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Epidemiological Status and Health System Screening of COVID 19 Hospitalized Patients in Isfahan, Iran

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Abstract

Background: The first case of Covid-19 disease was identified in Iran on February 19, 2020, and spread rapidly throughout the country. The aim of this study was to investigate the characteristics of COVID-19 hospitalized patients in Isfahan province of Iran from February 29, 2020, to July 21, 2020, and evaluate the effect of health system screening on the final outcome patients.

Methods: In this cross-sectional study, all patients with positive COVID-19 PCR test and patients with negative PCR test but suspected clinical symptoms of COVID 19, admitted to Isfahan hospitals from February 29 to July 21were included in the study and the epidemiological characteristics of patients such as demographic characteristics, underlying disease, early signs and symptoms and the final outcomes of patients were analyzed using SPSS software version 20.

Results: Of 11817 inpatients with COVID-19, 6590 (55.9%) were male, 1222 (10.4%) died, 9759 (82.8%) were discharged, and 4324 (36.7%) of hospitalized patients were asymptomatic. Among the hospitalized patients, 4642 (35.8%) had received primary screening services, and the mean age of the screened patients was statistically significantly higher than the group without primary screening (58.9±20.61, 55.08±21.57, P=0.068). 6914 (64.6%) of hospitalized patients had a positive initial PCR test, which was statistically significantly higher in patients with diabetes and an early symptom of sore throat. The Odds Ratio (OR) of readmission was most significantly associated with underlying cancer (OR=3.05, CI 95% 1.31-7.1) (P=0.011). The rate of readmission was statistically significantly higher in elderly, rural residents, and patients with underlying disease, diabetic, and hypertensive patients (P<0.05).

Conclusion: This study showed that about half of the people who tested positive for COVID- 19 needed to be hospitalized, and about 9 percent mostly diabetic and hypertensive patients, needed readmission. More than half of the hospitalized people were not screened by the health system. However, screening by the health system had no effect on the length of hospital stay and disease outcome.

Keywords: 2019 Novel Coronavirus, Epidemiological Characteristics, Health System Screening, Inpatient

Conflicts of Interest: *None declared*
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Introduction

In Iran, the COVID-19 outbreak started on Feb 19, 2020, in Qo m, and then spread rapidly to other provinces.

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↑What is "already known" in this topic:
National screening program in Iran was started on March 17, 2020 with high-risk individuals. The hospitalization rate of COVID 19 patients varies in populations. The characteristics of hospitalized patients and the association of screening with factors such as disease outcome and length of hospital stay have been assessed in few studies.

→What this article adds:
Most of the hospitalized people were not screened by the health system. The length of hospital stay was longer in women, rural residents, diabetics and patients with hypertension. Screening by health system had no effect on length of hospital stay and disease outcome.

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As of 330 137 tested patients until April 21, 2020, 80 868 people have been infected with COVID-19. Of them, 55 987 people have recovered, 3513 people are critically ill and 5031 people have died (1).

Despite global sanctions against Iran, the national screening program was started on March 17, 2020, with the aims of early detection, diagnosis, isolation, and treatment of the new cases and to follow their contacts. (2). The screening was based on the questions about the symptoms of COVID-19 and started with high-risk individuals including the elderly, pregnant mothers, people with underlying disease (diabetes, high blood pressure, immunodeficiency, etc.) and people with BMI>40. The health status of family members in terms of COVID-19 disease and the presence of high-risk individuals evaluated by health workers and other volunteers (3). If there were no suspicious cases at home, the necessary information (Principles of personal hygiene, symptoms and how to receive services if needed) would be provided to family members and the emphasis would be on staying at home and not attending meetings and crowded centers (4). People who have had suspicious symptoms will be contacted and a text message will be sent to them. Suspects are referred to the nearest health care unit and, in the evening or at night referred to selected centers. In order to increase the level of satisfaction, quality of health services, facilitate timely diagnosis of COVID-19 and training, in all cities covered by authors institute, centers on a 16-hour basis, with working hours from 8 am to 12 pm, and has been set up . If the patient has shortness of breath or an oxygen saturation level of less than 93% or a respiratory rate of more than 33 per minute, oxygen administration and appropriate isolation measures are performed, and the person is immediately referred to the selected hospital centers. After further evaluation in the hospital centers, a decision is made about the need for hospitalization. Outpatients are monitored daily by health care providers. Active telephone follow-up in the first 5 days is daily, and the last follow-up of the patient will be on the fourteenth day (5).

