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Clinical and Epidemiological Features of COVID-19 Patients in Rafsanjan County, Iran: A Secondary Data based Study

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Abstract

Background: Information about COVID-19 patients must be studied meticulously to control the COVID-19 pandemic more effectively. This study aimed to evaluate the clinical and epidemiological features of COVID-19 patients in Rafsanjan County.
Materials and Methods: In this descriptive study, data of 3,212 patients referred to the Ali-Ibn Abitaleb Hospital in Rafsanjan County, Iran were recorded. Collected data included demographic information (age, sex, etc.), information about the method of referral to the hospital, contact history, previous history of infections, clinical symptoms associated with the disease, and data on comorbidities. Data were analyzed using a chi-square test and logistic regression coefficients.
Results: The three common clinical symptoms were fevers (46%), muscular pain (44.6%), and coughs (34%). The most common comorbidity was hypertension (7.9%), and the case fatality rate was 10.8%. Besides, the death ratio in confirmed patients was significantly higher than that in suspected cases ($P < 0.001$). The chance of death in men was 16% higher than Women's (OR = 1.166). The chance of death in people with cancer and in people with reduced levels of consciousness was 9.1 and 5.5 times, respectively, higher than that in patients without comorbidity ($P < 0.001$).
Conclusions: Most of the features of our patients resembled those reported in previous research. The results of this study can contribute to healthcare policymaking for this disorder.

Keywords: COVID-19, Cross-Sectional Study, Patients

Introduction

Many pneumonia cases of unknown etiology emerged in Wuhan, China, in December 2019, whose clinical signs and symptoms greatly resembled those found in viral pneumonia [1]. Accordingly, a new coronavirus was identified as a pathogen, designated by the WHO as COVID-19 [2,3]. The coronavirus attracted attention worldwide due to its being greatly communicable in terms of common infection and quick dissemination. Pretty soon, the World Health Organization (WHO) declared the coronavirus 2019 disease (COVID-19) as an emergency for public health and regarded it as an international concern [4, 5]. COVID-19, with high pathogenicity and a rapid spread, caused fear and anxiety in society and citizens [6,7]. Evaluation and identification of clinical and epidemiological features of COVID-19 can help make proper decisions and control the epidemic. Thus, to control the COVID-19 pandemic more successfully,

it is required to explore information about COVID-19 patients meticulously. Globally, as of 06:07 pm (CEST), October 21, 2021, there have been 241,886,635 confirmed cases of COVID-19, including 4,919,755 deaths, having been reported to the WHO. Iran is one of the regions with the highest rate of COVID-19, and as of October 21, 2021, there have been 5,821,737 confirmed cases and 124,585 mortalities of COVID-19 [8]. Even though the amount of research on COVID-19 is growing globally, most studies are from China, the United States, and Europe [9-16]. Few studies from developing countries, such as Iran, have reported clinical and epidemiological features of this disease. In the present study, we aim to specify features of the COVID-19 patients who were hospitalized at the Ali-Ibn Abitaleb Hospital affiliated with Rafsanjan University of Medical Sciences in Rafsanjan County. This cross-sectional study aims to evaluate clinical and epidemiological features of COVID-19 patients in the Rafsanjan County within the time or period from February 11 to September 21, 2020. In fact, primary diagnosis based on early clinical signs can play a key role in further managing and warding off the infection, specifically in regions with restricted availability of quick testing [17].

Materials and Methods

A secondary data based design was created to analyze and explore clinical and epidemiological features of COVID-19 confirmed cases, which were determined by the positive results of the RT-PCR test (Reverse Transcription-Polymerase Chain Reaction). Besides, suspected cases were determined by suspicious clinical signs and chest CT scans among Rafsanjan citizens during the COVID-19 pandemic.

Data from 3,212 suspected cases and confirmed COVID-19 patients admitted to the Ali-Ibn Abitaleb Hospital in Rafsanjan County were analyzed. In addition, suspected cases were diagnosed by internal and infectious disease specialists and confirmed patients by positive results of the PCR test. The sampling method was a census. According to the data obtained from the hospital, all cases who were referred to the hospital from February 11, 2020, to September 21, 2020, were included in this study.

