

Research Paper:

Demographic Characteristics, Clinical Symptoms, and Radiological Features in Patients With COVID-19 in Iran



Abdollah Abolfathi¹, Fatemeh Mehrabi^{2*}, Ashkan Lotfi Sheikhan², Gholam Reza Mirzaei², Azam Moslemi³, Ruhollah Sohrabi²

1. Iranian Social Security Organization, Arak, Iran.

2. Department of Nursing, School of Nursing, Arak University of Medical Sciences, Arak, Iran.

3. Department of Biostatistics, School of Medicine, Arak University of Medical Sciences, Arak, Iran.



Citation: Abolfathi A., et al., 2020. Demographic Characteristics, Clinical Symptoms, and Radiological Features in Patients With COVID-19 in Iran. *Journal of Client-Centered Nursing Care*, 6 (3), pp. 163-174. <https://doi.org/10.32598/JCCNC.6.3.303.1>

doi <https://doi.org/10.32598/JCCNC.6.3.303.1>



Article info:

Received: 19 Sep 2019

Accepted: 21 Jun 2020

Published: 01 Aug 2020

Keywords:

COVID-19, Clinical chemistry test, Diagnostic imaging, Signs, Symptoms, Medical history

ABSTRACT

Background: Considering the new Coronavirus outbreak and limited data about this pandemic in Iran, this study aimed at assessing the demographic characteristics, clinical symptoms, paraclinical findings, and radiological features of hospitalized patients with COVID-19 according to their hospital records.

Methods: In this descriptive-cross-sectional study, the required data were collected from the Health Information System (HIS) and the records of the patients who had been hospitalized following positive COVID-19 Polymerase Chain Reaction (PCR) and lung Computed Tomography (CT) scans, in some hospitals of Markazi Province, Iran from February 20, 2020, to April 20, 2020. The selected hospitals were affiliated with the Iranian Social Security Organization. Clinical follow-up was continued until April 26, 2020. During this period, 260 records were assessed. The collected data included demographic characteristics, clinical symptoms, as well as the paraclinical findings and radiological features of the patients. The obtained data were analyzed by SPSS.

Results: Among 260 confirmed cases of COVID-19, 161 (61.9%) cases were men and 99 (38.1%) were women. The Mean±SD age of the explored patients was 58.78±16.44 years. Besides, 221 (85%) patients were hospitalized in the general ward and 39 (15%) cases in the Intensive Care Unit (ICU). Hypertension and diabetes were the most prevalent medical histories (comorbidities). Fever, fatigue, cough, anorexia, myalgia, dyspnea, oliguria, taste impairment, and smell deficiency were the most frequent clinical symptoms. Neutrophilia, lymphopenia, low blood glucose level, and increased BUN, ALP, CRP, and ESR were among the critical laboratory findings. Almost 30% of the studied patients presented acidosis in arterial blood gases analysis and 55% had normal blood gasses. Decreased PaO₂ was observed in 80% of the investigated patients. Most of the patients had received oxygen therapy, lopinavir, and hydroxychloroquine. Additionally, 11.2% of the patients were under invasive mechanical ventilators. Concerning the lung CT scan, 42.7% of the patients had ≥5 involved lobes. In terms of density, 51.9% of the subjects had mixed opacity. Most lung damages (41.5%) were in the central part of the lungs. In 55.8% of cases, these damages were patchy lesions, and 40% had an air-bronchogram. According to the Chi-squared test data, there was a significant relationship between the location of the lesions and the patient's need for suction (P<0.001). Besides, patients with central lung lesions required the highest percentage of suction (26%). In this study, 15% of the explored patients were hospitalized in the ICU, 84% were discharged by April 26, and 8.07% died.

Conclusion: The current research results provide the health team with beneficial information about the assessment and care of patients with COVID-19 and the prediction of treatment outcomes.

* Corresponding Author:

Fatemeh Mehrabi, MSc.

Address: Department of Nursing, School of Nursing and Midwifery, Arak University of Medical Sciences, Arak, Iran.

Tel: +98 (86) 34173503

E-mail: fmehrabi1392@gmail.com

Highlights

- Fever, fatigue, cough, anorexia, myalgia, dyspnea, oliguria, taste impairment, and smell deficiency were among the most frequent symptoms in the studied patients.
- Hypertension and diabetes were the most prevalent comorbidities in the explored patients.
- Respecting lung CT scan, 42.7% of the studied patients had ≥ 5 involved lobes.
- There was a significant relationship between the location of lung lesions and the patient's need for suction.
- Fifteen percent of the patients were hospitalized in the ICU, 84% were discharged, and 8.07% died.
- There was a significant difference between the average Creatinine (Cr) level of the patients who survived and those who died ($P < 0.05$).