The aim of the present study was to evaluate the screening status of patients admitted to hospitals due to COVID 19 in Isfahan province, assess the demographic and underlying condition and compare the hospitalization status (discharge or death) in screened and non-screened individuals, and investigate the role of health system screening on factors such as disease outcome and length of hospital stay. To our knowledge, so far, no study with this sample size in Iran has been conducted for this purpose.

Methods

In this cross-sectional study, demographic and epidemiological information of suspected and confirmed patients of COVID-19 in all hospitals of Isfahan province were extracted from hospital systems and electronic records of patients from February 29, 2020, to July 21, 2020. A suspected case of COVID-19 was defined patient with symptoms of fever, cough, sore throat, and/or respiratory distress and confirmed COVID-19 cases were defined as patients with positive COVID-19 PCR test (6). The checklist included variables of age, sex, type of underlying disease, PCR test result, clinical symptoms, the final outcome of their hospitalization (discharge, death, still hospitalized), readmission due to COVID 19, date of hospitalization, date of discharge or death, date of screening by a health care provider and residency type (city /rural /marginalized). This study was approved by the ethics committee of Isfahan University of Medical Sciences with the ethical code number IR.MUI.MED.REC.1399.209.

All the statistical analyses were performed by the Statistical Package for Social Sciences (SPSS Inc., Chicago, Illinois, USA) version 20. The numerical data were summarized as means± standard deviation and the qualitative data was reported as frequency and percentage. Kruskal Walist Test, Mann Whitney Test, and chi-square test were used to compare the characteristics of COVID-19 patients. P. value of less than 0.05 was considered as statistical significance.

Results

Out of 21203 patients with COVID-19 disease, 11817 were hospitalized (52.4%), 6602 (55.9%) were male, and 5214 (44.1%) were female. The mean and standard deviation of the age of hospitalized patients was 56.6±21.28 years. 9759 patients (82.8%) were discharged from the hospital at the end, 1222 patients (10.4) died and 810 patients (6.9%) were still hospitalized at the time of this study. 4324 patients (36.7) were hospitalized without initial symptoms and 7474 patients (63.3%) had at least one of the early symptoms. 162 (3.2%) patients had a history of contact with a person suspected of having the disease. Other characteristics of patients with COVID-19 hospitalization and the relationship between the final outcome, demographic characteristics, symptoms and underlying diseases are given in Table 1.

Among patients admitted with COVID-19, 1113 (8.7%) needed to be readmitted. Of these, 157 (14.1%) had diabetes, 220 (19.7%) had hypertension, 7 (0.63%) had cancer, 8 (0.72%) had asthma and 99 (8.9%) had cardiovascular disease. Other information on patient readmission is given in Table 2.

The mean age of hospitalized patients had a statistically significant relationship with the final outcome of their hospitalization so that the mean age of patients who died was significantly higher than discharged patients and patients who were still hospitalized (respectively 71.1±17.28, 56.2±20.56, 46.6±24.08, P<0.001). In the Tukey post-hoc test, the mean age of all three groups was statistically significant (P<0.001).

6914 (64.6%) patients had positive PCR for COVID-19, and 3794 (35.4%) had a negative test and were suspected of having COVID-19 disease. In hospitalized patients with COVID-19, a positive PCR test had a statistically significant relationship with diabetes mellitus and having the initial symptoms of sore throat.

