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Epidemiology and clinical characteristics of patients with Covid 19 admitted to Imam Khomeini Hospital in Ardabil in 2019-2020

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Abstract

Introduction and Objectives: Nowadays, corona pandemic is one of the most important health issues in Iran and all over the world. Due to the novelty of the disease and evidence that clinical symptoms, severity and mortality of the disease in different people can be different, the aim of this study was to investigate the epidemic and clinical characteristics of patients with coronavirus hospitalized in one of the educational-medical hospitals of Ardabil.

Methodology: The present study is a cross-sectional descriptive study that was performed by census method on 911 patients with Covid 19 who were hospitalized in Imam Khomeini Hospital for three months. Data were analyzed using a researcher-made questionnaire that included demographic characteristics and clinical symptoms of patients. The validity of the questionnaire content was obtained by surveying 10 specialists and faculty members. Information was collected using the electronic records of patients. Data were analyzed using SPSS software version 18 and using descriptive statistics of mean and standard deviation and analytical statistics of Chi-square.

Findings: In total, out of 1139 cases, 911 cases were statistically analyzed according to the information contained in it. The average age of the subjects was 15.61±24.31. Among them,511 patients (56.1%) were male. The most common underlying diseases were hypertension in 220 patients (24.1%) and diabetes in 194 patients (21.3%). Chi-square test also showed that there was statistically a significant relationship between cardiovascular disease, hypertension, diabetes and COPD with mortality ($p < 0.05$). The most common clinical symptoms in 635 (69.7%) patients with shortness of breath were, cough (493 individuals, 54.1%) and then fever (290 individuals, 31.8%).CRP was high in 446 patients (49.0%). Chi-square test showed that there was a statistically significant relationship between the amount of WBC, urea and creatinine with mortality ($p < 0.05$).

Results: The present study showed that old age, male gender and having chronic underlying diseases such as hypertension, cardiovascular disease, chronic obstructive pulmonary disease and diabetes are involved in disease morbidity and mortality. The most common clinical symptoms are fever, cough and shortness of breath. Also clinically important changes in patients are changes in white blood cells, increased urea and creatinine, and increased C-reactive protein.

Keywords: Covid 19, Epidemiology, Clinical features, Mortality, Underlying diseases

Introduction

In late December 2019, a new coronavirus, called the New Corona Virus_2019 (SARS_COVID_2), caused the outbreak of Wuhan (Hanan Seafood Market) pneumonia throughout China, which has already posed major health threats to global public health (1). On January 12, 2020, the World Health Organization (WHO) named the new virus "corona virus disease 2019" or Covid-19 (2,1). Covid-19 is the third known animal coronavirus disease after SARS and Middle East Respiratory Syndrome (MERS), which can infect humans through interspecies transmission and has now become a major public health threat (1,3). This disease is highly contagious and each person can infect at least 3 people (2). The rapid spread of the virus has left countries with large numbers of infected people. Since March 15, 2020, 163,000 people worldwide have been infected with the virus. Till now, however, more than 76,000 people have recovered. However, the incidence is still increasing (4). On February 23, 2020, 77041 cases of Covid-19 infection were confirmed in China, which exceeded the outbreak of Acute Respiratory Syndrome (SARS) in 2002 in China (1).

In Iran, since April 15, 2020, 76,389 patients were diagnosed with COVID-19, of which 4.777 deaths occurred with the virus. According to statistics, Iran ranks sixth in terms of deaths after the United States, Italy, Spain, France and Britain. Identifying the epidemiological characteristics of these patients will help to make the right decision and thus control the epidemic (2). On July 23, 2021, with the announcement of the Ministry of Health, 3,128,000 people in the country have been definitively infected with the corona virus, and with the death of 112 people in the last 24 hours, the number of corona deaths in the country has reached 83,329 individuals. From yesterday to today, July 23, 2021, and based on definitive diagnostic criteria, 11,059 new patients with Covid 19 were identified in the country, of which 1,299 cases were hospitalized (5).