The present study, with a descriptive cross-sectional and epidemiological design, was conducted on hospitalized COVID-19 patients (suspected and confirmed cases) at the Ali-Ibn Abitaleb Hospital in Rafsanjan County. All data of this study were collected based on hospital reports of the care data monitoring system belonging to the Iranian Ministry of Health and Medical Education. The variables examined in this study included demographic information (age, sex, etc.) and information about the method of referral to the hospital, contact history, previous history of infections, clinical symptoms associated with the disease (fevers, coughs, nausea, O2Sat, etc.) and records of comorbidities. In addition, definitive diagnosis of the patients was confirmed by RT-PCR using throat and nose swab samples from the URT (upper respiratory tract), or it was done clinically based on lung imaging data, specifically thoracic CT, or other suspicious symptoms.

The study variables were analyzed using descriptive statistics, such as frequency tables and percentages. Moreover, statistical analysis was performed by SPSS 22.0. Additionally, logistic regression coefficients were employed to assess the effect of numerous variables on the probability of deaths from COVID-19. All demographic variables, clinical symptoms, and underlying diseases were included in the model. Next, using the backward selection method, the intended variables are entered into the model.

This study was confirmed by the Ethics Committee of the Human Research Department at Rafsanjan University of Medical Sciences (IR.RUMS.REC.1399.006).

Results

The Mean ± SD of the subjects' age was 48.67 ± 21.11 years. In the time period from February 11, 2020 to September 21, 2020, a total of 3,212 cases were referred to the hospital, with most of whom (1,679) (52.3%) having been male. The male-to-female ratio was 1:09, which means 11 men were infected for every ten women. The largest number of the patients (2,897 cases) (90.2 %) referred to the hospital in the form of personal referrals, and the lowest number (7 cases) (0.2%) was related to ambulances at governmental centers. Most of the patients fell in the age group of 40-49. In addition, among them, 2,534 cases (78.9%) had a history of contact with a COVID-19 patient. Regarding clinical symptoms associated with the disease, the three common clinical symptoms were fevers (1,477 cases) (46%), muscular pain (1,431 cases) (44.6%), and coughs (1,092 cases) (34%) (Table 1). In addition, the most common comorbidity was hypertension (253 cases) (7.9%), and the least common comorbidity was HIV/AIDS (3 cases) (0.1%).

Table 1. Frequency distribution of age, gender, underlying diseases, referral, contact history, and clinical symptoms in suspected cases and confirmed patients with COVID19 who were referred to the Ali-Ibn Abi-Talib Hospital in Rafsanjan County in the time from February 11, 2020 to September 21, 2020

Variable		Frequency (percent)	Variable		Frequency (percent)
Age	<10 year	56 (1.70)	**Gender**	Female	1533 (47.70)
	10-19	140 (4.40)		Male	1679 (52.30)
	20-29	467 (14.50)	**Referral**	Private Ambulance	11 (0.30)
	30-39	677 (21.10)		Governmental Ambulance	7 (0.20)
	40-49	479 (14.90)		EMS	297 (9.20)
	50-59	389 (12.10)		Personal	2897 (90.20)
	60-69	382 (11.90)	**Clinical Symptoms**	Fevers	1477 (46.00)
	70-79	298 (9.30)		Coughs	1092 (34.00)
	>80	302 (9.40)		Muscular Pain	1431 (44.6)
	Indeterminate	22 (0.70)		Respiratory Distress	856 (26.70)
Underlying Disease	Cancer	41 (1.30)		Loss of Consciousness	102 (3.20)
	Chronic Liver Disease	17 (0.50)		Decreased Sense of Smell	11 (0.30)
	Diabetes	239 (7.40)		Decreased Sense of Taste	2 (0.10)
	Chronic Blood Disease	44 (1.40)		Seizure	15 (0.50)
	HIV/AIDS	3 (0.10)			
	Acquired Immunodeficiency Disease	11 (0.30)		Headache	151 (4.70)
	Heart Disease	161 (5.00)		Vertigo	22 (0.70)
	Chronic Kidney Disease	62 (1.90)		Paresthesia	9 (0.30)
	Asthma	20 (0.60)		Plegia	1 (0.00)
	Chronic Respiratory Disease	158 (4.90)		Chest Pain	38 (1.2)
	Chronic Neurological Disorders	61 (1.90)		Dermatitis	2 (0.1)
	Other Chronic Diseases	151 (4.70)		Abdominal Pain	33 (1.0)
	Hypertension	253 (7.90)		Nausea	85 (2.6)
	Pregnancy	24 (0.70)		Vomiting	97 (3.0)
Contact History	Yes	678 (21.10)		Diarrhea	66 (2.10)
	No	2534 (78.90)		Anorexia	46 (1.40)

