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Original

Comparison of clinical, radiological and laboratory findings in discharged and dead patients with COVID-19

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ABSTRACT

Background: Coronavirus disease 19 (COVID-19) is a recently described infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Iran was the first country where the SARS-Cov-2 was detected in the Middle East. In the current study, we aimed to evaluate the clinical, radiological and laboratory findings in hospitalized COVID-19 confirmed cases in Iran.

Methods: The clinical manifestations, radiological data, laboratory findings, and the underlying diseases of the patients with COVID-19 were obtained from electronic medical records. Next, this information was compared in discharged and dead patients.

Results: Overall, 4028 patients with COVID-19 including 3088 discharged, 778 dead, and 162 still hospitalized patients were enrolled in this study. The highest percentage of people who recovered (55%) was between 30 and 60 years old and the highest percentage of deaths (74.4%) was more than 60 years old. Based on demographic data, 50.05% were female and 49.95% were male. Clinical evaluations revealed that dyspnea (56.9%), cough (31.4%) and fever (17.8%) were the most manifestations. Comorbidities were significantly higher in the dead group. Laboratory analysis revealed abnormalities in lymphocyte count (LYM), erythrocyte sedimentation rate (ESR), and inflammatory biomarkers such as C-reactive protein (CRP). The most prevalent computed tomography (CT) scan data were ground-glass opacity (GGO) (30.5%) and consolidation (9.4%).

Conclusions: Laboratory parameters and clinical and radiological findings help to evaluate the follow-up of the disease in patients. Age and comorbidities are factors that predispose people to COVID-19. Further research is needed to evaluate the effects of various factors on the progression of COVID-19 infection.

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Comparación de los hallazgos clínicos, radiológicos y de laboratorio en pacientes dados de alta y fallecidos con COVID-19

Palabras clave:
COVID-19
Irán
Signos clínicos
SARS-CoV-2
Hallazgos de laboratorio

RESUMEN

Antecedentes: La enfermedad por coronavirus de 19 (COVID-19) es una enfermedad infecciosa recientemente descrita causada por el síndrome respiratorio agudo severo por coronavirus 2 (SARS-CoV-2). Irán fue el primer país de Oriente Medio donde se detectó SARS-Cov-2. En el estudio actual, nuestro objetivo fue evaluar los hallazgos clínicos, radiológicos y de laboratorio en pacientes hospitalizados con confirmación de COVID-19 en Irán.

Métodos: Se obtuvieron las manifestaciones clínicas, los datos radiológicos, los hallazgos de laboratorio y las enfermedades subyacentes de los registros clínicos electrónicos. Seguidamente, se comparó esta información con los pacientes dados de alta y fallecidos.

Resultados: A nivel global, se incluyó en este estudio a 4.028 pacientes con COVID-19, de los cuales 3.088 habían recibido el alta, 778 habían fallecido, y 162 seguían hospitalizados. El mayor porcentaje de recuperaciones (55%) se produjo entre las personas de 30 a 60 años, y el mayor porcentaje de muertes (74,4%) se dio en los mayores de 60 años. Sobre la base de los datos demográficos, el 50,05% fueron mujeres y el 49,95% varones. Las evaluaciones clínicas revelaron que la disnea (56,9%), la tos (31,4%) y la fiebre (17,8%) fueron las manifestaciones más prevalentes. Las comorbilidades fueron significativamente más elevadas en el grupo de fallecidos. Las analíticas revelaron anomalías en cuanto a recuento linfocitario, tasa de sedimentación eritrocitaria (ESR), y biomarcadores inflamatorios tales como proteína C reactiva (PCR). Los datos procedentes de la tomografía computarizada (TC) fueron opacidad en vidrio esmerilado (GGO) (30,5%) y consolidación (9,4%).

Conclusiones: Los parámetros de laboratorio y los hallazgos clínicos y radiológicos ayudan a evaluar el seguimiento de la enfermedad en los pacientes. La edad y las comorbilidades son factores que predisponen a las personas a la COVID-19. Es necesaria más investigación para evaluar los efectos de los diversos factores en la progresión de la infección por COVID-19.