Plain Language Summary

The current study assessed the demographic characteristics, clinical signs, and symptoms, as well as radiological features of hospitalized patients with COVID-19 in Markazi Province, Iran. With the collected information, a better view of the care and treatment of this disease was provided. The present study results suggested that men were more likely to be infected than women; however, there was no association between gender and the odds of COVID-19 infection. Fever, fatigue, cough, anorexia, myalgia, dyspnea, oliguria, taste impairment, and smell damage were the most common symptoms in the studied patients. Hypertension and diabetes were the most prevalent concurrent diseases in the explored patients. In addition to respiratory symptoms, attention to gastrointestinal and neurological disorders is essential for the diagnosis and treatment of this disease.

1. Introduction

C COVID-19 disease, caused by Coronavirus-2019 (2019-nCoV), appeared and reported in late 2019-early 2020 and rapidly spread throughout the world (Lu et al., 2020; Li 2020; Gorbalenya et al., 2020; Chen et al., 2020; Huang et al., 2020; Wang et al., 2020; Holshue et al., 2020; Wang et al., 2020).

In Iran, this virus was first appeared in Qom Province on February 19, 2020, and has gradually spread throughout the country. It is believed that Coronavirus 2019 is originated from snakes, bats, and pangolins (anteaters with scales) in the wet markets of Wuhan (Ji et al., 2020). This virus can spread quickly and has caused numerous deaths since its appearance (Wang et al., 2020). On March 11, 2020, the World Health Organization (WHO) has declared the disease as a pandemic (global epidemic) (World Health Organization, 2020).

This disease usually appears as viral pneumonia and its major symptoms are fever, dry cough, and fatigue. The incubation period of the disease is reported to be 1-14 days;

however, the symptoms usually appear between 3-7 days (Lu et al., 2020).

This disease is mostly transmitted by respiratory droplets and close contact; some evidence suggests that it can be transmitted through the oral-fecal route (Zhang et al., 2020).

Numerous studies have been conducted in China, the USA, and all around the world. The prognosis of COVID-19 patients depends on a wide range of factors. Accordingly, and considering the novelty of this disease, we decided to analyze the clinical symptoms, laboratory findings, and imaging manifestations in these patients. Therefore, the current study aimed to assess the demographic characteristics, clinical symptoms, paraclinical findings, and radiological features of patients with COVID-19 hospitalized in the hospitals of Markazi Province, Iran according to their hospital records.

In this study, we attempted to investigate the association between age, gender, laboratory and clinical findings, and underlying diseases in these patients, as well as their clinical and imaging manifestations.

This study was conducted in Markazi Province, i.e. the closest province to the primary center of Coronavirus outbreak in Iran (Qom).

2. Materials and Methods

This descriptive cross-sectional study was conducted in three hospitals affiliated with the Iranian Social Security Organization following the approval received from the relevant Deputy of Treatment.

Iranian Social Security Organization is a non-governmental public insurance institution. This public non-governmental organization is responsible for the compulsory insurance of workers and employers as well as the optional insurance of business owners, self-employed individuals, and freelancers. It is the oldest and largest non-governmental social security and medical insurance organization in Iran (www.tamin.ir/2020).

For all the patients who entered the study, COVID-19 infection was confirmed by Polymerase Chain Reaction (PCR) test and lung CT scan. All of the studied patients were hospitalized in Social Security Organization hospitals in Markazi Province, Iran.

The records of the 260 patients who had been hospitalized from February 20, 2020, to April 20, 2020, were assessed in this research. The medical records were collected and analyzed by the research team. Demographic characteristics, clinical and laboratory findings, and radiological features were collected using data collection forms, which have been generated through the information provided on the Hospital Information System (HIS) and field studies. To assess laboratory and radiology findings, the HIS (network connected to all parts of the hospital, including pharmacy, radiology, & laboratory) was used; this is because, in this system, patients' data are recorded from the moment of admission to discharge. This system was used in addition to the patients' clinical records. To investigate disease progression and the treatment effect, blood tests and biochemical parameters had been measured daily.

The recorded data included demographic characteristics, medical history, a history of contact with COVID-19 patients, the signs and symptoms of the disease, laboratory tests, Computed Tomography (CT) scans, treatment and medication records, arterial blood gases, and so on. The required data were documented by the cooperation of a physician, a nurse, a radiologist, and a laboratory expert.

