secondary data was identified, which included the respiratory support that all patients underwent. This was classified or distributed according to the following categories: room air breathing, nasal cannula, bag-mask ventilation, artificial respiration, and nasal cannula on flow. In addition, the patient's clinical data were recorded. These were determined during the period of stay in the hospital and included complications, length of stay in the hospital, and the number of deaths after treatment.

All patients were given a series of questions, as well as their thorough consent was acquired. This permitted the clinical improvements seen through patients to be determined, and they were divided into two groups. Patients were divided into two groups: those who were discharged from the hospital and those who were on the fourth day following therapy. The second category comprises patients who were discharged from the hospital. All patients in this category were subjected to the questionnaires, which enabled us to ascertain the extent of the improvements made to the patients and the effectiveness of the treatment they had undergone.

Additionally, a questionnaire was administered to assess the quality of life of the patients following treatment. This was done to ascertain the extent to which the treatment was effective and to identify its impact on various aspects of life, including physical, psychological, social, and emotional well-being, as well as daily activity. All demographic and clinical data were organised, managed, and their results were distributed using the SPSS version 22 program.

Results

Table 1: Clinical and demographic features of patients with COVID–19.

Features	**Number of patients [120]**	**Percentage [%]**
Age		
< 30	**6**	**5%**
30 – 40	**24**	**20%**
41 – 50	**54**	**45%**
> 50	**36**	**30%**
Sex		
Male	**72**	**60%**
Female	**48**	**40%**

BMI, [kg/m2]		
Underweight	**9**	**7.5%**
Normal weight	**14**	**11.67%**
Overweight	**22**	**18.33%**
Obesity	**34**	**28.33%**
Comorbidities		
Yes	**84**	**70%**
No	**36**	**30%**
Hypertension	**60**	**50%**
Diabetes	**45**	**37.5%**
Asthma	**14**	**11.67%**
Cardiovascular disease	**28**	**23.33%**
Chronic respiratory disease	**35**	**29.17%**
Anemia	**7**	**5.83%**
Kidney diseases	**26**	**21.67%**
Smoking status		
Yes	**50**	**41.67%**
No	**70**	**58.33%**
Education level		
Primary	**25**	**20.83%**
Secondary	**40**	**33.33%**

College/university	**55**	**45.83%**
Income status, $		
< 500	**56**	**46.67%**
500 - 700	**35**	**29.17%**
> 700	**29**	**24.17%**

Table 2: Identify the main symptoms prevalence on patients with COVID – 19.

Symptoms	**Number of patients [120]**	**Percentage [%]**
Cough	**90**	**75%**
Fever	**48**	**40%**
Sore throat	**30**	**25%**
Loss of smell/taste	**24**	**20%**
Nausea	**6**	**5%**
Diarrhea	**18**	**15%**
Shortness of breath	**36**	**30%**
Muscle pain	**12**	**10%**
Other	**7**	**5.83%**