The clinical symptoms of Covid 19 are usually fever, dry cough, muscle pain or fatigue, normal or decreased leukocyte count, and radiographic evidence similar to pneumonia. At first the sufferer usually complains of nausea and vomiting, a few days later, the fever starts. Less common symptoms are headache, dizziness, abdominal pain, nausea, diarrhea, and vomiting (6). Regarding clinical symptoms, Hang et al. found that the most common clinical symptoms in these patients were fever, cough, muscle pain and fatigue, shortness of breath, and sputum excretion (7). In their study, Gan et al. found that fever and cough were the most common symptoms and diarrhea and vomiting were rare. Also, the majority of patients show abnormalities in lung CT scan and lymphopenia in blood tests (1). Also, Sheng et al. found that pulmonary fibrosis may be one of the most severe complications after patients recover from modern coronavirus-19 infections (1).

Currently, the corona pandemic is one of the most important and major health issues in Iran and around the world. Due to the severity of this disease, the health system should have an acceptable plan to deal with this disease, because in the absence of a proper plan or policy in the field of health, the country will face many problems. So there will be a lot of work pressure on health system and its dimensions may not be compensable in various aspects. Aspects that include economic problems, social anxiety and lack of accountability of the health system, and etc. (8). It is important to examine patients in detail to understand epidemiological features such as incubation and infectious periods, the delay between infection and the identification, isolation and reporting of cases (9). However, due to the high mortality rate and different findings of various studies, as well as the clinical symptoms of the disease, the best way to deal with Covid 19 epidemic is to control the sources of infection, which can be strategies such as early detection, reporting, isolation, and quarantine, and most effectively using the timely dissemination of epidemic information. The more human knowledge is available about this new virus and the prevalence and epidemic extent of this disease, the better it will be possible to deal with it (1). It can be said that the first step in controlling the epidemic of a disease in society is to conduct an epidemiological study. An epidemiological study can describe the prevalence of the disease in the community. On the other hand, by conducting analytical epidemiological studies, it is possible to determine the cause of the spread of the disease and to have accurate and precise information for disease control planning in the community (10).

Given the pandemic prevalence of the disease and considering this disease is not only one of the current major problems of our society but the whole world, and given the novelty of the disease

and evidence that clinical symptoms, severity and mortality of the disease in different people can be different and the number of internal and external studies in this regard is very limited, so this study was conducted to investigate the epidemic and clinical characteristics of people with coronavirus hospitalized in Ardabil Hospital to be able to use the information obtained about disease control, prevention, education and management.

Methodology

The present study is a cross-sectional descriptive study that was performed on 911 patients with Covid 19 who were admitted to Imam Khomeini Hospital by census method. Patients hospitalized in three months of the year, from March 1st , 2017 to the end of May 2016, were examined. The inclusion criteria were all patients who were hospitalized with a diagnosis of Covid 19 and the exclusion criterion was the failure to complete the main information required in the patient file. Data were analyzed using a researcher-made questionnaire that included demographic characteristics and clinical symptoms of patients. The validity of the content of the questionnaire was obtained by surveying 10 specialists and faculty members, and information was collected using the electronic records of patients. Data were analyzed using SPSS software version 18 and using descriptive statistics of mean and standard deviation and analytical statistics of Chi-square.

Findings

A total of 1139 people were hospitalized for three months during March 2019 to May 2020, of which 313 (27.48%) individuals were hospitalized in March, 490 (43.02%) in April and 336 (49. 29%) in May. According to the information required by the researcher and completing the files of hospitalized patients, 911 files were statistically analyzed.