The disease onset was considered from the beginning of the initial symptoms. Laboratory and imaging values, as well as clinical signs and symptoms, were measured and recorded during hospitalization. The diagnosis of diabetes, hypertension, and other co-morbidities in the medical records was confirmed by a physician. The incidence of Acute Respiratory Distress Syndrome (ARDS), and acute renal and cardiac disorders was also recorded according to the laboratory values and the approval of specialists.

For all investigated patients, a chest CT scan was performed. Images were taken with a slice thickness of 1 to 1.5 mm. All imaging features were evaluated by a radiologist and a physician. These CT scan features included Ground Glass Opacity (GGO), mixed GGO, and consolidation. Additionally, the number of involved lobes and segments, lesion location, form, and other radiological patterns, including air-bronchogram, centrilobular nodules, tree-in-bud, reticular pattern, sub-pleural linear opacity, bronchial dilatation, cystic change, lymphadenopathy, and pleural effusion were checked in each CT scan image.

The number of involved lobes and segments were counted. If the lesion was located in the one-third outer part of the lung, it was considered to be in the outer part of the lung; otherwise, it was considered to be in the central part of the lung.

The Kolmogorov-Smirnov test was used to evaluate the normal distribution of the data. Normally distributed variables were reported as Mean±SD values. Continuous variables were analyzed by parametric tests [Independent Samples t-test, one-way Analysis of Variance (ANOVA), Tukey posthoc test & Pearson correlation coefficient]; qualitative variables were tested by the Chi-squared (χ^2) test or Fisher's Exact test, as appropriate. The collected data were analyzed by SPSS.

3. Results

This study was conducted using the records of 260 COVID-19 confirmed cases. Among the explored patients, 161 (61.9%) and 99 (38.1%) were male and female, respectively. The Mean±SD age of the studied patients was 58.78±16.44 years. Among them, 23.8% were in the age range of 50-59 years. The minimum and the maximum age of the explored patients were 16 and 91 years, respectively. A total of 157 (60.4%) patients were married; 229 (88.1%) were living in town; 221 (85%) were hospitalized in the general ward, and 39 (15%) in the Intensive Care Unit (ICU). The demographic and clinical information of the studied patients is presented in Table 1.

Table 1. Demographic characteristics of the COVID-19 hospitalized patients (N=260)

Demographic Variables		Total
Age (y)	29 <	8
	30-39	24
	40-49	48
	50-59	62
	60-69	41
	70 >	77
Mean±SD		58.78±16.44
Demographic Variables		No. (%)
Gender	Male	161 (61.9)
	Female	99 (38.1)
Comorbidities	Hypertension	52 (20)
	Diabetes	48 (18.5)
	Cardiovascular disease	17 (6.5)
	Malignancy	12 (4.6)
	COPD	32 (12.3)
	Liver disease	14 (5.4)
	Kidney disease	16 (6.2)
	Pregnant	10 (3.8)
	Breastfeeding	4 (1.5)
	NO	55 (21.2)
Job	Health Care	7 (2.7)
	Non Health Care	253 (97.3)
Educational level	illiterate	96 (36.9)
	Primary	76 (29.2)
	Secondary school	39 (15)
	Diploma	33 (12.7)
	University degree	16 (6.2)
Marital status	Married	157 (60.4)
	Single	103 (39.6)
Allergy	Yes	33 (12.7)
	No	227 (87.3)
Residency	City	229 (88.1)
	Village	31 (11.9)

Table 2. Signs and symptoms at admission and treatment and the clinical outcomes in the studied COVID-19 hospitalized patients

Signs and Symptoms		No (%)	
	Fever	227 (87.3)	
	Fatigue	221 (85)	
	Cough	183 (70.4)	
	Anorexia	219 (84.2)	
	Myalgia	222 (85.4)	
	Dyspnea	227 (87.3)	
	Expectoration	84 (32.3)	
	Pharyngalgia	79 (30.4)	
	Diarrhea	140 (53.8)	
	Nausea	69 (26.5)	
	Vomiting	61 (23.5)	
	Dizziness	103 (36.9)	
	Headache	127 (48.8)	
	Abdominal Pain	27 (10.4)	
	Taste Impairment	192 (73.8)	
	Smell Impairment	187 (71.9)	
	Oliguria	178 (68.5)	
	Loss of consciousness	50 (19.2)	
	ARDS	64 (24.6)	
	Duration of hospitalization, d (Mean±SD)	6.51±2.0	
Treatment	Oxygen therapy	182 (70)	
	ICU	39 (15)	
	Intubation & invasive mechanical ventilation	29 (11.2)	
	Respiratory suction	42 (16.2)	
	Hydroxychloroquine	237 (91.2)	
	Antibiotic treatment	Azithromycin	93 (35.8)
		Ceftriaxone	44 (16.9)
		Levofloxacin	10 (3.8)
		Combine	61 (23.5)
		NO	52 (20.0)
Antifungal treatment	1 (0.4)		
Antiviral treatment (Kaletra)	254 (97.7)		
Interferon administration	7 (2.7)		
Glucocorticoids	19 (7.3)		
Immunoglobulin therapy	2 (0.8)		
Clinical Outcome	Discharged	239 (91.93)	
	Died	21 (8.07)	