Of the hospitalized patients, 4,642 (35.8%) received screening services for COVID-19, and 8,307 (64.8%) were not screened. The mean age of patients who received screening services was statistically significantly higher than the group without screening (respectively

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Table 1. Demographic information and relation with final outcome of patients with COVID-19 hospitalized in this study (N = 11817)

Variable		Final outcome N (%)			Total N (%)	P *
		Discharged	Death	Still hospitalized		
Sex	Male	5401 (82)	707 (10.7)	482 (7.3)	6590 (55.9)	0.025
	Female	4358 (83.8)	515 (9.9)	328 (6.3)	5201 (44.1)	
Symptom						
Olfactory disturbance	Yes	12 (92.3)	0	1 (7.7)	13 (0.3)	0.473
	No	4188 (84.4)	473 (9.5)	304 (6.1)	4965 (99.7)	
Taste disturbance	Yes	46 (90.2)	5 (9.8)	0	51 (1)	0.180
	No	4291 (84.4)	482 (9.5)	314 (6.2)	5087 (99)	
Cough	Yes	330 (89.7)	28 (7.6)	10 (2.7)	368 (7.4)	0.005
	No	3849 (83.9)	441 (9.6)	295 (6.4)	4585 (92.6)	
Sore throat	Yes	159 (90.3)	14 (8)	3 (1.7)	176 (3.5)	0.029
	No	4041 (84.2)	459 (9.6)	302 (6.3)	4802 (96.5)	
Chills	Yes	196 (91.2)	14 (6.5)	5 (2.3)	215 (4.3)	0.013
	No	4004 (84.1)	459 (9.6)	300 (6.3)	4763 (95.7)	
Dyspnea	Yes	244 (89.7)	19 (7)	9 (3.3)	272 (5.5)	0.037
	No	3956 (84.1)	454 (9.6)	296 (6.3)	4706 (94.5)	
Fever	Yes	190 (92.2)	12 (5.8)	4 (1.9)	206 (4.1)	0.005
	No	4010 (84.1)	460(9.6)	301 (6.3)	4771 (95.9)	
Underlying diseases						
Diabetes mellitus+	Yes	1115 (82.8)	139 (10.3)	93 (6.9)	1347 (10.4)	0.882
	No	9583 (82.8)	1228 (10.6)	766 (6.6)	11577 (89.6)	
Hypertension+	Yes	1712 (82.9)	227 (11)	125 (6.1)	2064 (16)	0.421
	No	8986 (82.7)	1140 (10.5)	734 (6.8)	10860 (84)	
Cancer+	Yes	23 (74.2)	3 (9.7)	5 (16.1)	31 (0.2)	0.117
	No	10675 (82.8)	1364 (10.6)	854 (6.6)	12893 (99.8)	
Respiratory disease+	Yes	74 (80.4)	9 (9.8)	9 (9.8)	92 (0.7)	0.470
	No	10624 (82.8)	1358 (10.6)	850 (6.6)	12832 (99.3)	
Cardiovascular disease+	Yes	644 (82.4)	91 (11.6)	47 (6)	782 (6.1)	0.497
	No	10054 (82.8)	1276 (10.5)	812 (5.5)	12142 (93.9)	
The presence of one of the symptoms in a family member	Yes	119 (88.8)	7 (5.2)	8 (6)	134 (2.7)	0.270
	No	4081 (82.4)	466 (9.6)	297 (6.1)	4844 (97.3)	
Having a high-risk person in the family	Yes	1861 (81.4)	273 (11.9)	151 (6.6)	2285 (45.9)	<0.001
	No	2339 (86.9)	200 (7.4)	154 (5.7)	2693 (54.1)	
History of contact with a person suspected of having the disease	Yes	147 (90.7)	9 (5.6)	6 (3.7)	162 (3.3)	0.113
	No	4053 (84.2)	464 (9.6)	299 (6.2)	4816 (96.7)	

Table 2. Odds Ratio (OR) and Frequency of readmission in hospitalized patients according to underlying diseases

