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Original Article

Intensive Care Unit of COVID-19 during the Different Waves of Outbreaks in Jahrom, South of Iran

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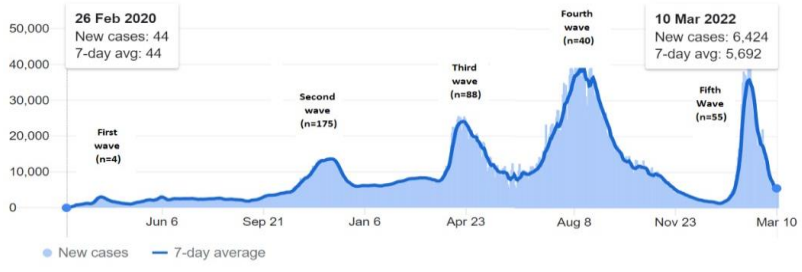
ABSTRACT

Introduction: The apt description of COVID-19's clinical course throughout hospitalization provides experiences for dealing with subsequent outbreaks, especially in patients with severe COVID-19 who get admitted to the intensive care unit (ICU). This study aimed to evaluate the symptomatology of patients with COVID-19 admitted to the ICU of Peymaniyeh Hospital in Jahrom in the first to the fifth wave of coronavirus.
Methods: This study was a descriptive-analytical on all ICU admitted COVID-19 patients during different outbreaks of COVID-19 from 2020 to 2022. Demographic data, symptomology at admission, and COVID-19 history were recorded along with the intubation rate. Data were compared among 5 different peaks of the COVID-19 in the whole country.
Results: Three-hundred sixty-nine patients were evaluated in this study. There was a significant difference between gender and hospitalization in the first to the fifth wave (P <0.005). In the first, second, and third waves, the frequency of hospitalization was higher in men than women, while reversed in the fourth and fifth waves. There was a significant difference between the first and fifth waves in terms of fever symptoms, loss of consciousness, headache, dizziness, chest pain, and lethargy (P <0.05). Respiratory distress was the most common symptom in the first to the fifth wave followed by chest pain, cough and fever were most common after respiratory distress.
Conclusion: diverse symptomatology in different waves of COVID-19 was found in our study, addressing the need for rapid clinical responses and policies specified for any new wave of outbreak.

GRAPHICAL ABSTRACT



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Introduction

Coronavirus 2019 disease (COVID-19) is caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV 2). The new coronavirus was identified in December 2019 as a pandemic getting started from Wuhan, China [1]. Although in most cases the disease is mild or asymptomatic, a subset of patients with moderate to severe pneumonia requires hospitalization in the ICU [2-4]. According to the published statistics, 15% of patients with this condition develop a severe form, 2% of patients are admitted to critical care units, and the disease's death rate is claimed to be 5% on average [5-6]. COVID-19 has complicated pathophysiology which can impact the lungs, heart, brain, liver, kidneys, and coagulation system [7-13]. In fact, in severe cases, the immune response affects the lungs too much, resulting in noncardiogenic pulmonary edema, hypoxia, and the requirement for mechanical ventilation and oxygenation [14-15]. Although intubation is required in some of these patients, patients who are mechanically ventilated have a significant mortality rate [16-17]. Several risk factors, such as concomitant infections [18], old age, chronic respiratory illness, and comorbidities [19], are associated with the severity of the disease [17-19]. A precise description of the COVID-19 clinical features throughout hospitalization provides vital insights into patients' prognosis and expected burden, as well as the duration of resources necessary for their care and clinical information for the disease's treatment. As a result of the aforementioned incidents, the current study was conducted to assess the clinical course of 19 patients hospitalized to the Peymaniyeh Hospital's ICU in Jahrom during the first to the fifth wave of coronavirus.

Materials and Methods

This was a descriptive-analytical study that comprehensively examied all patients with COVID-19 admitted to the COVID-19 ICU of Peymaniyeh Hospital in Jahrom in 2020-2022.

After obtaining an official letter of introduction from the Vice Chancellor for Research of Jahrom University of Medical Sciences approved by the research ethics committee (registration code of IR.JUMS.REC.1399.139), census sampling was conducted. Thus, all patients with COVID-19 who were hospitalized in Peymaniyeh Hospital in the intensive care unit from the beginning of the pandemic were included in the study. Inclusion criteria were a positive rt-PCR of COVID-19 nasal swab test and being admitted to ICU.

All participants were assured that the data was confidential and they had the right to be excluded from the study at any stage. The informed consent form was obtained from the research units after explaining the research.