Table 3. Laboratory findings of COVID-19 hospitalized patients

	Blood Routine	Normal Range	Mean±SD	Pattern	No. (%)
	Red blood cell count, ×106/μL	4.2-6.2	4.86±0.65	Increased	4 (1.5)
				Decreased	25 (9.6)
	White blood cell count, ×103/μL	4-10.1	6.81±3.6	Increased	17 (6.5)
				Decreased	26 (10)
	Neutrophil, ×103/μL	47-76	68.11±14.49	Increased	79 (30.4)
				Decreased	22 (8.5)
	Lymphocyte, ×103/μL	25-45	23.18±10.37	Increased	4 (1.5)
				Decreased	155 (59.6)
	Monocyte, ×103/μL	2-8	4.45±4.9	Increased	32 (12.3)
				Decreased	44 (16.9)
	Hemoglobin g/dL	12-16	13.78±2.4	Increased	17 (6.5)
				Decreased	38 (14.6)
	Hematocrit %	32-48	42.09±6.98	Increased	18 (6.9)
				Decreased	10 (3.8)
	Platelet (×109/L)	150 - 450	226.26±86.67	Increased	3 (1.2)
				Decreased	39 (15)
	Blood Sugar, mg/dL	70-130	116.8±52.07	Increased	46 (18.7)
				Decreased	214 (82.3)
	NA, mg/dL	135-145	137.23±4.07	Increased	6 (2.3)
				Decreased	93 (35.3)
	K, mg/d	3.5-5.5	3.95±0.61	Increased	3 (1.2)
				Decreased	33 (12.7)
	BUN	5-20	21.60±10.14	Increased	132 (50.8)
				Decreased	0
Blood biochemistry	Creatinine	0.7-1.4	1.15±0.52	Increased	49 (18.8)
				Decreased	27 (10.4)
	ALT (IU/L) alanine aminotransferase	41<	32.64±23.79	Increased	212 (81.5)
				Decreased	0
	AST (IU/L) aspartate transaminase	42<	34.25±13.26	Increased	69 (26.5)
				Decreased	0
	ALP	100-290	479.20±165.01	Increased	253 (97.3)
				Decreased	4 (1.5)
	Total bilirubin (μmol/L)	0.2-1.2	0.83±0.5	Increased	232 (89.2)
	LDH (U/L) lactate dehydrogenase	480<	493.51±159.57	Increased	122 (49.6)
CK (mmol/L) creatinine kinase	40-200	140.75±32.3	Increased	27 (10.4)	
Troponin			1: Positive	15 (5.8)	
			2: Negative (normal)	245 (94.2)	
Infection-associated	ESR	0-20	26.78±20.98		159 (61.2)
	C-reactive protein (mg/L)	(0.0-6.0)	23.14±18.79		181 (69.4)

	Blood Routine	Normal Range	Mean±SD	Pattern	No. (%)
Blood coagulation	Prothrombin time (s)	10-13	13.93±1.15	Increased	65 (25)
	Active partial thrombin time (s)	30-45	39.64±4.91	Increased	47 (18.1)
				Decreased	4 (1.5)
Atrial Blood Gas	PH	7.35-7.45	7.38±0.6	Increased	39 (15)
				Decreased	78 (30)
	PaO ₂ mm Hg	80-100	71.19±10.7	Decreased	209 (80.4)
	PaCO ₂ mm Hg	35-45	41.53±6.7	Increased	83 (31.9)
				Decreased	39 (15)
	HCO ₃	22-26	23.41±3.7	Increased	65 (25)
Decreased				71 (27.3)	

Client- Centered Nursing Care

Hypertension with 52 (20%) cases and diabetes with 48 (18.5%) cases were the most prevalent medical histories (comorbidity) in these patients. Among the patients, 164 (63.1%) were literate, 253 (97.3%) were non-healthcare members, 7 (2.7%) were healthcare personnel, and 33 (12.7%) cases had allergies.