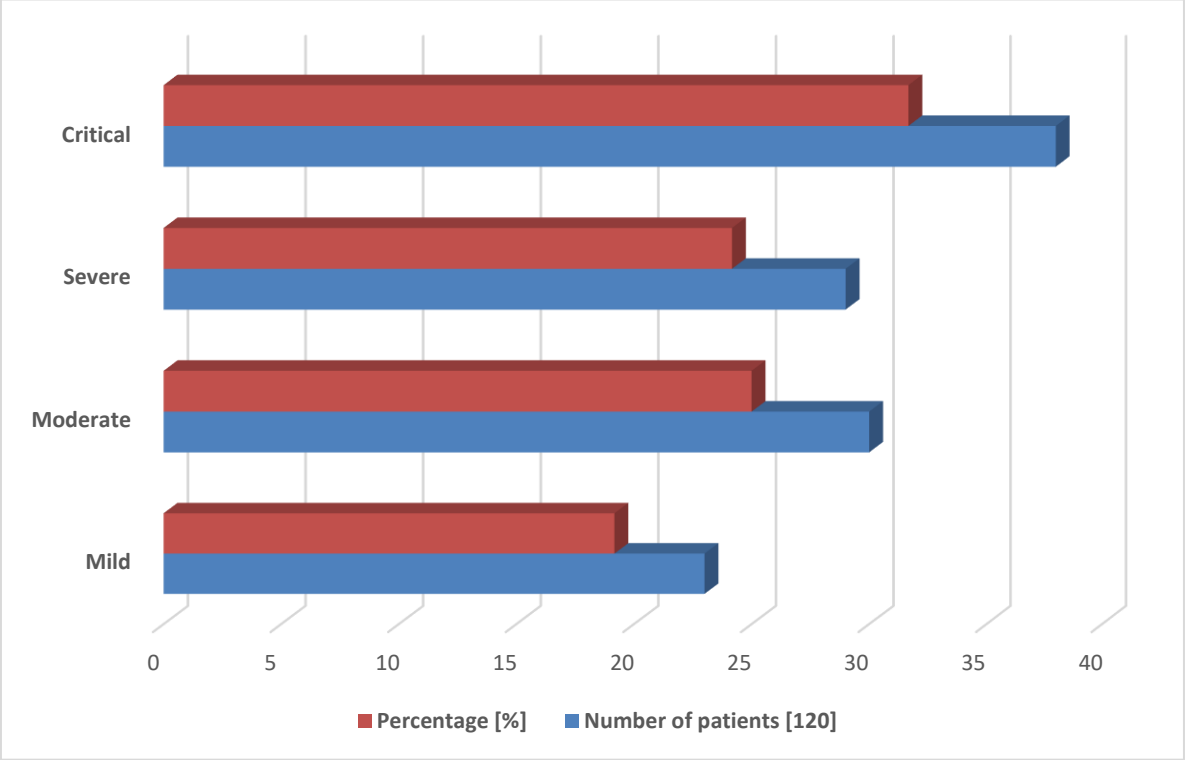

Figure 1: Distribution of severity of COVID–19 on patients.

Table 3: Identify types of techniques, diagnoses, and treatments conducted on patients with COVID–19.

Items	Number of patients [120]	Percentage [%]
COVID–19 diagnoses techniques		
Polymerase chain reaction (PCR) tests	**45**	**37.5%**
Antigen tests	**4**	**3.33%**
Antibody tests	**20**	**16.67%**
Chest x-rays	**51**	**42.5%**
Signs		
Blood pressure		
Normal	**50**	**41.67%**

Hypertension	**70**	**58.33%**		
Cholesterol				
Low	**18**	**15%**		
Normal	**40**	**33.33%**		
High	**62**	**51.67%**		
Heart rate				
Normal	**43**	**35.83%**		
High	**77**	**64.17%**		
Treatments				
Remdesivir	**11**	**9.17%**		
Corticosteroids	**23**	**19.17%**		
Oxygen therapy, SpO2	**86**	**71.67%**		
< 94%	**5**	**4.17%**		
94 – 96%	**12**	**10%**		
> 96%	**69**	**57.5%**		