Introduction

Coronavirus disease 19 (COVID-19), initially appeared in Wuhan City of China in late 2019, is a recently described infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[1,2] COVID-19 represents a particularly aggressive form[3]; however, for other coronaviruses, at least two epidemics have been reported over the last two decades.[4] As stated by the World Health Organization (WHO), COVID-19 outbreak is a public health emergency of international concern.[5,6] The mortality rate of critically ill COVID-19 patients is extremely high.[7] Age and comorbidities, such as hypertension (HTN) and chronic cardiac disease, were the main risk factors for the mortality of COVID-19 patients.[8,9]

SARS-CoV-2 infection is asymptomatic or mild, but in most cases, it resembles the common cold.[10,11] In more severe cases, the infection may clinically manifest as interstitial pneumonia with fever, cough, dyspnea, and bilateral infiltrates on chest imaging.[12,13] It also may progress to acute respiratory distress syndrome, multiple-organ failure, and even death, likely as a consequence of excessive activation of the immune system that leads to a cytokine storm.[14] According to the clinical classification method, patients are divided into four (ordinary, mild, severe, and critically ill) types considering the severity of the disease.[15] In some situations, asymptomatic carriers with positive reverse transcription-polymerase chain reaction (RT-PCR) tend to have normal health conditions during the laboratory examination, and others show abnormality. Therefore, discriminating their health status from other infected patients complicates the diagnóstico.[16] Significant elevation in the hepatic enzymes and serum creatinine (Cr) and also reduction in lymphocytes with high C-reactive protein (CRPs) are important markers for the severity. The most common blood test abnormalities include increased CRP (87%), decreased lymphocyte count (LYM) (68%), and enhanced lactate dehydrogenase (LDH) (69%). In addition, abnormal laboratory findings entail decreased albumin (43%), increased aspartate aminotransferase (AST) (47%), and elevated Cr (10%).[17]

A chest computed tomography (CT) can help determine the stage of temporary illness and severity of COVID-19 pneumonia. In the early stage of viral replication (days 0–4), turbidity diffuse of the ground-glass opacity (GGO) is predominant. In the progressive stage (days 5–8), crazy-paving patterns show a raise in the uptake of inflammatory cells to the lung interstitium. The peak stage (days 10–13) is characterized by consolidation with fibrosis and diffuse alveolar damage. These radiologic lesions are also observed in other viral pneumonia and noninfectious inflammatory lung diseases, but in a pandemic context, they may have diagnostic potential for infection with SARS-CoV-2.[18]

The purpose of this study was to compare demographic, clinical, laboratory and radiological findings of fatal and recovered COVID-19 cases in Iran.

Material and methods

Study design

The present single-center retrospective descriptive investigation was performed on COVID-19 cases admitted to Vasei Hospital, Sabzevar, Iran. The approach to the disease was in conformity with the national health instructions, adapted from the WHO guidelines, as well as based on the latest studies on COVID-19.[19]

Inclusion/exclusion criteria

The inclusion criteria included all patients who were hospitalized for COVID-19 from 20 February 2020 to 21 September 2021, cases whose clinical, laboratory, and radiological information were accessible in the Registration Center, and those who were tested positive for RT-PCR. Patients whose demographic information, laboratory tests, clinical signs, and/or radiological findings were not available in the Registration System were excluded from the study. Also, patients with hematological disorders were not included in the study.

Ethical considerations

The current study was approved by the Ethics Committee of Sabzevar University of Medical Sciences, Sabzevar, Iran (code of ethics: IR.MEDSAB.REC.1400.114). The patients' information was kept confidential.

Clinical assessment

Cases with fever, rhinorrhea, sore throat, cough, and respiratory distress were considered as patients suspected of COVID-19. The disease was diagnosed based on clinical and chest examination, laboratory findings, and RT-PCR test.[20] The clinical diagnóstico was determined by radiographic features of the lung, and COVID-19 diagnóstico was confirmed using RT-PCR with throat and nose swab from the upper respiratory tract.