Signs and symptoms during hospitalization, the received treatment, the time of hospitalization, and the patients' therapeutic outcomes are summarized in Table 2. The most frequent symptoms in 227 (87.3%) patients were fever, 221 (85%): Fatigue, 183 (70.4%): Cough, 219 (84.2%): Anorexia, 222 (85.4%): Myalgia, 227 (87.3%): Dyspnea, 178 (68.5%): Oliguria, 192 (73.8%): Taste impairment, and 187 (71.9%): Smell deficiency. Less common symptoms included 84 (32.3%) cases of expectoration, 79 (30.4%) pharyngalgia cases, 140 (53.8%) diarrhea records, 69 (26.5%) nausea reports, 61 (23.5%) vomiting cases, 27 (10.4%) abdominal pain reports, and 64 (24.6%) cases of ARDS. All the patients showed a decrease in SaO₂ level. Complications, such as septic shock, acute renal failure, and acute lung injury were not observed in this study.

Laboratory findings are listed in Table 3. The relevant results indicated that RBC was low in 9.6% of the explored cases and it was normal in 88.8% of them. WBC was low and high in 10% and 6.5% of the studied cases, respectively. Among the investigated patients, 8.5% had neutropenia, 30.4% experienced increased neutrophils, 59.6% had lymphopenia, and 1.5% encountered increased lymphocytes. Regarding the biochemical laboratory test data, blood glucose level was low in 82.3% of the cases, Blood Urea Nitrogen (BUN) was high in 50.8% of the cases, and Alkaline Phosphatase (ALP) was high in 97.3% of cases.

Furthermore, 69.6% of the studied patients presented abnormal C-Reactive Protein (CRP) and 61.2% had high Erythrocyte Sedimentation Rate (ESR). Besides, 87 (30%) of the study cases presented acidosis in arterial blood gases analysis and 55% had normal blood gasses; however, decreased PaO₂ was observed in 209 (80.4%) cases. The Independent Samples t-test data suggested no significant gender-wise difference in the average pH (P>0.05). However, the same test indicated a significant difference between the average Creatinine (Cr) level of the patients who survived and those who died (P<0.05). Most of the investigated patients had received oxygen therapy (182 cases, 70%). Lactate Dehydrogenase (LDH) level also increased in 122 (49.6%) cases.

Respecting medication, 254 (97.7%) cases received antiviral and lopinavir (ritonavir), and 237 (91.2%) patients received hydroxychloroquine. The most used antibiotics were azithromycin in 93 (35.8%), ceftriaxone in 44 (16.9%), and levofloxacin in 10 (3.8%) cases. In 61 (23.5%) patients, a combination of antibiotics was prescribed. Only for one (0.4%) patients, antifungal was used. Interferon was prescribed for 7 (2.7%), glucocorticoids for 19 (7.3%), and immunoglobulin for 2 (0.8%) patients. Among the explored patients, 29 (11.2%) were under invasive mechanical ventilator, and 39 (15%) were hospitalized in the ICU. Furthermore, 42 (16.2%) patients were suctioned during the treatment process, 91.93% were discharged by April 26, and 8.07% died. In this study, the death rate was higher in men than women; however, there was no relationship between gender and mortality rate (P=0.206).

The Mean±SD number of involved lobes of the lung in the CT scans were 4.1±1.03 and the involved Mean±SD segments were 2.28±6.25. Among the investigated patients, 42.7% had ≥5 involved lobes. In terms of density,

Table 4. Radiological data of COVID-19 hospitalized patients

Variables	Patterns	Mean (total)
Lobes involved	Mean (total)	4 (6)
Segments involved	Mean (total)	6 (14)
Density	GGO	60 (23.1)
	mixed	135 (51.9)
	consolidation	65 (25)
Location	Peripheral	64 (24.6)
	central	108 (41.5)
	both	88 (33.8)
Form	Patchy	145 (55.8)
	Oval	115 (44.2)
Other Radiological patterns	Air bronchogram	Yes 104 (40)
		No 156 (60)
	Centrilobular nodules	Yes 69 (26.5)
		No 191 (73.5)
	Tree-in-Bud	Yes 43 (16.5)
		No 217 (83.5)
	Reticular pattern	Yes 37 (14.)
		No 223 (85.5)
	Sub pleural linear opacity	Yes 44 (16.9)
		No 216 (83.1)
	Bronchial dilatation	Yes 25 (9.6)
		No 235 (90.4)
	Cystic change	Yes 21 (8.1)
		No 239 (91.9)
	Lymphadenopathy	Yes 26 (10)
		No 234 (90)
Pleural effusion	Yes	35 (13.5)
	No	225 (86.5)

Client-Centered Nursing Care

Ground-Glass Opacity (GGO) was observed in 23.1% of segments; there was mixed opacity in 59.1% of the segments and consolidation in 25% of the segments. Most lung lesions (41.5%) were situated in the central part of the lung, and 33.8% were in both central and lateral parts. In 55.8% of cases, these damages were patchy lesions, and the rest were oval. Moreover, 40% presented an air-bronchogram view, and the other pulmonary patterns were scarcely observed (Table 4).