Statistical data showed that the average age of the subjects was 31.24 ±.61.15. The lowest number was 2 people (0.2%) in the age group under 10 years, and the highest number was 192 people (21.1%) in the age group of 61-70, and 186 people (20.4%) in the age group of 71 - 80. Chi-square test showed that there is a statistically significant difference between mortality of different age groups (p = 0.01) (Table 1). The majority of patients were (511 individuals, 56.1%) male and the male to female ratio was 1 to 30. Among all women, 49 individuals (12.5%) and among all men, 81 individuals (15.9%) had died. Chi-square test showed that this number was not statistically significant (p = 0.15).). According to statistical data, 776 patients (85.2%) were insured and 123 patients (13.5%) were uninsured. The majority of patients were (543 individuals, 59.6%) married. Among the total units studied, 561 individuals (61.6%) were urban and the rest were rural. The data showed that 89 patients (9.8%) were admitted to the intensive care unit (ICU), of which 49 patients (55.0%) died. Chi-square test showed that this difference is statistically significant with the mortality rate in the non-ICU ward (p = 0.001). Also, out of a total of 911 cases examined, 130 patients (14.3%) ultimately died.

Table 1: Number and percentage of patients with Covid 19 admitted to Imam Khomeini Hospital in Ardabil based on age and mortality rate

Age group	Number	Percentage	Mortality		P-value
			Number	Percentage	
10 and lower than that	2	0.2 %	0	0 %	0.01
11-20	9	1 %	1	11.1 %	
21-30	46	5 %	2	4.3 %	
31-40	94	10.3 %	4	4.3 %	
41-50	112	12.3 %	9	8.0 %	
51-60	148	16.2 %	19	12.8 %	
61-70	192	21.1 %	26	13.5 %	
71-80	186	20.4 %	38	20.4 %	

Upper than 80	111	12.2 %	30	27.3 %	

According to the statistical results, 452 people (49.6%) had a history of underlying disease, among which the most common underlying disease in the study units were hypertension (220 individuals, 24.1%) and diabetes (194 individuals, 21.3 %), respectively. Chi-square test also showed that there is a statistically significant relationship between a number of underlying diseases and mortality ($p < 0.05$) (Table 2). Underlying diseases by gender showed that 9 (1.8%) men and 2 (0.5%) women had a history of stroke, 5 (1.1%) men had a history of heart attack, while none of the women had the history of heart attack. Chi-square test showed that this was also statistically significant ($p = 0.04$) that 18 (3.5%) of men and 29 (7.4%) of women had a history of chronic obstructive pulmonary disease ($p = 0.01$). Twenty-two (4.3%) of men and 10 (2.5%) of women had a history of chronic renal failure, 5 (1.1%) of men and 17 of women (4.3%) had hyperlipidemia. There was a statistically significant difference ($p = 0.001$). Ninety-four (18.4%) men and 99 (25.2%) women with Covid 19 had diabetes and also 107 (20.9%) men and 111 women (28.2%) suffered from hypertension. In both cases, chi-square test showed that there was a statistically significant relationship between the two sexes ($p = 0.01$).

Table 2: Number and percentage of previous disease history and its relationship with mortality among patients with Covid 19 admitted to Imam Khomeini Hospital in Ardabil

Disease history	Number (percentage of incidence)	Number (percentage of death)	Test Statistic	degree of freedom	P-value
Cardiovascular disease	108 (11.8)	21 (20.6)	3.72	1	0.047
Hypertension	220 (24.1)	40 (18.3)	3.82	1	0.043
Diabetes	194 (21.3)	36 (18.6)	3.87	1	0.042
Hyperlipidemia	22 (2.4)	1 (4.5)	1.74	1	0.186
Renal disease	32 (3.5)	7 (21.9)	1.56	1	0.212
COPD	47 (5.2)	13 (27.7)	7.23	1	0.007
CVA stroke	11 (1.2)	3 (27.3)	1.53	1	0.216

Examination of patients' clinical symptoms showed that all subjects had some degrees of loss of consciousness in 911 patients (100%) and in addition, the most common clinical symptoms in patients were shortness of breath in 635 patients (69.7%), cough in 493 patients (54.1%) and then fever in 290 patients (31.8%) (Table 3).