Laboratory assessment

Peripheral venous blood samples were collected at the time of admission. Routine blood tests, including the counts of red and white blood cells (RBC and WBC), leukocyte subtypes, hematocrit (HCT), hemoglobin (Hb), and platelet (PLT), were performed using an automated hematology analyzer (Sysmex Corporation, Kobe, Japan).[16] Collected laboratory data included PLT, LYM, and neutrophil counts (NEU), serum urea, creatinine (Cr) and albumin levels, erythrocyte sedimentation rate (ESR), and CRP.

CT image acquisition

Radiological evaluations were performed according to CT images. The CT scan was performed for the COVID-19 patients who had respiratory problems. Two expert radiologists assessed the presence of any radiological abnormality based on the evidence or explanations in the medical records and finally re-examined the results.

Statistical analysis

Descriptive statistics (e.g. mean, frequency tables, standard deviation, and variance), and analytical tests (Chi square, Pierson correlation coefficient test, and ANOVA) were calculated using SPSS version 26. The probability level (p) of ≤ 0.05 was considered statistically significant.

Results

Overall, 4028 patients with COVID-19 including 3088 discharged, 778 dead, and 162 still hospitalized patients were enrolled in this study. Among these patients, the gender distribution was 50% male and 49% female. Moreover, 103 (78%) cases were adults, and 29 (22%) cases were the elderly. The patients were partitioned into diverse age groups: 579 (74.4%) of deaths were > 60 years old, and 191 (24.6%) of deaths were between 30 and 60 years. Table 1 provides detailed information on the demographic characteristics of the two groups.

Table 2 outlines the primary manifestations related to the disease. Dyspnea (56.9%), cough (31.4%), and fever (17.8%) were the most frequent symptoms reported by the patients and physician. These manifestations were significantly differed in death and live groups ($p < 0.05$). Less common symptoms detected in patients included myalgia (8.3%), sore throat (0.8%), chills (5.8%), anorexia (4.8%), weakness (23.6%), nausea (7.8%), headache (3.6%), chest pain (1.8%), diarrhea (1.9%), vomiting (2.9%), and confusion (1.5%). All of the patients confirmed a decrease in the saturation of peripheral oxygen (SpO_2) level. The vital signs of patients with COVID-19 are summarized in Table 3. The data on the underlying diseases, including diabetes, HTN, hyperlipidemia (HLP), heart failure, lung diseases, surgery, cancer, addiction, and pregnancy are depicted in Table 4. In total, 1079 (26.8%) and 726 (18%) cases had HTN and diabetes, respectively.

The details of laboratory data are demonstrated in Table 5. There was a significant difference in parameters such as WBC, Hb, PLT, urea, Cr, sodium (Na+), potassium(K), and ESR between alive and dead groups ($p < 0.05$). Lymphocyte count was significantly lower in death group (13.12 ± 0.44) than in live group (18.77 ± 0.22).

Table 6 shows the radiologic data which were collected from all the patients with COVID-19. CT images were classified according to the type and size of pathological findings. GGO (30.5%), consolidation (9.4%), crazy paving (9.1%), and the reticular patterns (5.2%) were the most frequent radiologic findings (Figs. 1 and 2).

Table 1 – Demographic information of patients with COVID-19.