In this study, no statistically significant relationship was observed between radiological variables, demographic characteristics, and clinical findings ($P>0.05$). However, according to the Chi-squared test, there was a significant relationship between the location of lesions and the pa-

tient's need for suction ($P<0.001$); accordingly, the patients with central lung lesions required the highest percentage of suction (26%). Similarly, the Chi-squared test data indicated a significant relationship between Pleural Effusion (PE) and performing suction ($P=0.032$); 29% of patients with PE needed suction, while 14% of patients without PE required suction.

4. Discussion

This study investigated demographic data, clinical and laboratory findings, and radiological features, i.e. available in the records of the patients infected with Coronavirus 2019 in Iran. Moreover, the treatment process and its outcomes were evaluated. According to the find-

ings, the Mean±SD age of the explored patients was 58.78±16.44 years. The average age of COVID-19 patients in the USA (Richardson et al., 2020) is 63 years, and the same in China (Yang et al., 2020) was reported to be 45 and 56 years in two different studies. The majority of our studied patients were men, i.e. congruent with the results of studies conducted in Zhejiang, China (Yang et al., 2020), and New York, USA (Richardson et al., 2020). However, another study by Wang et al. in Wuhan, China revealed no significant gender-wise difference in this disease (Wang et al., 2020).

In the present study, 85% of the explored patients were hospitalized in the general ward and 15% in the ICU. In a study by Yang et al. (2020), among 149 patients, none were transferred to the ICU (Yang et al., 2020). The majority of our studied patients lived in town, which could be relevant to more travel and contact with the virus in the urban community.

In accordance with investigations in the USA (Richardson et al., 2020) and China (Zhou et al., 2020), the majority of patients in our study reported a history of diabetes and hypertension. In this study, the most frequent clinical symptoms of Coronavirus 2019 were fever, fatigue, cough, anorexia, myalgia, dyspnea, oliguria, taste impairment, and smell deficiency; this finding is similar to that of a study by Wang and associates (2020). In another study, fever, cough, and expectoration were among the most prevalent clinical symptoms of COVID-19 (Yang et al., 2020). However, there was no data about taste and smell impairment in these two studies. In our study, digestive symptoms, such as abdominal pain, diarrhea, nausea, and vomiting have also been observed. According to recent studies, it may indicate the oral-fecal transmission of the virus (Zhang et al., 2020). Hospitalization time in our study was about 6-7 days; in the study by Wang et al., it was 10 days (Wang et al., 2020), and in another study, it was 4-6 days (Richardson et al., 2020).

The most critical laboratory changes in this study included increased neutrophil, decreased lymphocyte, low blood glucose level, as well as increased BUN, LDH, and ALP. Increased CRP and ESR levels following the inflammation phase were among other laboratory findings, i.e. in accordance with the results of another study (Wang et al., 2020). These laboratory changes could be related to the inflammatory phase in the body and secretion of immunological factors. Being infected with COVID-19 is associated with reduced cellular immunity, and damage to kidneys, heart, and liver. These alternations are similar to those of Severe Acute Respiratory

Syndrome (SARS) and Middle East Respiratory Syndrome (MERS) (Wang et al., 2020).

In total, 30% of the studied patients presented acidosis in arterial blood gases analysis and 55% had normal blood gasses; however, a decrease in PaO₂ was found in 209 patients (80.4%). This finding is consistent with a study by Ottestad and Søvik (2020). The pathoanatomical and pathophysiological basis for respiratory failure in COVID-19 remains undetermined; however, diffuse alveolar damage with interstitial thickening leading to compromised gas exchange is a plausible mechanism (Ottestad & Søvik 2020). Considering lung involvement and reduction in alveolar ventilation, acidosis, and decreased PaO₂ can be justified.