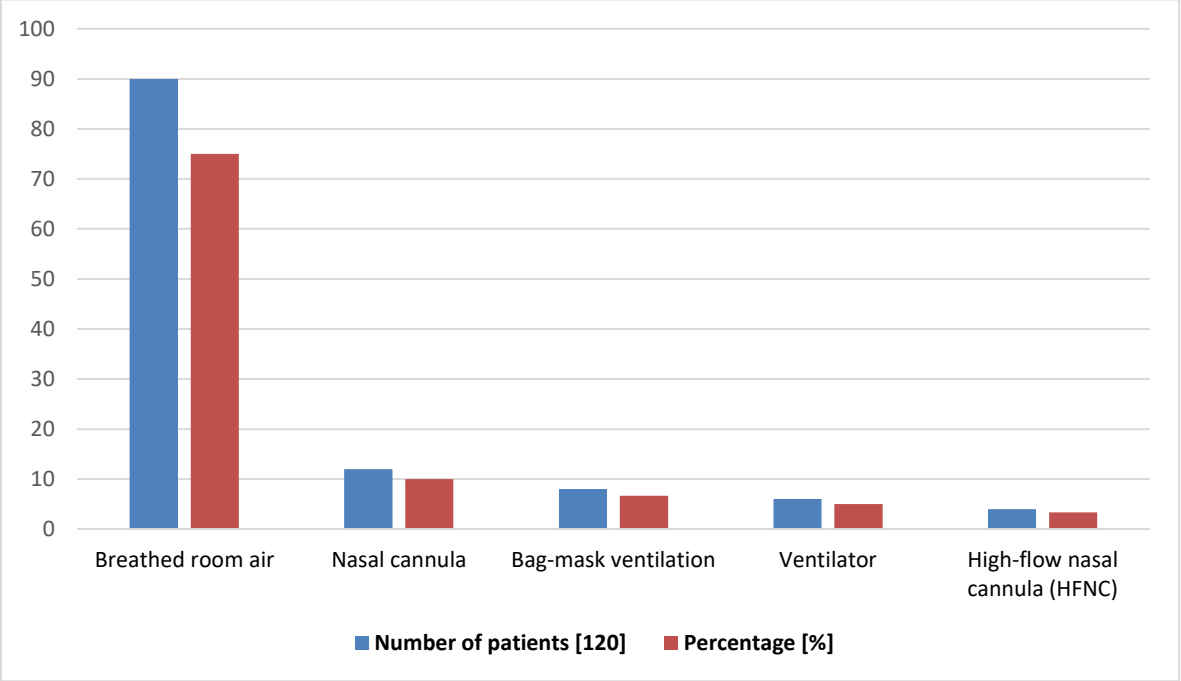

Figure 2: Determining the main data of Respiratory support who undergone to COVID-19 patients.

Table 4: Enrolled hospitalization data of patients with covid – 19.

Data	Number of patients	Percentage [%]
Complications		
Respiratory issues	**4**	**3.33%**
Organ damage	**3**	**2.50%**
Blood clotting	**3**	**2.50%**
Depression and anxiety	**8**	**6.67%**
Total	**18**	**15%**
Length of stay in hospital, days		
< 9	**6**	**5%**
9 – 15	**30**	**25%**
> 15	**84**	**70%**