Variable		Total (%) N(4028)	Death (%) N(778)	Live (%) N(3088)	P-value
Age	30>	230(5.8)	8(1.0)	207(6.7)	<0.001
	30–60	1956(48.5)	191(24.6)	1698(55.0)	
	>60	1842(45.7)	579(74.4)	1183(38.3)	
Gender	Female	2016(50.05)	355(45.6)	1583(51.3)	0.016
	Male	2012(49.95)	423(54.4)	1505(48.7)	
Marital status	Married	3563(88.3)	646(83.0)	2781(90.1)	<0.001
	Single	218(5.5)	32(4.1)	174(5.6)	
	Deceased wife	247(6.2)	100(12.9)	133(4.3)	
Job	Workless	2505(62.2)	553(71.1)	1847(59.8)	0.001
	Student	27(0.7)	1(0.1)	24(0.8)	
	Employed	1450(36.0)	211(27.1)	1185(38.4)	
	Not defined	46(1.1)	13(1.7)	32(1.0)	
Education	Unlettered	754(18.7)	227(29.2)	490(15.9)	<0.001
	High school or less	1202(29.85)	172(22.1)	988(32.0)	
	University	281(7.0)	21(2.7)	240(7.8)	
	Not defined	1791(44.45)	358(46.0)	1370(44.4)	
Location	Villager	1206(29.94)	235(30.2)	925(30.0)	0.012
	Townspeople	2820(69.96)	543(69.8)	2163(70.0)	
CRP	Negative	296(7.35)	54(6.9)	229(7.4)	0.020
	Positive	2016(50.05)	360(46.3)	1567(50.7)	
	Not defined	1716(42.6)	364(46.8)	1292(41.8)	

Abbreviations: CRP: C reactive protein; N: number.

Table 2 – Clinical features of patients with COVID-19.

Variable		Total (%) N(4028)	Death (%) N(778)	Live (%) N(3088)	P-value
Dyspnea	Yes	2294(56.9)	491(63.1)	1700(55.1)	<0.001
	No	1734(43.1)	287(36.9)	1388(44.9)	
Cough	Yes	1266(31.43)	141(18.1)	1085(35.1)	<0.001
	No	2762(68.57)	637(81.9)	2003(64.9)	
Fever	Yes	718(17.8)	128(16.5)	563(18.2)	0.011
	No	3310(82.2)	650(83.5)	2525(81.8)	
Myalgia	Yes	336(8.34)	32(4.1)	288(9.3)	0.005
	No	3692(91.56)	746(95.9)	2800(90.7)	
Sore throat	Yes	33(0.8)	3(0.4)	28(0.9)	<0.001
	No	3995(99.2)	775(99.6)	3060(99.1)	
Chills	Yes	232(5.8)	30(3.9)	191(6.2)	0.002
	NO	3796(94.2)	748(96.1)	2897(93.8)	
Anorexia	Yes	194(4.8)	24(3.1)	165(5.3)	<0.001
	No	3834(95.2)	754(96.9)	2923(94.7)	
Weakness	Yes	952(23.6)	182(23.4)	739(23.9)	0.011
	NO	3076(76.4)	596(76.6)	2349(76.1)	
Nausea	Yes	313(7.8)	27(3.5)	274(8.9)	<0.001
	NO	3715(92.2)	751(96.5)	2814(91.1)	
Headache	Yes	145(3.6)	7(0.9)	132(4.3)	<0.001
	NO	3883(96.4)	771(99.1)	2956(95.7)	
Chest pain	Yes	72(1.8)	4(0.5)	64(2.1)	0.004
	No	3956(98.1)	774(99.5)	3024(97.9)	
Diarrhea	Yes	77(1.9)	13(1.7)	60(1.9)	0.003
	No	3951(98.0)	765(98.3)	3028(98.1)	
Vomiting	Yes	116(2.9)	14(1.8)	98(3.2)	<0.001
	No	3912(97.1)	764(98.2)	2990(96.8)	
Confusion	Yes	59(1.5)	4(0.5)	51(1.7)	<0.001
	No	3969(98.5)	774(99.5)	3037(98.3)	
Consciousness	Yes	3468(86.1)	554(71.2)	2774(89.8)	0.015
	No	560(13.9)	224(28.8)	314(10.2)	

Table 3 – Vital signs of patients with COVID-19.