No effective treatment is suggested for COVID-19, and all treatments are currently supportive (Zhu et al., 2019). Using personal protective equipment, the isolation of patients, and supportive treatments are among the approaches in managing Coronavirus 2019. Most investigated patients received oxygen therapy, lopinavir, and hydroxychloroquine. Antibiotics, including azithromycin, ceftriaxone, and levofloxacin were also prescribed. Antifungals, interferons, glucocorticoids, and immunoglobulin were rarely used. Wang et al. argued that using antibiotic provides no effect on this infection, and like SARS and MERS, no appropriate antiviral has been found for this virus; however, in their study, all the patients had received antibiotics, 90% received antiviral, and 45% used methylprednisolone (Wang et al., 2020). In our study, lopinavir has been used as antiviral. In a similar study, oseltamivir was used as an antiviral (Wang et al., 2020). It should be mentioned that in Iran, at first, oseltamivir was used, instead of Kaletra. However, with the greater effectiveness of lopinavir, the use of oseltamivir was restricted.

In this study, the death rate was reported as 8.07%. In a study by Wang et al. (2020) in China, the death rate was reported as 4.3%; in another study by Richardson et al. (2020) in the USA, it was reported as 88.1% for the patients under mechanical ventilation, and for those in the age range of 18-65 years or older, the death rate was equal to 19.8% to 26.6%. In our study, the calculated death rate was only related to hospitalized patients.

In our study, lung involvement and the pattern of its changes were determined by the lung CT scans of 260 patients. Similar to previous studies (Yang et al., 2020; Song et al., 2020; Chung et al., 2020), GGO, consolidation, and the combination of both was observed on one side or both sides of the lung of our patients, as well as the presence of the central lesions. In the study by Yang et al.

(2020) most lesions were lateral, while in our study, the majority of lesions were central. Additionally, the number of involved lobes and segments in our study was higher, compared to their study (Yang et al., 2020). This finding can indicate the higher involvement of the lungs in this province of Iran, compared to China. The diagnosis of COVID-19 by CT scan alone, and without paying attention to clinical symptoms and PCR test is not accurate; this is because in the early stages of COVID-19, lung involvement and lung CT scan, cannot reflect the disease. Therefore, it is necessary for the healthcare team to comprehensively evaluate clinical symptoms, including fever, fatigue, olfactory, and taste impairments, along with a PCR test and lung CT scan; then make the right decisions.

The present research limitation was the impossibility to assess the incubation period of the disease (the duration of infection until the onset of clinical and laboratory symptoms). In this study, patients with both positive PCR test and positive lung CT scan in terms of COVID-19-related changes were investigated. However, individuals with positive PCR test, and no COVID-19-related clinical symptoms were not assessed. The kits used to measure laboratory values and the type of blood pressure monitors were beyond the control of the researchers. Moreover, the evaluation and follow-up of patients after discharge were not conducted. It is suggested that further studies be conducted on the confirmed cases of COVID-19 who are being treated at home.

5. Conclusion

This study was conducted on 260 COVID-19 patients in the Markazi Province of Iran. In addition to fever, fatigue, and cough, patients presented olfactory and taste impairments, and abdominal symptoms, which indicate nervous and gastrointestinal involvement. Among the patients, 15% were hospitalized in the ICU, and 8.03% of total patients died. Based on the obtained results, it is recommended that the medical staff and physicians pay attention to the gastrointestinal and neurological symptoms of the disease, as the symptoms of Coronavirus, and not only to the respiratory symptoms.

Ethical Considerations

Compliance with ethical guidelines

Permission of the Deputy of Treatment of Social Security Organization of Markazi Province and the related hospitals were obtained for conducting this research. Anonymity was considered in the assessment of the patients' records.

Funding

This research did not receive any grant from funding agencies in the public, commercial, or non-profit sectors.

Authors' contributions

Conceptualization: All author; Methodology: Fatemeh Mehrabi, Abdollah Abolfathi; Investigation and data curation: Abdollah Abolfathi, Ashkan Lotfi Sheikhan, Gholam Reza Mirzaei, and Ruhollah Sohrabi; Writing – original draft: Abdollah Abolfathi; Writing – review & editing: Fatemeh Mehrabi; Supervision: Fatemeh Mehrabi, Software and formal analysis: Azam Moslemi.

Conflict of interest

The authors declared no conflicts of interest.

Acknowledgments

The authors appreciate the Deputy of Treatment of Social Security Organization of Markazi Province for their cooperation in implementing this project. Also, the collaboration of the staffs of Social Security Organization hospitals in Markazi Province is appreciated.