Table 3: Frequency and percentage of clinical symptoms of patients with Covid 19 admitted to Imam Khomeini Hospital in Ardabil

Clinical symptoms	Number	Percentage
Fever	290	31.8 %
Cough	493	54.1
Sour throat	33	3.6
Shortness of breath	635	69.7
Chilling	141	15.5
Headache	45	4.9
Vertigo	24	2.6

Muscular pain	90	9.9
Nausea	70	7.7
Vomiting	68	7.5
Diarrhea	34	3.7
Anorexia	55	6.0
stomachache	23	2.5
Chest pain	57	6.3
Loss of consciousness	911	100
Weakness and lethargy	196	21.5

Statistical data on vital signs of patients during edema showed that the majority of the studied units had vital signs in the normal range. Among them, 87 individuals (9.5%) had fever, 68 individuals (7.5%) had tachycardia, 47 individuals (5.2%) had tachypnea and 65 individuals (7.1%) had Hypertension of systolic blood pressure. Examination of patients' laboratory findings also showed that 191 patients (21%) had leukocytopenia, and 156 patients (17.1%) had leukocytosis, and Chi-square test showed that there was a statistically significant relationship between WBC and mortality (p = 0.001). In 186 patients (20.4%) urea was higher than normal and in 133 patients (14.6%) creatinine was higher than normal. In this case, Chi-square test showed that between the level of urea and creatinine and mortality statistically was a significant relationship (p = 0.001). CRP level in 446 patients (49.0%) and ESR level in 105 patients (11.5%) were reported high (Table 4).

Table 4: Frequency and percentage of vital signs and laboratory findings of patients with Covid 19 admitted to Imam Khomeini Hospital in Ardabil

Vital Signs	**Less than normal**		**More than normal**	
	Number	**Percentage**	**Number**	**Percentage**
T (degrees Celsius): 36-37.9	20	2.2	87	9.5
PR (beats per minute): 60-100	31	3.4	68	7.5
RR (breathing per minute): 18-24	134	14.7	47	5.2
SBP (mm Hg): 120-90	13	1.4	65	7.1
DBZ (mm Hg): 80-90	215	23.6	29	3.2
SPO2 (percentage): 80-100	324	35.6	0	0
Laboratory Findings				
Normal range 4000-10000	191	21.0	156	17.1
RBC (mill / mm3) Normal range F: 4.2-5.4 M: 4.5-6.3	313	34.6	46	5.1
HB (g / dl) Normal Range F: 12-16 M: 14-18	367	40.6	41	4.5
HCT (%)	310	34.3	38	4.2

Normal Range F: 36-46 M: 39-52				
MCV (fl) Normal range 80-96	99	10.9	44	4.8
MCH (Pgr) Normal Range 26-32	79	8.7	77	8.5
MCHC (g / dl) Normal Range26-36	207	22.7	32	3.5
PLT Normal range 150000-450000	244	26.8	15	1.6
SGOT (IU / L) Normal range 5-40	0	0	119	13.1
SGPT (IU / L) Normal range 5-40	7	0.8	70	7.7
PT (Sec)	0	0	213	23.4
INR (Index) Normal range 1-1.4	1	0.1	59	6.5
PTT (Sec) Normal range 30-45	6	0.7	102	11.2
Blood Suger (mg/dl) Normal range 70-140	17	2.0	104	11.4
Urea (mg/dl) Normal range 15-45	25	2.7	186	20.4
Creatinine (mg/dl) Normal range 0.5-1.4	15	1.6	133	14.6
LDH (IU/L) Normal range 0-500	0	0	334	36.7
CPK (IU/L) Normal range 25-200	15	1.6	113	12.4
ESR (mm/hr) Normal range F: <20 M: <15	0	0	105	11.5
CRP Normal range Negative	0	0	446	49.0

Discussion

In this study, 911 patients with Covid 19 admitted to Imam Khomeini Hospital in Ardabil for three months were studied. The study of the age of these people showed that the highest number of people were in the age group of 60 and above, and among them the highest number was between 60 - 70 years. The study of mortality rates in different age groups in the present study showed that the mortality rate increases with age and the highest mortality rate was in the age group of 80 and above. Other studies have shown that old age is associated with a higher risk of mortality. A study by Nikpour Aghdam et al., which examined 2,286 patients with Covid 19 over a three-month period, showed that the majority of Covid 19 patients were in the 50-60 age group and there was a significant and positive relationship between age and mortality and by the increase of age, mortality increases (2). The results of s.zhao study and z.cao study also showed that old age is associated with a higher probability of mortality (11 & 12). A study by Maria Khan et al., which examined 845 patients at a screening center in Pakistan over a two-month period, showed that the incidence increases with old age and age is one of the risk factors for the disease (13). Cumming et al. Examined 257 patients with Covid 19 in New