The data collection tool was a checklist in this study. This checklist included information such as age, gender, place of residence, underlying diseases, and clinical manifestations of the COVID-19 at admission to the hospital. All data were weighed against the first to the fifth wave, as follows 12 March 2020 to September (1st wave), October to December 2020 (2nd wave), January 2021 to June 2021 (3rd wave), July 2021 to November 2021 (4th wave), and December 2021 to February 2022 (5th wave).

Data analysis

Data analysis was carried out by using SPSS software version 21 as well as by descriptive and inferential statistical tests at a significant level of $P<0.05$. Chi-square was used to evaluate the difference in the distribution of categorical and dichotomous variables in various waves.

Results and Disscusion

Data were collected from 362 patients with COVID-19 patients admitted to the ICU of Peymaniyeh Hospital. The lowest frequency of patients was hospitalized in the first wave (n = 4) and the highest was in the second one (n = 175). The frequency of patients with COVID-19 admitted to the ICU of Peymaniyeh Hospital in the first to the fifth wave in terms of demographic variables is depicted in the table below (Table 1). The results of the Chi-square test showed that there was a significant difference between the contact history with a patient having coronavirus ($P = 0.002$) and the previous history of COVID-19 ($P = 0.016$) with hospitalization in the first to the fifth wave ($P<0.05$). ICU hospitalization in patients with COVID-19 with a contact history with a patient having coronavirus from the first

to the fifth wave had an increasing trend so that most cases of hospitalization by a contact history with a patient having coronavirus in the fourth (54.5%) and the fifth wave (45%). The highest number of hospitalizations with a previous history of COVID-19 was in the third wave (17%) (Table 1).

Table 1: Frequency of COVID-19 patients based on demographic variables

Demographic variable		The first wave (n=4)		The second wave (n=175)		The third wave (n=88)		Fourth wave (n=40)		Fifth Wave (n=55)		P-value
		N	%	N	%	N	%	N	%	N	%	
Gender	Male	3	75.0	105	60.0	52	59.1	12	30.0	25	45.5	0.005
	Female	1	25.0	70	40.0	36	40.9	28	70.0	30	54.5	
Age	20<	0	0.0	1	0.6	0	0.0	0	0.0	2	3.6	0.19
	30-20	0	0.0	4	2.3	3	3.4	2	5.0	2	3.6	
	40-31	0	0.0	12	6.9	1	1.1	5	12.5	4	7.3	
	50-41	1	25.0	22	12.6	4	4.5	5	12.5	9	16.4	
	60-51	0	0.0	18	10.3	12	13.6	5	12.5	10	18.2	
	70-61	0	0.0	39	22.3	26	29.5	8	20.0	15	27.3	
	80-71	1	25.0	38	21.7	16	18.2	5	12.5	6	10.9	
	80<	2	50.0	41	23.4	26	29.5	10	25.0	7	12.7	
Place of residence	City	3	75.0	111	63.4	60	68.2	26	65.0	38	69.1	0.90
	Village	1	25.0	64	36.6	28	31.8	14	35.0	17	30.9	

Although most patients admitted to the ICU had hypertension and diabetes, the results of the Chi-square test showed that there was no significant difference between previous medical history and hospitalization in the first to fifth the wave (P = 0.59) (Table 2).

Table 2: Frequency of patients with 19 patients admitted to the ICU according to the medical history

Medical history		The first wave (4)		The second wave (175)		The third wave (88)		Fourth wave (40)		Fifth Wave (55)		P-value
		N	%	N	%	N	%	N	%	N	%	
History of contact with a patient with coronavirus	No	4	100	126	72.0	53	60.2	22	55.0	25	45.5	0.002
	Yes	0	0.0	49	28.0	35	39.8	18	45.0	30	54.5	
Previous medical history	No	0	0.0	49	28.0	27	30.7	9	22.5	18	32.7	0.59
	Heart disease	0	0.0	9	5.1	4	4.5	2	5.0	2	3.6	
	Diabetes	0	0.0	23	13.1	3	3.4	6	15.0	9	16.4	
	Hypertension	3	75.0	73	41.7	42	47.7	20	50.0	21	38.2	
	Other	1	25.0	21	12.0	12	13.6	3	7.5	5	9.1	
Previous history of Covid 19	No	4	100	165	94.3	73	83.0	39	97.5	50	90.9	0.02
	Yes	0	0.0	10	5.7	15	17.0	1	2.5	5	9.1	
Intubation	No	1	25.0	72	41.1	29	33.0	18	45.0	14	25.5	0.17
	Yes	3	75.0	103	58.9	59	67.0	22	55.0	41	74.5	

The results of the Chi-square test indicated that there was a significant difference between the first to the fifth wave in terms of fever symptoms, loss of consciousness, headache, dizziness, chest pain and lethargy (P<0.05). Respiratory distress was the most common symptom in the first to the fifth wave. After respiratory distress, chest pain, cough and fever were most common (Table 3).