References

- Chen, N., et al., 2020. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: A descriptive study. *Lancet*, 395 (10223), pp. 507-13. [DOI:10.1016/S0140-6736(20)30211-7]
- Chung, M., et al., 2020. CT imaging features of 2019 novel coronavirus (2019-nCoV). *Radiology*, 295 (1), pp. 202-7. [DOI:10.1148/radiol.2020200230] [PMID] [PMCID]
- Dong, L. & Bouey, J., 2020. Public mental health crisis during COVID-19 pandemic, China. *Emerging Infectious Diseases*, 26 (7), pp. 1616-8. [DOI:10.3201/eid2607.200407] [PMID] [PMCID]
- Gorbalenya, A. E., et al., 2020. Severe acute respiratory syndrome-related coronavirus: The species and its viruses—a statement of the Coronavirus Study Group. *Nature Microbiology*, 5, pp. 536-44. [DOI:10.1038/s41564-020-0695-z]
- Holshue, M. L., et al., 2020. First case of 2019 novel Coronavirus in the United States. *The New England Journal of Medicine*, 382 (10), pp. 929-36. [DOI:10.1056/NEJMoa2001191] [PMID] [PMCID]
- Huang, C., et al., 2020. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*, 395 (10223), pp. 497-506. [DOI:10.1016/S0140-6736(20)30183-5]
- Ji, W., et al., 2020. Cross-species transmission of the newly identified coronavirus 2019-nCoV. *Journal of Medical Virology*, 92 (4), pp. 433-40. [DOI:10.1056/NEJMoa2001316] [PMID] [PMCID]

- Li, Q., et al., 2020. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. *The New England Journal of Medicine*, 382 (13), pp. 1199-207. [DOI:10.1056/NEJMoa2001316] [PMID] [PMCID]
- Lu, H., Stratton, C. W. & Tang, Y. W., 2020. Outbreak of pneumonia of unknown etiology in Wuhan China: The mystery and the miracle. *Journal of Medical Virology*, 92 (4), pp. 401-2. [DOI:10.1002/jmv.25678] [PMID] [PMCID]
- Ottestad W., & Søvik, S., 2020. COVID-19 patients with respiratory failure: What can we learn from aviation medicine? *British Journal of Anaesthesia*, 125(3), pp. e280–e281. [DOI:10.1016/j.bja.2020.04.012]
- Richardson, S., et al., 2020. Presenting characteristics, comorbidities, and outcomes among 5700 patients hospitalized with COVID-19 in the New York City Area. *JAMA*, 23 (20), pp. 2052-9. [DOI:10.1001/jama.2020.6775] [PMID] [PMCID]
- Song, F., et al., 2020. Emerging Coronavirus 2019-nCoV pneumonia. *Radiology*, p. 200274. [DOI:10.1148/radiol.2020209021] [PMID]
- Wang, C., et al., 2020. A novel coronavirus outbreak of global health concern. *Lancet*, 395 (10223), pp. 470-3. [DOI:10.1016/S0140-6736 (20)30185-9]
- Wang, D, et al., 2020. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus infected pneumonia in Wuhan, China. *JAMA*, 323 (11), pp. 1061-9 [DOI:10.1001/jama.2020.1585] [PMID] [PMCID]
- Wang, W., Tang, J. & Wei, F., 2020. Updated understanding of the outbreak of 2019 novel coronavirus (2019-nCoV) in Wuhan, China. *Journal of Medical Virology*, 92 (4), pp. 441-7. [DOI:10.1002/jmv.25689] [PMID] [PMCID]
- World Health Organization. 2020. WHO director-general's opening remarks at the media briefing on COVID-19-11 March 2020 [Internet]. Cited 29 September 2020, WHO: <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19--11-march-2020>
- Yang, W., et al., 2020. Clinical characteristics and imaging manifestations of the 2019 novel coronavirus disease (COVID-19): A multi-center study in Wenzhou city, Zhejiang, China. *Journal of Infection*, 80 (4), pp. 388-93. [DOI:10.1016/j.jinf.2020.02.016] [PMID] [PMCID]
- Zhang, H., et al., 2020. The digestive system is a potential route of 2019 nCoV infection: A bioinformatics analysis based on single-cell transcriptomes. *BioRxiv*, Just Accepted. [DOI:10.1101/2020.01.30.927806]
- Zhou, F., et al., 2020. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: A retrospective cohort study. *Lancet*, 395 (10229), pp. 1054-62. [DOI:10.1016/S0140-6736 (20)30566-3] [PMID] [PMCID]
- Zhu, N., et al., 2020. A novel coronavirus from patients with pneumonia in China, 2019. *The New England Journal of Medicine*, 382 (8), pp. 727-33. [DOI:10.1056/NEJMoa2001017] [PMID] [PMCID]

This Page Intentionally Left Blank