York for two months and concluded that the average age of patients was 62 and that most deaths occurred in people over 50 (14). In this regard, some studies have reported that old age is associated with decreased immune function (15) and also that old age has previously been reported as a mortality factor in SARS (16) and MERS (17). The study of kai liu et al., which was performed on 56 patients admitted to Hainan Hospital from January 15, 2020 to February 18, 2020, in contrast to the present study and some other studies showed that 18 patients were elderly people (32.11%) and the majority of them (38 individuals, 67.86%) were young or middle-aged (18). Some studies have reported the age range of the disease to be 25 to 89 (19) and some studies have reported that the disease is very rare in infants and children (20). This can be due to the difference in the number of samples studied or the culture of disease prevention in different societies at different ages, and in the study population of this researcher, older people observed more cases of disease prevention. Overall, the present study and other studies showed that age can be a risk factor of incidence as well as a risk factor for increased mortality in patients with Covid 19.

Regarding the overall mortality rate, the present study showed that out of 911 patient cases, 130 individuals (14.3%) eventually died. Studies by Wang et al. showed that the mortality rate was 2.84% (21). According to Huang et al., this rate was 15% (22). A study by Wu et al. estimated that the mortality rate was 14% (23). In the study of Zhu et al., this rate was 33% (24). Guan et al reported that the mortality rate was 1.4% (25). Various studies have reported different mortality rates, which may be due to differences in the number of people studied, their average age, underlying diseases at the same time as Corona incidence, the duration of the study, as well as the body's resistance to the virus which is different in different people. But overall, mortality is declining due to the high incidence rate, and some studies have even reported single-digit rates. Geely et al. in a systematic review and meta-analysis of the epidemiology of patients with Covid 19 among 212 studies and 281,461 patients concluded that the mortality rate is 5.6% (26).

The present study showed that the incidence and the mortality rate is higher among males than females and this amount is nearly double. In this regard, Nikpour Aghdam et al. showed that the majority of infected people are men and the ratio of women to men is 1 to 1.93 and the mortality rate is higher in men than women (2). Khan et al. in their study showed that the majority of patients were male (13), Cumming et al. also indicated in their study that more than half of the patients with Covid 19 were men and also stated that two factors of poor treatment results are male gender and old age (14). Previous studies have shown that SARS-COV and MERS-COV affected men more than women (27, 28). Geely et al. also showed in their study that male gender is one of the risk factors that increases mortality due to Covid 19 (26). According to the results of present study and other studies, male gender is one of the risk factors for morbidity and increased mortality, which can be due to different physical conditions of men and women or exposing to more environmental risks of men than women. Also, previous studies have shown that women are more observant of hand hygiene than men and are more looking for preventive methods (29, 30).

About half of the subjects had underlying disease, most of which was related to hypertension, diabetes, and cardiovascular disease, respectively, and there was a statistically significant relationship between cardiovascular disease, diabetes, hypertension, and chronic obstructive pulmonary disease and mortality. A study by Nanshan Chen et al., which examined 99 patients at Winyhan Jinyintan Hospital from January 1 to January 20, 2020, found that similar to the present study, about 50 percent of patients with Covid had 19 underlying diseases (31). The study by Nikpour Aghdam et al. showed that common underlying diseases among patients with Covid 19 included diabetes, hypertension, chronic obstructive pulmonary disease, cardiovascular disease, chronic renal failure, and cancer. So it can be concluded that, there is a statistically significant relationship between underlying diseases and mortality rate and they increase the mortality rate. The majority of studies in this regard also showed that underlying diseases have a statistically significant effect on mortality in people with Covid 19 (32, 33, 34). In a meta-analysis study, Geely et al found that having underlying diseases, including immune disorders, diabetes, and cancer, increased the severity of the disease, and diabetes