According to Table 2, 100 cases (6%) of male patients and 79 cases (5.2%) of female patients died. Besides, the chi-square test demonstrated no statistically significant difference in the death ratio between male and female patients. The mean age of the two groups of suspected cases and confirmed patients was compared using the independent t-test. Accordingly, it was found that the mean age of the confirmed patients was significantly higher than that of the group of suspected cases ($P < 0.001$). Moreover, the mean age of the survived patients was significantly higher than that of the group of deceased ones ($P < 0.001$).

Table 2. The mean, median, and standard deviation of age according to disease status (suspected or confirmed), death status (deceased or non-deceased), as well as gender frequency according to death status (deceased or non-deceased) in COVID-19 patients who were referred to the Ali-Ibn Abi-Talib Hospital in the Rafsanjan County in the time from February 11, 2020 to September 21, 2020

Variable	Variable levels	Frequency (percent)	Median	Mean ± SD	P-value*
Disease Status	Suspicious	2525 (79.15)	44	47.84 ± 21.52	<0.001*
	Confirmed	665 (20.85)	50	51.84 ± 19.16	
	Sum	3190 (100)	45	48.67 ± 21.11	
Death Status	Deceased	3014 (94.48)	44	47.50 ± 20.58	
	Non-Deceased	176 (5.52)	73	68.77 ± 19.90	

Variable	Variable Levels	Deceased	Non-deceased	P-value**
		Frequency (percent)	Frequency (percent)	
Gender	Female	79 (5.20)	1454 (94.80)	
	Male	100 (6.00)	1579 (94.00)	
	Sum	179 (5.60)	3033 (94.40)	

Because some variables were not recorded for some people (missing data), the sum of the levels is not the same for different variables. *Independent t-test; ** Chi-square test; $P < 0.05$ (being the significant level for all tests)

As Table 3 shows, 107 cases (4.2%) of suspected cases and 72 cases (10.8%) of confirmed patients died [CFR (Case Fatality Rate) =10.8%]. Furthermore, using the chi-square test, it was found that the death ratio in confirmed patients was significantly higher than that in suspected cases (P < 0.001).

Besides, 63 cases (2.5%) of patients without underlying diseases, 47 cases (13.6 %) of patients with an underlying disease, and 69 cases (20.4%) of patients with at least two underlying diseases died. Using the chi-square test, it was found that the death ratio in patients with at least two underlying diseases was significantly higher than that in the other two groups (P < 0.001) (Table 3). In addition, using logistic regression, it was found that the chance of death in infected males was 16% higher than that in females (OR = 1. 166).

Table 3. Case fatality rates (CFR) in COVID-19 patients with and without co-infections who were referred to the Ali-Ibn Abi-Talib Hospital in Rafsanjan County in the time period from February 11, 2020, to September 21, 2020

Variable	Variable Levels	No Disease Frequency (percent)	One Disease Frequency (percent)	At Least Two Disease Frequency (percent)	P-value*
Death Status	Deceased	63 (2.50)	47 (13.60)	69 (20.40)	< 0.001
	Non-Deceased	2465 (97.50)	299 (86.40)	269 (79.60)	
	Sum	2528 (100)	346 (100)	338 (100)	
Variable	**Variable Levels**	**Deceased Frequency (percent)**		**Non-deceased Frequency (percent)**	**P-value***
Disease Status	Suspicious	107 (4.20)		2440 (95.80)	< 0.001
	Confirmed	72 (10.80)		593 (89.20)	
	Sum	179 (5.60)		3033 (94.40)	

* Chi-square test; p < 0.05 (significance level for all tests)