Finding		Total mean(±SD) N(4028)	Death mean(±SD) N(778)	Live mean(±SD) N(3088)	P-value
Blood Pressure	Upper	123.07(±0.29)	139.50(±0.04)	110.89(±0.17)	0.111
	lower	79.0(0.037)	86.0(0.13)	73.0(0.07)	
Pulse Rate		96.43(±0.47)	98.49(±1.56)	95.56(±0.33)	<0.001
Respiratory Rate		22.45(±0.45)	24.87(±1.66)	21.60(±0.19)	0.021
Temperature		37.37(±0.04)	37.51(±0.11)	37.34(±0.05)	<0.001
SpO2		88.88(±0.44)	79.11(±0.54)	91.40(±0.54)	<0.001

SpO2: oxygen saturation; N: number; SD; standard deviation.

Discussion

When new infections emerge, clinical, laboratory, and imaging findings are important data that needs to be carefully investigated.[21–23] In this context, the present descriptive retrospective study was conducted to evaluate the clinical features of 4028 patients in Vasei Hospital.

The middle age group (30–60) had the highest rate of infection. This finding was consistent with the age reports of infected individuals in previous studies.[24,25] Of note, SARS-CoV-2 can infect all ages. Women were almost more infected than men, but the death rate was found to be greater in males than females. An earlier survey has also emphasized that the incidence of SARS-CoV-2 infection is approximately 15% higher in premenopausal women than men in some age ranges. However, COVID-19 mortality among men is significantly higher than in women of all ages,[26] but this outcome was reverse in some other studies.[27–29]

In this study, dyspnea, cough, and fever were the most common symptoms in COVID-19 patients, which affirms the findings of previous studies on this matter.[27,30–32] Some other investigations reported fever and cough as the most prevalent clinical signs.[29,33] Symptoms of the upper respiratory tract such as sore throat were less common in patients. Unlike

Table 5 – Laboratory findings of patients with COVID-19.

Findings	Mean Total (±SD) N(4028)	Mean Death (±SD) N(778)	Mean Live (±SD) N(3088)	P-value
WBC (10^3)	7.53(±0.08)	9.67(±0.25)	6.98(±0.08)	0.001
NEU (%)	80.22(±0.20)	84.85(±0.46)	78.98(±0.23)	0.001
LYM (%)	17.58(±0.19)	13.12(±0.44)	18.77(±0.22)	<0.001
Hb	13.44(±0.05)	12.9(±0.14)	13.58(±0.06)	0.002
PLT	200.71(±1.88)	189.13(±3.94)	202.85(±2.08)	<0.001
Urea	47.64(±0.66)	75.73(±2.19)	40.74(±0.53)	<0.001
Cr	1.26(±0.01)	1.75(±0.06)	1.14(±0.14)	<0.001
Na	137.85(±0.11)	138.34(±0.26)	137.73(±0.12)	0.016
K	4.45(±0.05)	4.6(±0.06)	4.41(±0.06)	0.002
ESR	46.48(±0.52)	50.51(±1.23)	45.41(±0.57)	<0.001

Abbreviations, WBC: white blood cell; NEU: neutrophil count; LYM: lymphocyte count; Hb: hemoglobin; PLT: platelet count; Cr: creatinine; Na: sodium; K: potassium; ESR: erythrocyte sedimentation rate; N: number; SD; standard deviation.

Table 4 – Underlying diseases of patients with COVID-19.

Variable		Total (%) N(4028)	Death (%) N(778)	Live (%) N(3088)	P-value
Diabetes	Yes	726(18.0)	184(23.7)	507(16.4)	<0.001
	No	3302(82.0)	594(76.3)	2581(83.6)	
HTN	Yes	1079(26.8)	295(37.9)	741(24.0)	<0.001
	No	2949(73.2)	483(62.1)	2347(76.0)	
HLP	Yes	473(11.7)	110(14.1)	343(11.1)	0.011
	No	3555(88.1)	668(85.9)	2745(88.9)	
Heart failure	Yes	430(10.7)	131(16.8)	280(9.1)	0.002
	No	3598(89.2)	647(83.2)	2808(90.9)	
Lung disease	Yes	254(6.3)	75(9.6)	165(5.3)	0.015
	No	3774(93.7)	703(90.4)	2923(94.7)	
Surgery	Yes	502(12.5)	109(14.0)	377(12.2)	0.006
	No	3526(87.5)	669(86.0)	2711(87.8)	
Cancer	Yes	46(1.1)	16(2.1)	29(0.9)	<0.001
	No	3982(98.9)	762(97.9)	3059(99.1)	
Addiction	Yes	245(6.1)	71(9.1)	159(5.1)	0.003
	NO	3783(93.9)	707(90.9)	2929(94.9)	
Pregnancy	Yes	71(1.8)	1(0.1)	66(2.2)	0.003
	No	3957(98.2)	777(99.9)	3022(97.8)	
Other past medical	Yes	793(19.7)	191(24.6)	567(18.4)	<0.001
	No	3235(80.3)	586(75.3)	2455(79.5)	