Underlying disease+	Frequency of Readmission (%)	P *	Non-adjusted OR of readmission	Confidence interval 95% for OR (min-max)	Adjusted++ OR of readmission	Confidence interval 95% for adjusted OR (min-max)
Diabetes mellitus	157 (11.6)	0.001	1.43	1.2-1.71	1.40	1.17-1.68
Hypertension	220 (10.6)	0.001	1.29	1.11-1.52	1.17	1-1.39
Cancer	7 (23.3)	0.013	3.05	1.31-7.1	3.01	1.29-7.04
Respiratory disease	8 (8.7)	0.968	0.98	0.48-2.03	0.89	0.41-1.79
Cardiovascular disease	99 (12.8)	<0.001	1.56	1.25-1.94	1.43	1.13-1.81

*: Chi-square test. +: Positive/Negative, ++: Adjusted for sex and other underlying diseases.

58.9±20.61, 55.08±21.57, P<0.001). The mean and standard deviation of the length of hospital stay in patients was 6.05 days. The median and interquartile range of the length of hospital stay was 5 (3-7) days. The mean days of hospital stay in screened and non-screened patients were not statistically significant (respectively 6±5.03, 6.07±6.57, P=0.560). There was no significant relationship between receiving screening services and the outcome of hospitalization of patients (P=0.718). Details of the relationship between receiving screening services for COVID-19 and demographic characteristics, the outcome of hospitalization and underlying diseases of patients are given in Table 3.

The mean length of hospital stay was significantly higher in the group over 60 years than in children under 6 years (P<0.001). The mean length of hospital stay was significantly higher in rural residents than in urban areas. (P=0.033) The mean and standard deviation of the length of hospital stay of patients in terms of demographic characteristics and underlying diseases and symptoms of patients are given in Table 4.

Discussion

Limited studies have systematically reported data on COVID-19 patients from hospitals and health care settings in Iran. The present study showed that about half of the people who tested positive for COVID- 19 needed to be hospitalized, and about 9 percent mostly diabetic and hypertensive patients needed readmission. Cough, dyspnea and chills were the most common early symptoms in hospitalized individuals. The most common underlying diseases in hospitalized patients were hypertension and dia-

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Table 3. The relationship between receiving screening services for COVID-19 and demographic characteristics, outcome of hospitalization and underlying diseases of patients

Variables	Variables subtype	COVID-19 Screening service N (%)		P *
		Yes	No	
Sex	Male	2660 (36.7%)	4591 (63.3%)	0.026
	Female	1982 (34.8%)	3716 (65.2%)	
Residency type	City	3257 (92.9)	250 (7.1)	0.244
	Rural	872 (94.4)	52 (5.6)	
	Marginalized	505 (92.7)	40 (7.3)	
Underlying disease	Yes	1490 (43)	1975 (57)	<0.001
	No	3152 (33.2)	6332 (66.8)	
Diabetes mellitus+	Yes	668 (49.5)	681 (50.5)	
	No	3974 (34.3)	7626 (65.7)	<0.001
Hypertension+	Yes	812 (39.2)	1257 (60.8)	<0.001
	No	3830 (35.2)	7050 (64.8)	
Cancer+	Yes	12 (38.7)	19 (61.3)	0.732
	No	4630 (35.8)	8288 (64.2)	
Respiratory disease	Yes	37 (39.8)	56 (60.2)	0.420
	No	4605 (35.8)	8251 (64.2)	
Cardiovascular disease	Yes	294 (37.6)	488 (62.4)	0.293
	No	4348 (35.7)	7819 (64.3)	
Final outcome	Discharged	3821 (35.7)	6877 (64.3)	0.718
	Death	499 (36.5)	868 (63.5)	
	Still hospitalized	316 (36.8)	543 (63.2)	

*: Chi-square test,

Table 4. The mean and standard deviation of patient's duration of hospitalization due to COVID-19 based on age groups, sex, city, initial sign and underlying diseases

