



Analysis of Epidemiological Characteristics of COVID-19 Patients in Rudan county, Iran

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Abstract

Background: On March 11, 2020, the World Health Organization (WHO) declared the novel coronavirus disease 2019 (COVID-19) as a global pandemic. The aim of the present study was to analyze the epidemiological characteristics of COVID-19 patients in Rudan county so that regional managers can make timely and effective decisions.

Materials and Methods: This is a cross-sectional study performed on all registered patients with confirmed COVID-19 in Rudan county by July 10, 2020. Patient information was extracted from COVID-19 patient information registration system. The collected data included gender, age, mortality, underlying disease, time of infection, occupation, contact history, and hospitalizations. Data were analyzed using SPSS version 22.0.

Results: In this study, 614 (56%) of the patients were male and 477 (43%) were female. The mean age of patients was 43 ± 17 years. A total of 136 patients (12.5%) had at least one underlying disease. The majority of patients with underlying diseases (75%) had a history of contact with a patient with confirmed COVID-19. There was no statistically significant relationship between mortality and gender. The mean age of inpatients and outpatients was 56 ± 19 and 40 ± 15 years, respectively. Most deaths occurred among the elderly and housewives, and the highest infection rate also occurred among the latter group.

Conclusion: In a situation where the COVID-19 pandemic is a global threat, health systems must demonstrate appropriate and timely responses based on the development and implementation of preventive policies and the care of vulnerable and high-risk patients.

Keywords: Coronavirus, COVID-19, Rudan, Epidemiology

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Introduction

On March 11, 2020, the World Health Organization (WHO) declared the novel coronavirus disease 2019 (COVID-19) as a global pandemic. The first case of this disease was officially announced in China at the beginning of December 2019 and in Iran on February 19, 2020, in Qom and gradually spread to other countries (1). Over the past few decades, a large number of people have been affected with three epidemics caused by coronavirus family (SARS-2003, MERS-2012, and COVID-2019) worldwide. However, COVID-19 is distinguished from other previous epidemics considering their significant genetic differences, as well as the extent of their effects and mode of transmission (2).

In addition to its rapid spread, this disease has attracted global attention due to its strong impact on all sections and structures of society (3) and it is among the greatest challenges of the present century since it affects all age,

gender, occupational, and especially at-risk groups such as children, the elderly, pregnant mothers, health workers, and patients suffering from underlying diseases (2, 4). On January 30, 2020, the WHO declared the outbreak of the novel coronavirus as the sixth public health emergency of international concern, posing a threat not only to China but to all countries (5).

Since the onset of the COVID-19 pandemic, many studies have been conducted on various aspects of the disease in different parts of the world, each of which has yielded valuable results, and has provided us with a better understanding of the disease and a guide for governments to deal with it (2, 4). Although the policies and measures taken by different countries to prevent and combat this disease have yielded relative success in some cases, little knowledge of the routes of transmission and uncertainty in predicting the course of the disease have raised concerns in various societies (6). Therefore,

the fundamental step in developing effective policies to combat this disease is to achieve a better understanding of the current situation and considering the underlying conditions.

The results of studies and experiences of countries affected by this disease show that not only the onset of the outbreak and its pattern varies in each country but also this difference exists within countries and does not follow the same pattern in all regions and cities of a country (7). In addition to the role of government and the implementation of national policies in the prevention and control of this disease, epidemiological analysis and patient characteristics at the regional level play an important role in raising awareness and producing appropriate evidence for managers and policymakers so that they can develop appropriate policies to deal with this disease by relying on evidence-aware policies (8).

Rudan county with a population of 129515 is located in the east of Hormozgan province and southern Iran, which is one of the areas with a high prevalence of coronavirus. The aim of the present study is to analyze the epidemiological characteristics of COVID-19 patients in Rudan county so that regional managers, in line with national policies and decisions taken to combat the disease, can make timely and effective decisions by recognizing the current situation.