Table 3: Frequency of patients with COVID-19 admitted to ICU based on symptoms

symptoms	First wave (4)		Second wave (175)		Third-wave (88)		Fourth wave (40)		Fifth Wave (55)		P-value
	N	%	N	%	N	N	%	N	%	N	
Fever	1	25.0	81	46.3	29	33.0	9	22.5	17	30.9	0.02
Cough	1	25.0	82	46.9	35	39.8	19	47.5	28	50.9	0.61
Muscular pain	1	25.0	77	44.0	35	39.8	8	20.0	24	43.6	0.075
respiratory distress	4	100.0	122	69.7	58	65.9	21	52.5	34	61.8	0.15
Loss of consciousness	1	25.0	27	15.4	19	21.6	2	5.0	1	1.8	0.006
Decreased sense of smell	0	0.0	4	2.3	5	5.7	0	0.0	0	0.0	0.18
Decreased sense of taste	0	0.0	4	2.3	5	5.7	0	0.0	0	0.0	0.18
Headache	0	0.0	8	4.6	12	13.6	7	17.5	5	9.1	0.03
Vertigo	0	0.0	4	2.3	10	11.4	0	0.0	4	7.3	0.01
Paraparesis	0	0.0	2	1.1	4	4.5	0	0.0	0	0.0	0.17
Chest pain	0	0.0	5	2.9	13	14.8	3	7.5	1	1.8	0.002
Abdominal pain	0	0.0	2	1.1	4	4.5	2	5.0	2	3.6	0.43
Nausea	0	0.0	10	5.7	6	6.8	6	15.0	1	1.8	0.12
Vomiting	0	0.0	11	6.3	4	5.3	5	12.5	0	0.0	0.13
Diarrhea	0	0.0	6	3.4	2	2.7	2	5.0	1	1.8	0.91
Lethargy	0	0.0	3	1.7	13	14.8	8	20.0	17	30.9	0.001

The clinical manifestations of COVID-19 in ICU patients are unknown. There was a lot of variance in ICU admission rates from 4 [26] to 32 percent [27], and mortality as 52.4 percent [29] across studies due to variations in design, patient demographic, and geography. The goal of this study was to assess the clinical outcomes of COVID-19 patients admitted to the Peymaniyeh Hospital's ICU in Jahrom from the first to the fifth wave of COVID-19 rates ranging from 0.7 percent [28] to COVID-19. The majority of COVID-19 patients admitted to the ICU were over 50 years old and resided in the city, however, the Chi-square test revealed that there was no significant difference in age or residential place between the first and fifth rounds of hospitalization. Yang et al. (2020) found that the average age of death was 50 years, with males dying at a younger age [30]. In their study, Alsofayan et al. (2020) suggested that the average age of the patients was 36 years [31]. This contradicts the findings of the current study. In a research of 656 infected individuals conducted by Li et al. (2020), it was discovered that the incidence was somewhat greater in men [32]. Women had a greater incidence than males, according to Y et al. (2020) and Peckham et al. (2020) [33-34]. In the current study, there were more males than women in the COVID-19 ICU in the first, second, and third waves. In the fourth and fifth waves, the frequency of hospitalization was higher in women (70%). The results of the Chi-square test illustrated that there is a significant difference between gender and hospitalization in the first to the fifth waves. At first, it seems that the presence of men in the outdoors has increased the incidence of men, and with the continuation of the epidemic and the involvement of family members, we have also seen an increase in the incidence of women with the disease. The most important ways of transmitting the virus during coughing, directly contacting and talking to a symptomatic patient at a distance of one to two meters. However, asymptomatic individuals can also be carriers [35-36]. Droplets transfer when a person comes in close contact with a person who has respiratory symptoms at a distance of 1 meter and therefore, the mucous membranes of the mouth, nose, or conjunctiva are at risk of being infected with respiratory droplets [37]. In this