The logistic regression model was employed to assess the effect of various variables on the probability of death from COVID-19. To this end, all demographic variables, clinical symptoms, and underlying diseases were included in the model; next, using the backward selection method, the intended variables were kept in the model (Table 4). Table 4 shows the logistic regression, standard error, odds ratio, confidence interval, and significance level for each variable. With a one-year increase in age, the chance of death increased by 4% (P < 0.001) (OR [95% CI] = 1.039 [1.019–1.060]). Besides, for a one-unit increase in the blood oxygen level (O2Sat), the chance of death decreased by 6% (P < 0.001) (OR [95% CI] = 0.938 [0.909–0.968]). In addition, the chance of death in people with reduced levels of consciousness was 5.5 times higher than that in other patients (P < 0.001) (OR [95% CI] =5.531 [2.650–11.546]). Besides, the chance of death in people with cancer was 9.1 times higher than that in other people (P < 0.001) (OR [95% CI] =9.142 [2.789–29.969]). In fact, this chance was 2.5 times higher in diabetics (P=0.004) (OR [95% CI] = 2.504 [1.340–4.680]) and 2.5 times in people with chronic respiratory diseases (P=0.011) (OR [95% CI] = 2.510 [1.237–5.094]) than in other people.

Table 4. The relationship between (OR, CI) age, gender, and underlying diseases in suspected and confirmed COVID-19 patients who were referred to the Ali-Ibn Abi-Talib Hospital in Rafsanjan County in the time period from February 11, 2020, to September 21, 2020

Variable	B	S.E.	P-value	OR	95% CI for OR	
					Lower	Upper
Age	0.039	0.010	<0.001*	1.039	1.019	1.060
O_2Sat	-0.064	0.016	<0.001*	0.938	0.909	0.968
Temperature	0.312	0.197	0.113	1.366	0.929	2.008
Loss of Consciousness	1.710	0.375	<0.001*	5.531	2.650	11.546
Cancer	2.213	0.606	<0.001*	9.142	2.789	29.969
Diabetes	0.918	0.319	0.004*	2.504	1.340	4.680
Chronic Kidney Disease	0.911	0.508	0.073	2.487	0.919	6.729
Chronic Respiratory Disease	0.920	0.361	0.011*	2.510	1.237	5.094
Constant	-11.457	7.523	0.128	0.000		

B = Regression coefficient; S.E = Standard Deviation; OR = Odds Ratio; CI = Confidence Interval

Discussion

Based on the results of this study, until September 21, 2020, a total of 3,212 suspicious cases and confirmed patients were referred to the hospital. In addition, COVID-19 affected males more than females; these results were in line with those of previous studies [18-20]. Various reasons have been suggested in this regard. Li et al stated that

the distribution of the male-to- female ratio could be due to the effect of sex hormones and that the X-chromosome has a key role in adaptation as well as that inherent safety of society [21]. In addition, it is supposed that owing to the Iranian culture, males have more personal contacts due to working outside the home than females who are often at home.

According to the results of this study, the highest age range of patients at the time of the study was related to the middle-aged (40-49). With a one-year increase in age, the chance of mortality increases by 4%. However, with the disease spreading throughout the world and given new mutations, the disease spreads among different ages. Regression analysis in the present study indicated that a greater risk of death accompanied older ages. Research suggests that older age has a lower potential for the immune system [22]. In previous studies, old ages have been mentioned as a risk factor for death in the Severe Acute Respiratory Syndrome (SARS) [23] and the Middle East Respiratory Syndrome (MERS) [24]. The most common clinical symptoms in this study included fevers (1,477 cases) (46%), muscular pain (1,431 cases) (44.6%), and coughs (1,092 cases) (34%). This was similar to the COVID-19 infection in Asian cases mostly accompanied by fevers and coughs [25, 26]. Regardless of the usual symptoms, such as fevers, muscular pain, and the like [27-29], our findings demonstrated that many patients had unusual signs, like abdominal pain, diarrhea, nausea, vomiting, and dizziness. In a European study conducted by Lechien et al, migraine, anosmia, rhinorrhea, and nasal congestion were reported as the most frequently observed symptoms, followed by common symptoms. However, these differences in virus presentation could be due to changes in the genotype or presentation level of virus receptors.