Materials and Methods

This observational cross-sectional study was performed on all registered patients with confirmed COVID-19 in Rudan county by July 10, 2020. Rudan county with a hot climate has a population of 129 515. It is located in the east of Hormozgan province and southern Iran which is one of the areas with a high prevalence of coronavirus.

Data Sources

Information about each patient was extracted from the COVID-19 patient information registration system. The information of all patients with confirmed COVID-19 is recorded in this system and reported to the Disease Management Center of the Ministry of Health and Medical Education. To expedite the identification of suspected COVID-19 cases, four 16-hour sampling centers (suspectious patients could visit these centers at any time) were set up in different parts of Rudan county and sampling of suspected cases was carried out based on the physician's opinion in these centers. Inpatients were also sampled based on the opinion of an infectious disease specialist. Samples taken from patients were sent to a reference laboratory in Bandar Abbas, which was approved by the Ministry of Health, and the definitive diagnosis of COVID-19 was made using polymerase chain reaction (PCR). All positive and definite cases based on laboratory diagnosis were carefully examined by health workers, and their information was finally recorded in the disease surveillance system. In cases where the recorded

information was incomplete, we used the information in the patients' files. The authenticity of the extracted information was confirmed by two qualified experts, none of whom were members of the research team. Data collected included gender, age, mortality, underlying disease, time of infection, occupation, history of contact with infected cases, and hospitalizations. A checklist was used to extract the data.

Statistical Analysis

The collected data were analyzed using SPSS version 22.0. To describe qualitative data, frequency (n) and percentage (%) and for quantitative data, mean and standard deviation (SD) were applied. The normality of the age variable was verified using Kolmogorov–Smirnov test ($P=0.251$). Therefore, t test was used to assess the relationship between mortality and patients' age in men and women. For all statistical analyses, $P<0.05$ was considered statistically significant.

Results

Until July 10, 2020, of a total of 2265 suspicious cases sampled, 216 inpatients (47.16%) and 875 outpatients (47.42%) had confirmed COVID-19 based on the laboratory results. A total of 614 patients (56%) were male and 477 patients (43%) were female. The mean and median age of patients were 43 ± 17 and 40.5 years, respectively.

Most of the patients, 955 (87.5%), did not have underlying diseases and 136 (12.5%) had at least one underlying disease (Table 1). Of the total number of patients with underlying disease, 22 (16%), 35 (25.7%), and 79 (58%) were under 40, 40-60, and over 60 years of age, respectively. The mean age of patients with and without underlying diseases was 60 and 40 years, respectively. Table 2 shows the distribution of patients by occupation.

The mean age of inpatients (56.11 ± 13) was significantly higher than the mean age of outpatients (40.14 ± 15) ($P<0.001$). A total of 89 patients (41.2%) had at least one underlying disease. The majority of patients with underlying diseases (75%) also had a history of contact with a patient with confirmed COVID-19 within 2 weeks prior to infection. A total of 18 and 12 deaths occurred among inpatients and outpatients, respectively, which was statistically significant ($P<0.001$).

Table 1. Distribution of Underlying Diseases

	Number	Percent
Blood pressure	50	36
Diabetes	12	8.6
Chronic heart disease	16	11.5
Simultaneity of two underlying diseases	45	32.4
Other underlying diseases	16	11.5

Table 2. Distribution of COVID-19 Cases in Occupational Groups

	No. (%)
Public sector employees	148 (13.6)
Workers and employees of the non-governmental sector	237 (22)
Health staff	87 (8)
Housewives	369 (33.8)
Students	39 (3.6)
Children under five years of age	3 (.3)
Retired and disabled	66 (6)
Unemployed	25 (2)
Self-employed	84 (7.7)
Other	33 (3)

Among the death cases, 19 (64%) were male and 11 (36%) were female (Table 3). There was no statistically significant relationship between patients' mortality and their gender ($P=0.43$).

The mean age of death was 72 ± 21 years among women and 66 ± 12 among men, which was not statistically significant ($P=0.74$). Twenty-two (73%) of those who died had a history of contact with a COVID-19 patient in the two weeks prior to infection.