study, the results of the Chi-square test showed that there is a significant difference between the contact history with a patient having coronavirus and a previous history of COVID-19 with hospitalization in the first to the fifth waves. ICU admission in patients with COVID-19 with a contact history with a patient having coronavirus from the first to the fifth wave has an increasing trend, so that most cases of hospitalization with a contact history with a patient having coronavirus in the fourth (54.5%) and the fifth wave (45%). The highest number of hospitalizations with a previous history of COVID-19 was in the third wave (17%). The results of the present study indicated that although most patients admitted to the ICU had high blood pressure and diabetes, the results of the Chi-square test showed that there was no significant difference between previous medical history and hospitalization in the first to the fifth wave (Table 2). Some studies have reported the presence of comorbid conditions such as hypertension in critically ill patients [40-40]. A study by Argenziano et al. [2020] also reported that hospitalized patients, especially those treated in intensive care units, often had underlying diseases such as hypertension, diabetes, and obesity [41]. In the proposed study, although the association between the disease and comorbidities was not significant, high blood pressure was reported in most subjects. In fact, hypertension and related therapies [such as angiotensin-converting enzymes and angiotensin receptor blockers] are associated with mortality in these patients [42]. In the end, the results of this study demonstrated that there is a significant difference between the first to the fifth wave in terms of fever symptoms, loss of consciousness, headache, dizziness, chest pain, and lethargy. Respiratory distress is the most common symptom in the first to the fifth wave. Chest pain, cough, and fever were most common after respiratory distress. The highest frequency of different symptoms was in the second wave (Table 3). Siso´-Almirall et al. (2020) stated in their study that clinical symptoms such as fever, chills, shortness of breath, depression, and laboratory symptoms such as decreased lymphocytes and increased CRP could predict hospitalization chances [43]. In fact, respiratory involvement is the most common form of the disease and the most common symptoms of this disease are fever, dry cough, shortness of breath, and sore throat [44-45]. Kazeminia et al. (2020) in their study stated that fever and cough were the most important symptoms in patients [46]. Song et al. (2020) reported a 96% prevalence of fever and a 47% prevalence of cough [47]. In the present study, respiratory distress was mentioned as the most common symptom during the five review periods, considering that it examined patients admitted to the ICU. Therefore, due to the fact that in different investigations, the study groups were different, the clinical symptoms mentioned as the most common form of the disease are different. Comparing the results of the proposed study with previous studies conducted in Jahrom city, a large number of examinations indicated high levels of stress due to COVID-19 disease in the people of the city, which could indicate the severity of the epidemic in the city [48-51]. Previous clinical studies in the city have shown that gender differences were associated with their clinical status among those who died in COVID-19 and that the role of gender was also seen to some extent in this scrutiny. Several other studies have dealt with the status of laboratory factors of coronary patients [53-54] and the role of race [55] and even how pre-hospital and emergency systems [56] function in Jahrom city. These factors were not examined in the proposed study. In another study in the Jahrom city itself, a high level of gastrointestinal symptoms was obvious, which was less seen in our study [57]. The number of patients under 20 years of age admitted to the intensive care unit was very low in our study. However, the severity of the disease in children in Jahrom has not been reported since the onset of a severe pandemic [58]. Comparing the results of the present study with previous ones conducted in Jahrom city, a large number of studies have shown high levels of stress due to Covid 19 disease among citizens, which could indicate the epidemic severity in the city. [48-51]. Previous clinical studies in Jahrom have shown that gender differences were associated with

their clinical status among those who died in COVID-19 and that the gender role was also seen to some extent in this investigation. Several other studies have dealt with the status of laboratory factors of coronary patients [53 and 54] and the role of race [55] and even the functioning of pre-hospital and emergency systems [56] in Jahrom city and it can be addressed in future studies. In another study in the Jahrom city itself, a high level of gastrointestinal symptoms was vivid, which was less seen in our study [57]. The number of patients under 20 years of age admitted to the intensive care unit was very low in our scrutiny. However, the severity of the disease in children in Jahrom has not been reported since the onset of a severe pandemic [58].

Advantages and Limitations

As we retrospectively evaluated medical records registered in hospital, there were some important datasets missing as well as the detailed sociocultural characteristics, also mortality status and length of ICU hospitalization was not declared in the registry which would be the interesting variables for further studies, while our study focused on the symptomatology at admission time that would be helpful to detect patients who are at higher risks of the ICU administration. It has previously been indicated that trends of COVID-19 symptoms are varied in different months passing the COVID-19 in the whole world in a meta-analysis study that was confirmed here for ICU admission, as well [59].

Conclusion

Findings of the proposed study showed that the majority of patients with 19 ones were at the ages more than 50 years in the ICU and in the first, second, and third waves, the frequency of hospitalization was higher than men and in the fourth and fifth waves, the frequency of hospitalization was higher in women, as well. Respiratory distress was the most common symptom in the first to the fifth wave. Our study also indicated that COVID-19 symptom patterns of patients are being changed during different disease waves of outbreaks which should be considered for detecting patients who are more susceptible to ICU admission.

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Authors' contributions

All the authors met the criteria of authorship based on the recommendations of the international Committee of Medical Journal Editors.

Conflict of Interest

We have no conflicts of interest to disclose.

Consent for publication:

None declared.

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