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Social,economic and demographic determinants of risk of death in patients infected with coronavirus: A case study of Ahvaz

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***Abstract*---*Introduction & Objectives*: This article studies the determinants of death risk among coronavirus infected patients in Ahvaz. In this regard, we have studied, analyzed and explained the effect of social, economic and demographic variables including age, gender, marital status, income, occupation, education, place of residence, etc. on the risk of death among coronavirus infected patients. *Methods*: This study was a survey and used a researcher-made questionnaire to collect information. The statistical population is all coronavirus infected patients in the period of march 2020 to September 2021. We used logistic regression with odds ratio report to analyze the data and tested all hypotheses at 95% confidence level. *Findings*: The results show that the risk of death due to coronavirus infection is very unequal among socio-economic groups and in terms of various variables, so that the risk of death in terms of job variable is higher among business men, drivers, employees and farmers in compared to other occupational groups. People aged 61 to 75 are 68.3 times more likely to die than ones under 30. Married people are 2.49 times more likely to die than single ones. People with underlying disease are of risk of death by 1.5 times more likely compared to those without underlying disease. People with BSc degree or higher are of risk of death by 1.3 times more likely compared to people with elementary or high school degree. Attending various ceremonies increases the probability of death by 1.47 times compared to not

attending. In this research, the relationship between income, gender, and residence variables and the risk of corona caused death was not confirmable. *Conclusion*: The probability of death among coronavirus infected patients is associated with their demographic, economic and social bases, especially their age, education, occupation, and on the other hand, with individual behaviors such as contact management, observing health protocols, and awareness of the epidemic.

Keywords*---Corona, risk of death, economic, social and demographic factors, logistic regression.***

Introduction

The death rate of corona pandemic among societies is one of the most important indicators of the effectiveness of health development and health systems. The study of corona deaths from various perspectives has attracted the attention of researchers in various fields of science, including health demography and various fields of social sciences(39)(40). Because such deaths are not only a biological and medical issue, but also many components such as the level of development of societies, environmental, geographical, cultural, social, economic factors play a decisive role in the rate and causes of its occurrence.

Mortality data by age and gender are the main components of health status assessment and, along with other epidemiological, economic and social information, are the primary cornerstone of health decisions (2). Epidemiological study of the trend of causes of death in recent years in Iran shows that death due to non-contagious diseases was increasing, especially cardiovascular disease, unintentional accidents and cancers (3). On the other hand, attention to emerging and re-emerging infectious and contagious diseases is still of particular importance in health systems (4). Infectious and epidemic diseases have emerged as a great threat to human existence for centuries and can even wipe out the entire population. Epidemiological studies have shown that millions of people have lost their lives due to these global epidemics. Examining the history of pandemics in different periods brings us to the conclusion that from the beginning of human life, there have been epidemic diseases and have always been a threat to human health (5).

The prevalence of these epidemics is not new and occurs from time to time. The outbreak of Covid-19 is firstly reported in Wuhan, China in late December 2019 (6). Although seemingly purely medical in nature and related to the health system, the Corona epidemic crisis is a multidimensional phenomenon whose effects and consequences are observable and traceable in various economic, social, political and demographic areas (8). The beginning of recognizing the corona epidemic in Iran was from Qom on February 20, 2017.

Domestic and foreign researchers have studied the determinants of corona mortality. Studies conducted by Rahmanian et al. (2021), Zhang et al. (2020), and Chen et al. (2019) have identified underlying diseases such as cardiovascular disease, hypertension, diabetes, and respiratory diseases as the most important

factors in increasing corona caused mortality. In their researches, Motambodezi (2019) and Marvasti et al. (2020) have emphasized variables such as age, gender and occupation (10) (11) (12) (13) (14) (15). In a European study conducted in 2020 by Davood et al., the survival of hospitalized patients with pulmonary symptoms showed a significant decrease compared to other patients (17). In a study in the United States, almost every hospitalized patient with corona had another underlying condition, that is, 88% of patients had simultaneously more than one disease (18). Ghasemi et al also found in a study that two-thirds of corona deaths were men who had at least one underlying disease (19). In a study conducted by Wei et al in China's Hubei Province, the average age of people who died of corona infection was 51 years, and the majority of the population was older men (20). In another study conducted by Biswas et al. (2019), male patients had a significantly increased risk of corona mortality compared to female patients. The risk of death in patients over 50 years of age was associated with a 15.4-time increase compared to patients under 50 years of age (21). In a study carried out by Altonen (2020), older patients with underlying conditions such as obesity or diabetes were more likely to develop severe disease (10).

This study tries to specify the economic, social and demographic determinants of death risk among patients with corona patients. Considering the death ratio to the population of each province in Gilan, Mazandaran, Qazvin, Ardabil, Golestan and Khuzestan provinces, this rate has been more severe than other provinces in Iran. At first, it was generally thought that due to the hot weather, Khuzestan province and especially Ahvaz would face a smaller number of patients; in March 1998, with the announcement of the start of the corona epidemic, Ahvaz identified 310 definite cases of corona patients and recorded 17 deaths in March. Since the beginning of Corona, many people in Ahvaz have lost their lives due to Corona, but not all people have the same conditions against this epidemic. Therefore, regarding the special economic, social and cultural characteristics of Khuzestan province and especially Ahvaz, the study field of this research is Ahvaz. The population under study is the coronavirus infected patients in Ahvaz from March 2017 to the end of September 2021. From the beginning of the corona epidemic until the implementation of this research (March 2017-September 2021) in Ahvaz, it has recorded 153,358 definite cases of infection. 1529 people of them died, of which 870 (56.9%) were men and 659 (43.1%) were women. In this research, we will try to measure the share of influential variables through two-way logistic regression and the weight of each of these (social, economic and demographic) variables in the risk of corona death.