Variable		Duration of hospitalization (days) Mean ±SD	P
Age	Children (<5 Y)	4.66±5.49	<0.001*
	Adolescents (6-19 Y)	5.54±6.61	
	Young (19-29 Y)	5.14±7.52	
	Middle-aged (30-59 Y)	5.86±5.92	
	Elderly (>60 Y)	6.37±5.64	
Sex	Male	6.01±5.99	0.450**
	Female	6.10±5.98	
Place of residence	City	5.89±4.91	0.033**
	Rural	6.42±6.14	
	Marginalized	6.02±5.19	
Underlying disease	Yes	6.07±6.00	<0.001**
	No	6.01±5.97	
Diabetes	Yes	6.41±5.89	<0.001**
	No	6.00±6.00	
Hypertension	Yes	6.21±5.79	0.038**
	No	6.02±6.02	
Cardiovascular disease	Yes	4.66±5.49	0.925**
	No	4.66±5.49	
Chronic respiratory disease	Yes	5.78±4.54	0.793**
	No	6.05±6.00	
Cancer	Yes	4.88±3.35	0.420**
	No	6.02±5.99	
Initial Signs	Yes	6.07±6.00	0.926**
	No	6.01±5.97	

*: Kruskal Walist Test, **: Mann Whitney Test

betes .About 10% of hospitalized patients died. In this study, cancer was three times more likely to be readmitted. About 65% of hospitalized people were not screened by the health system. However, there was no significant difference in the mean hospital stay and disease outcome between the screened and unscreened groups.

In New York City, similar to the present study, older persons, men, and hypertension, obesity, and diabetes were highly prevalent among hospitalized patients. In contrast to our study, the most common initial symptom in hospitalized patients was fever and respiratory rate greater than 24 beats per minute. Also, the mortality rate in our study was lower but the rate of readmission was higher than in New York City, probably because of differences in hospitalization protocols and treatment management (7).

Consistent with our study, Killerby showed that Older age, diabetes mellitus, and obesity, were associated with hospitalization in Georgia (8).

Zhou et al. reported that hypertension is the most common comorbidity, followed by diabetes and coronary heart disease. The most prevalent symptoms on admission were fever and cough, and most patients were male. However, the mortality rate was higher in the Zhou study. It seems that the cause of the difference in mortality is due to the

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greater severity of the disease in the subjects in the study (9).

Tenforde reported demographic and baseline characteristics of inpatients with PCR–positive tests in the United States. More than half of the hospitalized patients were female. Cardiovascular conditions, chronic respiratory disease, and diabetes were the most common underlying disease. Pleuritic chest pain, shortness of breath, fever and cough were the most prevalent early symptoms. About one-third of hospitalized patients had a history of contact (≤6 feet) with COVID-19 patients which is significantly higher than our study. Also, the rate of olfactory and taste disturbances has been less reported in our study maybe due to recall bias in our patients (10).

Ortiz-Brizuela reported that patients with comorbidities, especially diabetes and hypertension, either middle-age obese or elderly, early symptoms of fever, cough, or dyspnea, were more likely to be admitted (11).

This report also has its limitations. Some patients were still hospitalized until the end of the study, and therefore interpretation of death outcomes should be performed with caution. This study reported symptoms at the onset of the disease and that the symptoms may have changed during the illness. Also, a large number of hospitalized people have not been screened by the health system, and as a result, the initial symptoms reported by patients after hospitalization may not have been accurately reported due to recall bias.

Conclusion

This study showed that cough, dyspnea and chills were the most common early symptoms in hospitalized individuals. About half of the people who tested positive for COVID- 19 needed to be hospitalized, and about 9 percent mostly diabetic and hypertensive patients, needed readmission.More than half of the hospitalized cases were not screened by the health system, however, screening had no effect on length of hospital stay and disease outcome.

Ethics approval and consent to participate

The current study is approved by the Ethics Committee of the Isfahan University of Medical Sciences (IR.MUI.MED.REC.1399.209). All patients were aware of the objectives of the study and were willing to participate in the study.

Consent for publication

All patients were told that their information would be reported in the articles and patients expressed their consent.

Availability of data and materials

Patient data will be provided to the applicant upon written request to the responsible author.

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Conflict of Interests

The authors declare that they have no competing interests.

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