In the present study, 2,534 COVID-19 patients (78.9%) had a history of contact with another COVID-19 patient, having been observed in most the similar studies. Therefore, a history of contact does not seem to be a prerequisite for suspected patients to be diagnosed with COVID-19.

Moreover, the most common comorbidity was hypertension in 253 cases (7.9%), consistent with previously reported findings [20, 30]. Fang et al suggested a theory implying that the coronavirus binds to its target via angiotensin-converting enzyme 2 (ACE-2) expressed by epithelial cells in kidneys, lungs, and blood vessels. According to him, the infection can increase the risk of contracting acute COVID-19 in people consuming ACE inhibitors and angiotensin II Type-I receptor blockers (ARBs) [31-33].

According to the results of the present study, 100 cases (6%) of male patients and 79 cases (5.2%) of female patients died. Hence, no statistically significant difference was observed in the male-to-female death ratio among the patients (P = 0.32). In addition, logistic regression found that the chance of death in infected men was 16% higher than that in infected women (P = 0.32). However, it appears that women are less liable to unexpected side-effects of viral infections than men based on their different inherent immunity, steroid hormones, and parameters about sex chromosomes. Immune regulatory genes encoded by the female X chromosome can be predisposed to lower viral load levels, so less inflammation occurs in women than in men [34]. Women are more likely to be affected by the post-infection smell dysfunction in viral infections about parainfluenza, Epstein–Barr virus, or the previous form of coronavirus affecting males [35].

While the CFR of COVID-19 has been highly varied in different countries, the mortality rate among confirmed patients (CFR) was 10.8% in this study, which was lower than the national CFR among hospitalized patients in Iran (24.4%) [36].

The results of this research indicated that with a unit of increase in blood oxygen levels, the odds of death decreased by 6% (P < 0.001), being in line with the study of Haghighi M. et al. Thus, having hypoxia (with O2 saturation < 90%) was significantly associated with the mortality rate (OR [95% CI]=11.41 [3.07–42.47]) [37]. Therefore, frequent noninvasive ventilation, high-flow nasal oxygen, and prone position could be used in respiratory caregiving to produce improved results [12, 38, 39]. The chance of mortality in cancer patients was 9.1 times higher than in other patients (P < 0.001). In fact, cancer patients are considered a highly vulnerable subgroup of the population. According to research, cancer patients have a more acute course of the disease, with a higher proportion of such patients demanding greater amounts of intensive care, having a more quickly progressing disease, and having an increased risk of mortality [40].

Our final analysis used retrospective data and depended on the data obtained from hospital reports of the care data monitoring system belonging to the Iranian Ministry of Health and Medical Education, being a limitation in this study. As a result, the bias induced by confounded data from unobserved or unrecorded traits could have remained in our estimation of associations, so we cannot approve cause-effect relationships. Thus, it is recommended that similar studies be conducted for the last seven months and compared with the present study's findings.

Conclusion

A great part of the features of our cases resembled those reported in previous studies; thus, the present study's findings highlight the noticeable impact of age, gender, and underlying diseases on the likelihood of death among COVID-19 patients. Accordingly, these results can play an effective role in healthcare policymaking for COVID-19.