Mortality rate		
Yes	**6**	**5%**
No	**114**	**95%**

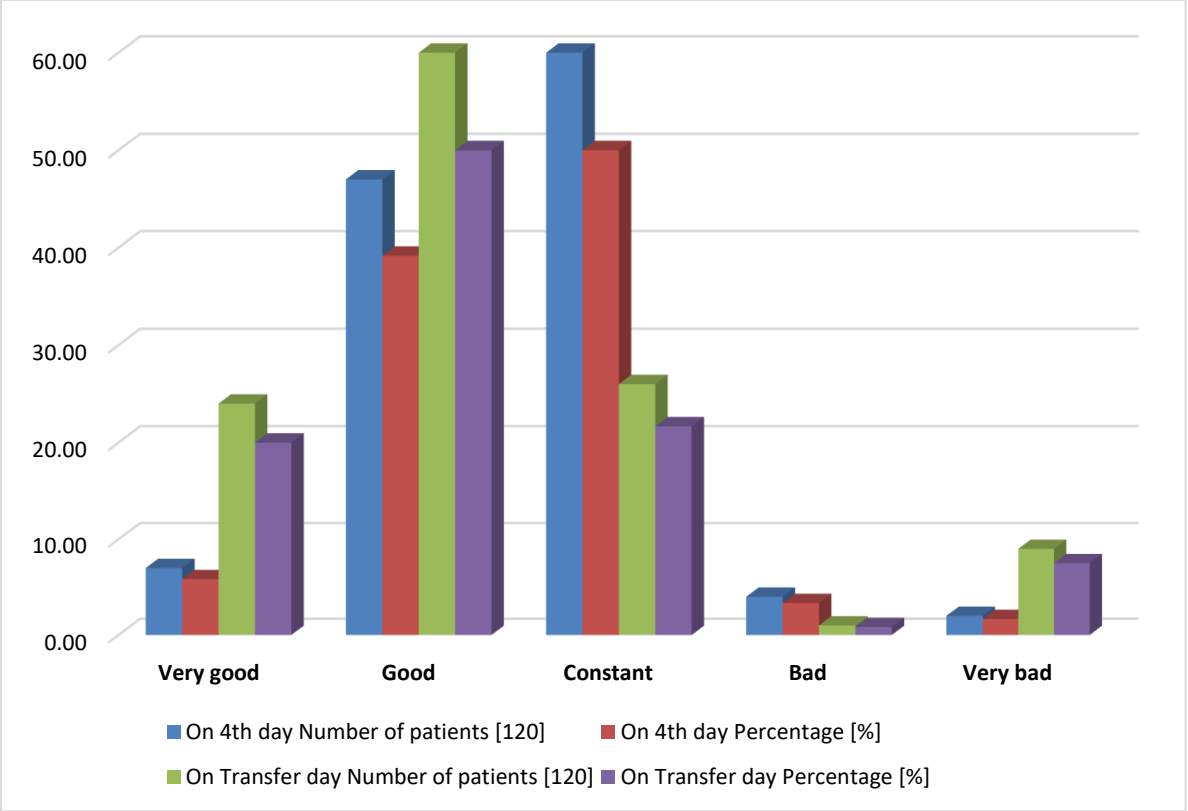

Figure 3: Clinical improvement outcomes of COVID-19 patients after conducting treatment in day five and transfer day.

Table 5: Assessment of quality of life for patients after treatments of covid – 19.

Items	**QoL scores**
Physical function	**67.72 ± 8.90**
Psychological function	**75.52 ± 9.87**
Social and emotional functions	**72.24 ± 6.69**
Daily activity	**77.60 ± 6.85**

Table 6: Analysis of multiple logistic regressions for the risk factors affected treatment outcomes in patients with COVID-19.

Risk factors	OR	CI 95%
Comorbidity	4.87	1.22 – 19.74
Breathed room air	2.6	0.6 – 7.2
Abnormal white blood cells	2.5	0.5 – 8.8
Smoking	1.8	0.9 – 8.96
Hypertension	2.7	1.2 – 7.55
Cough	3.30	0.10 – 5.75
Normal D-dimer	6.80	1.6 – 9.77
Decreased blood pH	5.9	1.3 – 25.90

Discussion

The study aimed to determine the demographic and clinical outcomes of patients aged between 41 and 50 years, which constituted 45% of the total number of patients. The next largest group was patients aged between 30 and 40 years, which accounted for 20% of the total. Males were found to have the highest rate of cases, with 72 cases, compared to females, who accounted for 28% of the total. A total of 48 cases were observed, with a prevalence of comorbidities of 70%. The most prevalent diseases in the patients were hypertension (60 cases), diabetes (45 cases), chronic respiratory disease (35 cases), and cardiovascular disease (28 cases). Additionally, 50 individuals were found to be smokers. In addition, the most common symptoms were identified: cough (90 instances), fever (forty-eight cases), shortness of breath (a total of 36 cases), as well as sore throat (30 cases).

In regard to diagnostic outcomes, patients underwent a battery of tests employing cutting-edge technology. These tests showed that polymerase chain reaction (PCR) tests had been conducted on 45 instances, antigen testing in 4 cases, antibody tests of 20 cases, and chest X-rays on 51.

The treatment used were Remdesivir. A total of 11 cases were treated with corticosteroids, 23 cases received oxygen therapy and SpO2 monitoring, and 86 cases were diagnosed with mild, moderate, severe, or critical forms of COVID-19. Furthermore, we identified the most common forms of respiratory support, which were room air (75%), nasal cannula (10%), bag-mask ventilation (6.67%), ventilator (5%), and high-flow nasal cannula (HFNC) (3.33%).