Discussion

The results of this study showed that the majority of deaths occurred among inpatients and the elderly who had a history of contact with COVID-19 patients. Most of the elderly suffered from underlying diseases, and housewives were the most important groups at risk.

The first case of COVID-19 in Iran was identified on February 19, 2020, and February 27, 2019, in the city of Rudan (9), who was a passenger from the city of Qom. Although there was not much time between the occurrence of the disease in the city of Rudan and its occurrence in the country, most of the disease cases were sporadic until April 19, 2020. The upward trend of the infection has started from May 20, 2020, and is still continuing (Figure 1). Additionally, most patients recovered through home care. However, some regions of the country were facing epidemic conditions during the same period, and the measures taken to prevent the disease during this period mainly included the implementation of policies and decisions adopted at the national level and were applied to all regions of the country. These decisions included closing schools and markets, restricting interprovincial traffic, advising to stay at home, and emphasizing the use of personal protective measures. These restrictions were applied throughout the country on 23 March, 2020, and were gradually removed as the disease was controlled from April 12, 2020 (7) and many parts of the country achieved a stable situation after controlling this epidemic. However, the disease exacerbated from this date onward in the city of Rudan, unlike many parts of the country. Although the government and the media play an undeniable role in the

successful implementation of policies and decisions taken at the local and regional levels, in addition to government support, the disease control seems to require the implementation of policies at the regional level according to the local pattern of the disease. The trend and pattern of the disease is not the same among countries and even among regions of a country, and the simultaneous intervention of the government and the development of regional policy in this regard seems necessary.

The results of the present study showed that the elderly and inpatients with underlying diseases, as well as housewives, are among the most at-risk groups. Results of a study in Saudi Arabia revealed that more than 96% of COVID-19 patients had a history of at least one underlying disease (10). In other studies, the prevalence of underlying diseases among COVID-19 patients was reported to be 19-20%, and hypertension was the most common disease among other underlying diseases (11, 12). This seems normal given that the prevalence of high blood pressure is generally higher in the elderly. The present study showed that 12.5% of all patients and 42% of inpatients had an underlying disease. The elderly and the disabled were more likely to be hospitalized due to underlying disease, as well as a history of contact with COVID-19 patients, and had the highest mortality rate among all age and occupational groups. Numerous studies have referred to the higher risk of infection and mortality rate among the elderly (13-15). Therefore, paying attention to this group of patients and having a clear care policy is an important step in reducing deaths from this disease as well as reducing the workload of hospitals and service providing centers. Many countries have implemented policies in this regard. They are seeking to increase the hospital capacity by imposing restrictions and reducing unnecessary admissions, as well as canceling or postponing unnecessary surgeries, calling on retirees, and recruiting new staff (11, 16). Outpatient care and home quarantine are being implemented in most countries.

Health systems need to display flexible, appropriate, and timely responses to COVID-19 pandemic by developing and implementing preventive policies and care for

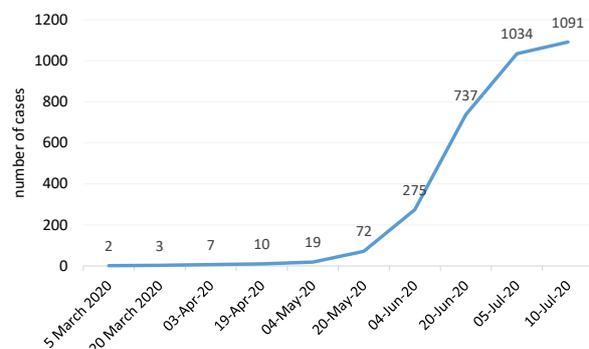
**Figure 1.** Cumulative Frequency of COVID-19 Infection.