Abbreviations: HTN: Hypertension; HLP: hyperlipidemia; N: number.

Table 6 – Radiologic findings of patients with COVID-19.

Variable		Total (%) N(4028)	Death (%) N(778)	Live (%) N(3088)	P-value
Ground-glass opacity	Yes	1232(30.6)	328(42.2)	853(27.6)	0.002
	No	2796(69.4)	450(57.8)	2235(72.4)	
Crazy paving	Yes	369(9.2)	118(15.2)	234(7.6)	0.002
	No	3659(90.8)	660(84.8)	2854(92.4)	
Halo	Yes	14(0.4)	4(0.5)	10(0.3)	<0.001
	No	4014(99.6)	774(99.5)	3078(99.7)	
Reticular	Yes	210(5.2)	82(10.5)	114(3.7)	<0.001
	No	3818(94.8)	696(89.5)	2974(96.3)	
Consolidation	Yes	378(9.4)	142(18.3)	215(7.0)	<0.001
	No	3650(90.6)	636(81.7)	2873(93.0)	

SARS, patients with SARS-CoV-2 rarely had gastrointestinal manifestations, including vomiting and diarrhea. In our study, most patients were asymptomatic related to the symptoms of COVID-19. This maximum probably means that all sufferers with SARS-CoV-2 viral contamination can be admitted irrespective of symptoms. Comorbidities can enhance the severity of COVID-19 disease. Cardiovascular diseases (CVDs), diabetes, and chronic obstructive pulmonary disease have been attributed to the poor outcomes of COVID-19.[34] The dead groups had a high rate of diabetes, HTN, and heart and lung diseases compared to the live groups. Patients with COVID-19 and type 2 diabetes require multiple interventions, and the risk of intensive care unit (ICU) admissions is higher than non-diabetic individuals. It has been proven that people with low blood glucose manage aggravation conditions and increase mortality.[35,36] CVD was strongly associated with another coronavirus. Similarly, the increased prevalence of CVD was observed in patients with COVID-19, particularly those with severe signs and symptoms.[36] The high threat of COVID-19 in CVD sufferers possibly arises from ACE-2 receptors presence on cardiomyocytes. Atherosclerosis, procoagulant activation, and hemodynamic instability are the main consequences of inflammatory cytokine release in COVID-19.[37] Patients with HTN are more prone to serious complications from COVID-19. The invasion of SARS-CoV-2 into cells involves ACE2, an important enzyme in blood pressure homeostasis. Therefore, changes in the renin-angiotensin system can affect the occurrence and progression of COVID-19.[38]

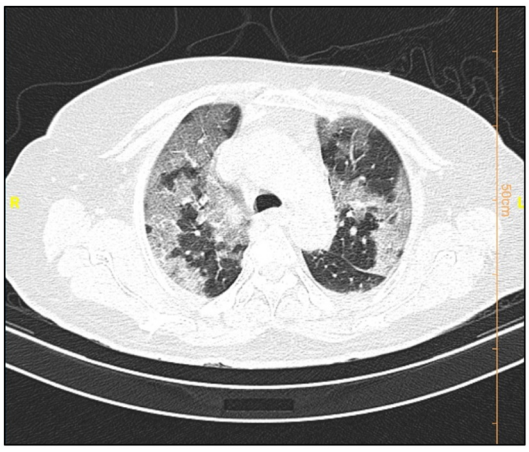

Fig. 2 – COVID-19 pneumonia: CT scan shows crazy paving pattern.