Furthermore, we conducted a clinical outcome analysis in the hospital setting, where we found that the rate of complications after treatment was 15%. The most common factors were respiratory issues (4 cases) and depression and anxiety (8 cases). The length of stay in the hospital was classified into three categories: less than nine days (6 cases), 9–15 days (30 cases), and more than 15 days (84 cases). The death rate was 6 cases. Furthermore, clinical outcomes were classified into three categories: very good (7 cases), good (47 cases), and bad (4 cases) on the fourth day; and very good (24 cases), good (60 cases), and bad (1 case) at the end of the study. In terms of quality of life after treatment, the following scores were obtained: Physical function (67.72 ± 8.90), Psychological function (75.52 ± 9.87), Social and emotional functions

(72.24 ± 6.69), and Daily activity (77.60 ± 6.85).

According to recent studies, the novel coronavirus disease, commonly known as COVID-19, has grown into a global phenomenon, impacting millions of people worldwide, with people who have pre-existing health conditions, including diabetes and heart disease, experiencing more severe outcomes because of to the virus. [23,24,25]

Furthermore, it is possible that those suffering from such ailments will experience severe complications as a result of the virus, compared to the mild symptoms which are commonly observed, leading to higher rates of death among people with underlying conditions and many requiring hospitalizations as a last resort. [26 -29]

According to a study of the literature, those who have comorbidity have a greater risk of mortality than those without, as the presence of other disorders could result in the development of severe symptoms, which may eventually lead to death. [30]

Furthermore, the presence of other conditions during COVID-19 treatment can alter the efficacy of the treatment, as people who have underlying medical issues may require more intensive treatment as well as closer monitoring, but some medications used to treat comorbidities may interact with those used to treat COVID-19. [31 - 34]

Conclusion

The results of our study indicate that patients with comorbidities are at a higher risk of developing severe symptoms and complications from COVID-19, which in turn leads to increased hospitalisations and mortality rates. Furthermore, the current findings demonstrate that the effectiveness of the treatments used has significantly contributed to the prevention and reduction of the severity of the disease. However, the effectiveness of treatment can vary depending on individual factors such as age, overall health, and the presence of comorbidities. The importance of early detection and prompt medical intervention in improving outcomes for patients infected with COVID-19 cannot be overstated.

References:

1. Drosten C., Günther S., Preiser W., Werf S.V.D., Brodt H.-R., Becker S., Rabenau H., Panning M., Kolesnikova L., Fouchier R.A.M., et al. Identification of a Novel Coronavirus in Patients with Severe Acute Respiratory Syndrome. N. Engl. J. Med. 2003;348:1967–1976.
2. de Groot R.J., Baker S.C., Baric R.S., Brown C.S., Drosten C., Enjuanes L., Fouchier R.A.M., Galiano M., Gorbalenya A.E., Memish Z.A., et al. Middle East Respiratory Syndrome Coronavirus (MERS-CoV): Announcement of the Coronavirus Study Group. J. Virol. 2013;87:7790–7792.
3. Huang C., Wang Y., Li X., Ren L., Zhao J., Hu Y., Zhang L., Fan G., Xu J., Gu X., et al. Clinical Features of Patients Infected with 2019 Novel Coronavirus in Wuhan, China. Lancet. 2020;395:497–506.
4. Wang C., Horby P.W., Hayden F.G., Gao G.F. A Novel Coronavirus Outbreak of Global Health Concern. Lancet. 2020;395:470–473.
5. Le T.A.T., Vodden K., Wu J., Atiwesh G. Policy Responses to the COVID-19 Pandemic in Vietnam. Int. J. Environ. Res. Public Health. 2021;18:559.
6. World Health Organization. COVID-19 Weekly Epidemiological Update. World Health Organization; Geneva, Switzerland: 2022. pp. 1–33.
7. Wikipedia, Timeline of the COVID-19 Pandemic in Vietnam. [(accessed on 25 January 2023)]. Available online: https://en.wikipedia.org/wiki/Timeline_of_the_COVID-19_pandemic_in_Vietnam
8. Mai D.T., Phan H., Hoang V.M., Nguyen T.D., Phan H.Q., Vuong X.T., Dao V.P. Treatment of Stroke Patients in the Context of the COVID-19 Pandemic: Lessons Learnt from a Major Stroke Center in Vietnam. J. Glob. Health. 2021;11:03092.
9. Ministry of Health of Vietnam COVID-19 Information. [(accessed on 25 January 2023)];2023 Available online: https://ncov.moh.gov.vn/

10. Richardson S., Hirsch J.S., Narasimhan M., Crawford J.M., McGinn T., Davidson K.W. Presenting Characteristics, Comorbidities, and Outcomes among 5700 Patients Hospitalized with COVID-19 in the New York City Area. JAMA. 2020;323:2052–2059.