Table 3. Comparison of Death Rates According to the Studied Variables

Variables name	Category	Treated cases		Death Cases		Statistics	P Value
		No.	%	No.	%		
Patient status	Inpatient	198	18.7	18	60	$\chi^2 = 31.39$	<0.001
	Outpatient	863	81.3	12	40		
Gender	Male	595	56.1	19	63.3	$\chi^2 = 0.62$	0.43
	Female	466	43.9	11	37.7		
Age group	<40	581	54.8	2	6.7	$\chi^2 = 50.27$	<0.001
	40-60	295	27.8	8	26.7		
	>60	185	17.4	20	66.7		
Underlying disease	Yes	121	11.4	15	50	$\chi^2 = 38.82$	<0.001
	No	940	88.6	15	50		
Exposure history	Yes	894	84.3	22	73.3	$\chi^2 = 2.5$	0.108
	No	167	15.7	8	26.7		
Age	Mean \pm SD	42.60 \pm 14		68.37 \pm 13		t = -8.24	<0.001

vulnerable and high-risk patients in situations where there is still no definitive treatment. A part of these measures includes compliance with health recommendations and instructions by all people and the other part includes measures taken by the health system. Timely identification and follow-up of patients, equipping and preparing medical centers and hospitals under epidemic conditions, and having a suitable surveillance program for patients outside the hospital are among the measures which were taken into consideration by other countries (17).

The results of the present study revealed that non-governmental sector employees and workers, as well as housewives, were among the main groups suffering from the highest incidence. Employees working in the non-governmental sector suffered the most economic losses as a result of government-imposed restrictions, and most housewives had a history of previous contact with COVID-19 patients. Developing protection-based policies and reducing infections in these occupational groups can play an important role in reducing the risk of infection. One of the policies implemented in this regard was the government's financial support for vulnerable families and non-governmental businesses in order to reduce the level of interactions at the community level and break the chain of disease transmission (18). It seems that observance of health measures at the family level is as necessary as the community level and the compliance of individuals and society along with government interventions is a basic principle to prevent and control this disease.

In the absence of definitive treatment for COVID-19, timely identification of at-risk and high-risk groups and having a clear surveillance plan are effective policies to prevent the spread of the disease (19, 20). One of the most important measures taken to this end was the screening of all pregnant mothers, which led to the identification of 29 cases of COVID-19 disease. The establishment

of 24-hour sampling centers that were available to patients with suspected COVID-19 symptoms and the possibility of inpatient sampling were among the other measures taken in this regard. Healthcare workers and providers were among the other at-risk groups. Having stress management programs for health care providers, increasing protective equipment, reducing their workload, changing policies related to the admission and referral of patients and their companions, and avoiding unnecessary surgical procedures are among the measures taken in other countries (21).

The present study has several limitations. First, the inpatients were visited by an infectious disease specialist and their medical history was carefully examined; however, the criterion for having the underlying disease in outpatients was based on their self-report. Therefore, one of the reasons for the high prevalence of underlying diseases among inpatients may be the above-mentioned issue, which requires further research in this regard. Second, it was not possible to perform further analysis since it was a retrospective study and there was no access to more patient information. Third, there was no access to information about COVID-19 negative individuals to compare their characteristics with COVID-19-positive patients.

Conclusion

The results of the present study showed that although COVID-19 is a threat to all age, gender, and occupational groups, some groups such as the elderly and disabled, housewives, non-governmental sector workers, and healthcare workers are among high-risk groups. Therefore, policy makers need to pay attention to these groups of people and provide care plans for them. Inpatients are mostly older people with a history of underlying diseases. Having a clear policy to manage the admission of patients can reduce the pressure of unnecessary referrals and

improve the staff capability, which is a rational policy used in many countries that provides better care for inpatients in need of essential care. Paying attention to the local pattern of disease transmission and spread, developing regional policy, and using evidence in decision-making are among the issues that, if ignored, pose serious challenges to disease control.

Conflict of Interest Disclosure

The authors declare that they have no conflict of interests to the publication of this article.

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Ethical Statement

Our study had no specific ethical considerations; however, the necessary permissions were obtained to access patient information.

Authors' Contributions

MS supervised and managed the study. SH M did the statistical analysis and wrote the article. PN and M SH were the statistical consultant of the project, and MN was the clinical consultant of the project.

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Informed Consent

We did not have a consent form due to the lack of direct referral to patients. However, the necessary permissions were obtained to access patients' information.

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