Our study found abnormalities in inflammatory biomarkers such as CRP and ESR. It turned out that most COVID-19 patients had exceeded the CRP and ESR levels, and the higher level was detected in the dead group. CRP has been regarded as an essential predictor of disease severity in SARS.[39,40] Data from patients were associated with lymphopenia and increased urea levels, especially in the dead group. Lymphopenia suggests that COVID-19 may affect lymphocytes, especially T lymphocytes.[28] Viral particles spread throughout the airway mucosa and first use the ACE2 receptors of ciliary bronchial epithelial cells to infect other cells, triggering cytokine storms in the body and producing various immune responses, peripheral leukocytes, and immune cells that cause alterations in lymphocytes and so forth.[41,42] Other data, including biochemical parameters such as serum Na^+ and K^+ were almost normal in all cases.

Data from the patients' CT scan demonstrated that the most common lesion was a ground-glass appearance, which supports the results achieved from Bao et al.'s and Qaisieh et al.'s research works.[43,44] Well-known diagnostic imaging features of early CT in COVID-19 cases include bilateral GGO

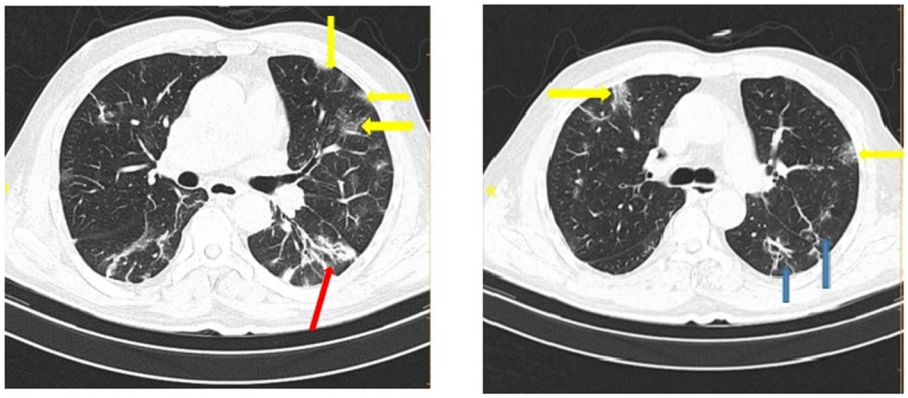

Fig 1 – COVID-19 pneumonia: CT scan shows bilateral ground-glass opacity (yellow arrows), consolidation (red arrow), and reticular opacities (blue arrows). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

with peripheral or posterior distribution (or both), predominantly in the lower lobe, but less commonly in the right middle lobe.[45] In our study, GGO with consolidation was found to be 9.4% in the general and 18.3% in the dead groups. It has also been indicated that there is a relationship between the pattern of CT findings and the progression of the disease.[46] This study has several limitations. First, the period of follow-up was short. Second, some of the patients were still hospitalized and we could not place them in one of the dead or deceased groups. Third, patients with insufficient data were excluded from the study. Fourth, false-positive and false-negative results may occur during the detection of virus via PCR test. Finally, this study was limited to a single center and it is better to interpret it more carefully.

Conclusion

In summary, we studied the medical information of 778 sufferers who died from COVID-19 contamination, and 3088 sufferers who recovered. Patients in the dead group revealed greater pre-present comorbidities, including dyspnea, oxygen saturation decrease, reduced lymphocytes, and extended CRP levels. Thus, it is counseled that clinician examine the elements in the preliminary prognosis of this contamination and additionally in the course of the remedy of the contamination.

Conflict of interests

The authors declare that no competing interest exists.

Authors' contribution

Mahbobe Jafari, Maryam Akbari, Maryam Navidkia, Shirin Dashtbin, Faezeh Mmousavi, Mohsen Heidary, and Saeed Khoshnood contributed in revising and final approval of the version to be published. All authors agreed and confirmed the manuscript for publication.

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