11. Kurihara C., Manerikar A., Querrey M., Felicelli C., Yeldandi A., Garza-Castillon R., Lung K., Kim S., Ho B., Tomic R., et al. Clinical Characteristics and Outcomes of Patients with COVID-19-Associated Acute Respiratory Distress Syndrome Who Underwent Lung Transplant. JAMA. 2022;327:652–661.

12. Wang W., Xin C., Xiong Z., Yan X., Cai Y., Zhou K., Xie C., Zhang T., Wu X., Liu K., et al. Clinical Characteristics and Outcomes of 421 Patients with Coronavirus Disease 2019 Treated in a Mobile Cabin Hospital. Chest. 2020;158:939–946.

13. Okogbenin S.A., Erameh C.O., Egbuta O.C., Iraoyah K.O., Onyebujoh J.T., Erohubie C.E., Jaggu A.Y., Onovo R., Avbuluimen M., Odewale M.A., et al. Clinical Characteristics, Treatment Modalities and Outcome of Coronavirus Disease 2019 Patients Treated at ThisDay Dome Isolation and Treatment Centre, Federal Capital Territory Abuja, Nigeria. Niger Postgrad Med. J. 2021;28:81–87. [PubMed] [Google Scholar]

14. Thai P.Q., Toan D.T.T., Dinh T.S., Hoang T.H.V., Luu N.M., Hung L.X., Ngo V.T., Luu N.H., Duong H.L., Luong N.K., et al. Factors Associated with the Duration of Hospitalization among COVID-19 Patients in Vietnam: A Survival Analysis. Epidemiol. Infect. 2020;148:e114.

15. Ha B.T.T., Quang L.N., Mirzoev T., Tai N.T., Thai P.Q., Dinh P.C. Combating the COVID-19 Epidemic: Experiences from Vietnam. Int. J. Environ. Res. Public Health. 2020;17:3125.

16. Nguyen H.V., Hoang M.V., Dao A.T.M., Nguyen H.L., Nguyen T.V., Nguyen P.T., Khuong L.Q., Le P.M., Gilmour S. An Adaptive Model of Health System Organization and Responses Helped Vietnam to Successfully Halt the COVID-19 Pandemic: What Lessons Can Be Learned from a Resource-Constrained Country. Int. J. Health Plann. Mgmt. 2020;35:988–992.

17. Nguyen T.H.D., Vu D.C. Impacts of the COVID-19 Pandemic Upon Mental Health: Perspectives from Vietnam. Psychol. Trauma Theory Res. Pract. Policy. 2020;12:480–481.

18. Doan D.A., Ho H.H., Tran L.D., Nguyen P.L., Le A.T.L., Dinh D.X. Knowledge, Attitudes, and Practices of University Students Regarding COVID-19: A Cross-Sectional Study in Vietnam. BMC Public Health. 2022;22:2016.

19. Nguyen T.D.T., Kawai K., Nakakubo T. Capacity Assessment to Secure COVID-19 Waste Treatment in Vietnam. J. Mater. Cycles Waste Manag. 2023;25:302–313.

20. Phan L.T., Nguyen T.V., Huynh L.K.T., Dao M.H., Vo T.A.N., Vu N.H.P., Pham H.T.T., Nguyen H.T., Nguyen T.T., Le H.Q., et al. Clinical Features, Isolation, and Complete Genome Sequence of Severe Acute Respiratory Syndrome Coronavirus 2 from the First Two Patients in Vietnam. J. Med. Virol. 2020;92:2209–2215.