and hypertension increased mortality from Covid 19 disease. Khan Marie et al. also stated in their study that having chronic underlying diseases is one of the risk factors for Covid 19 (13). Cumming et al. Also showed in their study that hypertension, chronic heart and lung disease, and diabetes are directly related to disease mortality (14). A study in China and Italy found that having underlying disease of hypertension had a negative effect on mortality from Covid disease (35, 36). The present study and similar studies in general showed that having chronic underlying diseases, especially heart disease, pulmonary disease, hypertension, diabetes and renal failure, increases the risk of disease and subsequent mortality from Covid 19 disease. This case should be considered in patients' prevention, control and prioritization programs.

Examination of patients' clinical signs showed that the most common clinical symptoms were shortness of breath, cough and fever, respectively. In this regard, the majority of clinical studies, similar to the present study, have reported shortness of breath, cough and fever as the most common clinical symptoms of Covid 19, and sometimes the order of these symptoms may vary in prevalence, which may be less clinically important. The study by kai liu et al. showed that the most common symptom among all patients was fever followed by cough and sputum (18). In their study, Khan Marie et al. showed that the most common clinical symptoms of patients were fever, cough and shortness of breath, respectively (13). Cumming et al. showed that shortness of breath, fever and cough are the most common clinical symptoms, respectively (14). According to the results of the present study and other similar studies, it can be said that fever, cough and shortness of breath are the three most prominent symptoms of Covid 19 and due to the high prevalence of the disease, people with these symptoms should be evaluated for infection and prevention methods should be considered.

Regarding the laboratory and clinical results of the patients, the present study showed that there is both leukocytosis and leukopenia among the studied patients, but the presence of leukopenia is more common than leukocytosis and a statistically significant relationship was found between white blood cell count and mortality. Also, the amount of urea and creatinine was high in a number of patients, among whom the prevalence of increased urea was higher than creatinine, and there was a statistically significant relationship between the amount of urea and creatinine and mortality. C-reactive protein was high in about half of the patients studied. In their study, Cumming et al. showed that proteinuria and lymphocytopenia were common among patients with Covid 19, and the levels of ferritin, D- dimer, and C-reactive protein increased in most patients (14). A study by Geely et al found that liver enzymes (AST and ALT), urea, CRP, neutrophils, and basophils were higher in people with severe disease than in those without severe disease. This increase is statistically significant in both groups and, conversely, the lymphocyte count in patients with high severity is lower, and this is also statistically significant. Also in this study, the results of meta-analysis showed that there is a relationship between the increase of the number of neutrophils, liver enzymes, creatinine, and C-reactive protein and, conversely, decrease of lymphocytes and albumin with mortality (26). Overall, the results of the present study and other similar studies indicate significant clinical changes in patients with Covid 19, such as changes in white blood cells that decrease or increase in these patients, increases in urea, creatinine and C-reactive protein, which are associated with mortality in patients and there is a significant relationship between them. So, these changes should be anticipated and if possible some plans can be implemented to control, treat, or prevent their further progression.

Although this study was performed on a large number of patients with Covid 19, one of the limitations of the study is that it was performed in a medical center in the whole province and in one city. Information was also extracted from patients' records and there may be a record error.

Conclusion

The present study, which was performed on 911 patients with Covid 19, showed that a number of factors are involved in morbidity and mortality from the disease. These factors include old age, male gender, and chronic underlying conditions such as hypertension, cardiovascular disease, chronic obstructive pulmonary disease, and diabetes. Regarding the clinical symptoms at the time of infection, the most common ones are fever, cough and shortness of breath, and due to the high incidence

among the communities, these symptoms are important for rapid initiation of treatment and observance of safety protocols to prevent the spread of the disease. Also, important clinical changes among patients were changes in white blood cells, increase in urea, creatinine and C-reactive protein. The first two cases had a statistically significant relationship with mortality. In hospitalized cases, these points should be controlled and treated.

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