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References

1. Wang L, Wang Y, Ye D, Liu Q. Review of the 2019 novel coronavirus (SARS-CoV-2) based on current evidence. Int J Antimicrob Agents. 2020;55(6):105948.
2. Zhou P, Yang XL, Wang XG, Hu B, Zhang L, Zhang W, et al. A pneumonia outbreak associated with a new coronavirus of probable bat origin. Nature. 2020;579(7798):270-3.
3. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al., A Novel Coronavirus from Patients with Pneumonia in China, 2019. N Engl J Med. 2020;382(8):727-33.
4. Aggarwal S, Garcia-Telles N, Aggarwal G, Lavie C, Lippi G, Henry BM. Clinical features, laboratory characteristics, and outcomes of patients hospitalized with coronavirus disease 2019 (COVID-19): Early report from the United States. Diagnosis (Berl). 2020;7(2):91-6.
5. Siordia JA Jr. Epidemiology and clinical features of COVID-19: A review of current literature. J Clin Virol. 2020;127:104357.
6. Kaljee L, Zhang L, Langhaug L, Munjile K, Tembo S, Menon A, et al. A randomized-control trial for the teachers' diploma programme on psychosocial care, support and protection in Zambian government primary schools. Psychol Health Med. 2017;22(4):381-92.
7. Zakeri MA, Hossini Rafsanjanipoor SM, Kahnooji M, Ghaedi Heidari F, Dehghan M. Generalized Anxiety Disorder during the COVID-19 Outbreak in Iran: The Role of Social Dysfunction. J Nerv Ment Dis. 2021;209(7):491-6.
8. World Heahlth Organization. WHO Coronavirus (COVID-19) Dashboard. Geneva, Switzerland: World Heahlth Organization; 2020. Available from: https://covid19.who.int/. Accessed March 4, 2020.
9. Docherty AB, Harrison EM, Green CA, Hardwick HE, Pius R, Norman L, et al. Features of 20 133 UK patients in hospital with covid-19 using the ISARIC WHO Clinical Characterisation Protocol: prospective observational cohort study. BMJ. 2020;369:m1985.
10. Vena A, Giacobbe DR, Di Biagio A, Mikulska M, Taramasso L, De Maria A, et al. Clinical characteristics, management and in-hospital mortality of patients with coronavirus disease 2019 in Genoa, Italy. Clin Microbiol Infect. 2020;26(11):1537-44.
11. Chen P, Zhang Y, Wen Y, Guo J, Jia J, Ma Y, et al. Epidemiological and clinical characteristics of 136 cases of COVID-19 in main district of Chongqing. J Formos Med Assoc. 2020;119(7):1180-4.
12. Yang X, Yu Y, Xu J, Shu H, Xia J, Liu H, et al. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. Lancet Respir Med. 2020;8(5):475-81.
13. Mez J, Daneshvar DH, Kiernan PT, Abdolmohammadi B, Alvarez VE, Huber BR, et al., Clinicopathological Evaluation of Chronic Traumatic Encephalopathy in Players of American Football. JAMA. 2017;318(4):360-70.
14. Faury H, Courboulès C, Payen M, Jary A, Hausfater P, Luyt C, et al. Medical features of COVID-19 and influenza infection: A comparative study in Paris, France. J Infect. 2021;82(2):e36-9.
15. Nachtigall I, Lenga P, Jóźwiak K, Thürmann P, Meier-Hellmann A, Kuhlen R, et al. Clinical course and factors associated with outcomes among 1904 patients hospitalized with COVID-19 in Germany: an observational study. Clin Microbiol Infect. 2020;26(12):1663-9.
16. Maechler F, Gertler M, Hermes J, van Loon W, Schwab F, Piening B, et al. Epidemiological and clinical characteristics of SARS-CoV-2 infections at a testing site in Berlin, Germany, March and April 2020-a cross-sectional study. Clin Microbiol Infec. 2020;26(12):1685.e7-1685.e12.
17. Lai CC, Shih TP, Ko WC, Tang HJ, Hsueh PR. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): The epidemic and the challenges. Int J Antimicrob Agents. 2020;55(3):105924.
18. Pan F, Ye T, Sun P, Gui S, Liang B, Li L, et al. Time Course of Lung Changes at Chest CT during Recovery from Coronavirus Disease 2019 (COVID-19). Radiology. 2020;295(3):715-21.
19. Shahriarirad R, Khodamoradi Z, Erfani A, Hosseinpour H, Ranjbar K, Emami Y, et al. Epidemiological and clinical features of 2019 novel coronavirus diseases (COVID-19) in the South of Iran. BMC Infect Dis. 2020;20(1):427.

20. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, et al. Clinical Characteristics of 138 Hospitalized Patients with 2019 Novel Coronavirus–Infected Pneumonia in Wuhan, China. JAMA. 2020;323(11):1061-9.
21. Hassan SA, Sheikh FN, Jamal S, Ezeh JK, Akhtar A. Coronavirus (COVID-19): A Review of Clinical Features, Diagnosis, and Treatment. Cureus. 2020;12(3):e7355.
22. Wu C, Chen X, Cai Y, Xia J, Zhou X, Xu S, et al. Risk Factors Associated with Acute Respiratory Distress Syndrome and Death in Patients with Coronavirus Disease 2019 Pneumonia in Wuhan, China. JAMA Intern Med. 2020;180(7):934-43.
23. Hong KH, Choi JP, Hong SH, Lee J, Kwon JS, Kim SM, et al. Predictors of mortality in Middle East respiratory syndrome (MERS). Thorax. 2018;73(3):286-9.
24. Choi KW, Chau TN, Tsang O, Tso E, Chiu MC, Tong WL, et al. Outcomes and prognostic factors in 267 patients with severe acute respiratory syndrome in Hong Kong. Ann Intern Med. 2003;139(9):715-23.
25. Wu Z, McGoogan JM. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72 314 Cases From the Chinese Center for Disease Control and Prevention. JAMA. 2020;323(13):1239-42.
26. Cao Y, Liu X, Xiong L, Cai K. Imaging and clinical features of patients with 2019 novel coronavirus SARS-CoV-2: A systematic review and meta-analysis. J Med Virol. 2020;92(9):1449-59.
27. Wu J, Wu X, Zeng W, Guo D, Fang Z, Chen L, et al. Chest CT Findings in Patients with Coronavirus Disease 2019 and Its Relationship with Clinical Features. Invest Radiol. 2020;55(5):257-61.
28. Ruan Q, Yang K, Wang W, Jiang L, Song J. Clinical predictors of mortality due to COVID-19 based on an analysis of data of 150 patients from Wuhan, China. Intensive Care Med. 2020;46(5):846-8.
29. Chen J. Pathogenicity and transmissibility of 2019-nCoV- a quick overview and comparison with other emerging viruses. Microbes Infect. 2020;22(2):69-71.
30. Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. Lancet. 2020;395(10229):1054-62.
31. Li XC, Zhang J, Zhuo JL. The vasoprotective axes of the renin-angiotensin system: physiological relevance and therapeutic implications in cardiovascular, hypertensive and kidney diseases. Pharmacol Res. 2017;125(Pt A):21-38.
32. Wan Y, Shang J, Graham R, Baric RS, Li F. Receptor Recognition by the Novel Coronavirus from Wuhan: an Analysis Based on Decade-Long Structural Studies of SARS Coronavirus. J Virol. 2020;94(7):e00127-20.
33. Fang L, Karakiulakis G, Roth M. Are patients with hypertension and diabetes mellitus at increased risk for COVID-19 infection? Lancet Respir Med. 2020;8(4):e21.
34. Conti P, Younes A. Coronavirus COV-19/SARS-CoV-2 affects women less than men: clinical response to viral infection. J Biol Regul Homeost Agents. 2020;34(2):339-43.
35. Suzuki M, Saito K, Min WP, Vladau C, Toida K, Itoh H, et al. Identification of viruses in patients with postviral olfactory dysfunction. Laryngoscope. 2007;117(2):272-7.
36. Jalili M, Payandemehr P, Saghaei A, Sari HN, Safikhani H, Kolivand P. Characteristics and Mortality of Hospitalized Patients with COVID-19 in Iran: A National Retrospective Cohort Study. Ann Intern Med. 2021;174(1):125-7.
37. Haghighi M, Hatami H, Aryannezhad S, Delbarial N. Risk Factors of Mortality among Hospitalized COVID-19 Patients in A Large University Hospital in Tehran, Iran. Infect Epidemiol Microbiol. 2021;7(2):141-54.
38. Wang K, Zhao W, Li J, Shu W, Duan J. The experience of high-flow nasal cannula in hospitalized patients with 2019 novel coronavirus-infected pneumonia in two hospitals of Chongqing, China. Ann Intensive Care. 2020;10(1):37.
39. Elharrar X, Trigui Y, Dols AM, Touchon F, Martinez S, Prud'homme E, et al. Use of Prone Positioning in Nonintubated Patients with COVID-19 and Hypoxemic Acute Respiratory Failure. JAMA. 2020;323(22):2336-8.
40. European Society For Medical Oncology (ESMO). Cancer Patient Management During the COVID-19 Pandemic. Geneva, Switzerland: European Society For Medical Oncology; 2020. Available from: https://www.esmo.org/guidelines/cancer-patient-management-during-the-covid-19-pandemic