21. Baloch S., Baloch M.A., Zheng T., Pei X. The Coronavirus Disease 2019 (COVID-19) Pandemic. Tohoku J. Exp. Med. 2020;250:271–278.

22. Li J., Huang D.Q., Zou B., Yang H., Hui W.Z., Rui F., Yee N.T.S., Liu C., Nerurkar S.N., Kai J.C.Y., et al. Epidemiology of COVID-19: A systematic review and meta-analysis of clinical characteristics, risk factors, and outcomes. J. Med. Virol. 2021;93:1449–1458.

23. Ministry of Health of Vietnam. 3416/QD-BYT: Guidance on Diagnosis and Treatment of Acute Respiratory Infection Caused by New Strain of Corona Virus (2019-nCoV) Ministry of Health of Vietnam; Hanoi, Vietnam: 2021.

24. Moazzam M., Sajid M.I., Shahid H., Butt J., Bashir I., Jamshaid M., Shirazi A.N., Tiwari R.K. Understanding COVID-19: From Origin to Potential Therapeutics. Int. J. Environ. Res. Public Health. 2020;17:5904.

25. Ennezat P.V., Gottlieb R.L., Juneja K., Hill J.A. Outpatient Remdesivir to Prevent Progression to Severe COVID-19. N. Engl. J. Med. 2022;386:1094.

26. S Sav N.M., Türay S., Özde S., Öksüz S. Evaluation of Clinical Features and Treatment Results of Pediatric Patients with Pre-Diagnosis of COVID-19. Duzce Med. J. 2022;24:162–169.

27. Zhu B., Feng X., Jiang C., Mi S., Yang L., Zhao Z., Zhang Y., Zhang L. Correlation between white blood cell count at admission and mortality in COVID-19 Patients: A retrospective study. BMC Infect. Dis. 2021;21:574.

28. Surendra H., Elyazar I.R., Djaafara B.A., Ekawati L.L., Saraswati K., Adrian V., Widyastuti, Oktavia D., Salama N., Lina R.N., et al. Clinical characteristics and mortality associated with COVID-19 in Jakarta, Indonesia: A hospital-based retrospective cohort study. Lancet Reg. Heal. -West. Pac. 2021;9:100108.

29. Cao J., Tu W.-J., Cheng W., Yu L., Liu Y.-K., Hu X., Liu Q. Clinical Features and Short-Term Outcomes of 102 Patients with Corona Virus Disease 2019 in Wuhan, China. Clin Infect Dis. 2020;71:748–755.

30. Li L.-Q., Huang T., Wang Y.-Q., Wang Z.-P., Liang Y., Huang T.-B., Zhang H.-Y., Sun W., Wang Y. COVID-19 Patients' Clinical Characteristics, Discharge Rate, and Fatality Rate of Meta-Analysis. J. Med. Virol. 2020;92:577–583.

31. Zhang B., Zhou X., Qiu Y., Song Y., Feng F., Feng J., Song Q., Jia Q., Wang J. Clinical Characteristics of 82 cases of death from COVID-19. PLoS ONE. 2020;15:e0235458.

32. Xiong S., Liu L., Lin F., Shi J., Han L., Liu H., He L., Jiang Q., Wang Z., Fu W., et al. Clinical characteristics of 116 hospitalized patients with COVID-19 in Wuhan, China: A single-centered, retrospective, observational Study. BMC Infect. Dis. 2020;20:787.

33. Ullrich F., Hanoun C., Turki A.T., Liebregts T., Breuckmann K., Alashkar F., Reinhardt H.C., von Tresckow B., von Tresckow J. Early report on the severity of COVID-19 in hematologic patients infected with the SARS-CoV2 omicron variant. Eur. J. Haematol. 2022;109:364–372.

34. Borst B.V.D., Peters J.B., Brink M., Schoon Y., Bleeker-Rovers C.P., Schers H., van Hees H.W.H., van Helvoort H., Boogaard M.V.D., Hoeven H.V.D., et al. Comprehensive Health Assessment 3 Months after Recovery from Acute Coronavirus Disease 2019 (COVID-19) Clin. Infect. Dis. 2021;73:E1089–E1098.