Theoretical framework of research

Regarding the determinants of mortality, thinkers in different scientific fields have provided different theories and models. In his theory entitled Epidemiological Transmission, the classical theorist Omran explained the causes of death in three stages: "Plague and Famine Period", "Global Epidemic Decline Period", and "Destructive Disease Period" and stated that the causes of death from infectious diseases change to chronic diseases (22). In studies of the causes of death due to coronavirus, chronic and underlying diseases have been one of the underlying causes of death.

According to Preston (1976), with the increasing proportion of the population reaching middle age and old age, the epidemiological situation in developing countries is increasingly reflecting the diseases and health issues of adults instead of children, and the age structure of the population is one of the most decisive determinants of the mortality in different societies (23).

Alshansky and Alt see the new stage of transition in terms of the increasing influence of individual behaviors and lifestyles on the mortality pattern. From their standpoint, we should add a fourth stage to the epidemiological transition, called the hubristic period. Although medical advances are effective in reducing mortality, the causes and age of death are generally under influence of other factors. Job, tobacco addiction, drug use, exercise, diet, stress and use of motor vehicles are some examples (24).

Aplin mentions a fourth stage called the age of delayed exhausting diseases. In his opinion, at this stage, while the existence and importance of exhausting diseases as the main causes of death, their lethality decreases somewhat and the deaths caused by them are delayed for some time. This delay is due to changes and advances in medical technology that extend the life of patients and the elderly who are struggling with diseases such as cancer and cardiovascular disease. In his theory, Aplin mentions a fifth stage as the "period of return of infectious diseases and epidemics" and several factors for the recurrence of infectious diseases (25).

Epidemiological transmission theory deals with the complex changes in health patterns and diseases, the interrelationships between these patterns, the economic, social, biological, and demographic factors that affect them, and the consequences of this complex network. Theories of population transfer and epidemiological transmission are two clear examples of scientists' efforts to create a conceptual framework for the scientific study of population dynamics with respect to significant developments in the present era.

Procedure

The statistical population of this research is the definitively diagnosed patients with coronavirus infection and deaths due to this disease in Ahvaz in the period of March 2020 to September 2021. We received the research ethical code from the Deputy for Health and Medical of Ahvaz for our presence in the hospitals of Corona Center, two health centers in the west and east of Ahvaz. By the time of concluding this dissertation, there were 153,358 cases of definitive infection with Covid-19 and 1529 deaths due to this disease in Ahvaz. For better conclusion and generalizing results to the whole population, we considered the total statistical population (corona deaths) as the sample size.

Findings

According to descriptive findings, from among the total number of deaths in the period under study (1529 people), 56.9% were male and 43.1% were female. Most deaths, about 40 percent, were in the age group of 61 to 75 years, and the lowest death rate, with 1.5 percent, was in the age group under 30 years. Of the total

number of deceased, 1163 (76.1%) were married and 366 (23.9%) were single. There were 855 deaths (55.9%) among people with high school level education and the lowest number of deaths with 4 deaths (0.027) was among people with higher education. There were also 562 deaths (36.8%) among housekeepers and the lowest death rate with 7 cases (05%) among farmers and ranchers.

53.9% of deaths took part in friendly and family gatherings, 16.6% (253 cases) took part in weddings or mourning ceremonies. The results also showed that 1478 people (96.7%) lived in cities and 51 people (3.3%) lived in villages. 902 people (59%) had underlying disease. The income level of 41.6% of cases (636) was 10-15 million and 8.4% of deaths (129 cases) concerned the income level of 15 million and more. 1157 people (75.7%) had a positive contact history, 271 (17.7%) had a domestic travel history, 37 (2.4%) had a foreign travel history and 64 (4.2%) had an unknown contact history. Among the 1529 sample of deaths, 291 (32.8%) obtained their information from health workers and then 201 (22.7%) obtained their information from cyberspace (9).

From the beginning of the corona pandemic (March 2020) in Ahvaz to the time of this study (September 2021), 153,358 cases were of definite infection. The number of deaths among the patients was 1529, of which 870 (56.9%) were men and 659 (43.1%) were women. Most cases in the east of Ahvaz were for Bahonar quarter, Zaytoun Karmandi and in the west of Ahvaz for Golestan quarter. In general and according to the available statistics, there were 79372 (51.8) definite patients with corona and 1004 cases (65.6%) of deaths due to this disease in East Ahvaz and 73986 (48.2%) definite patients with corona and 525 cases (34.3%) of deaths due to this disease in western Ahvaz. Considering the geographical and biological characteristics of these two regions, we can say that the concentration of public markets and gathering places such as arcades, parks and other recreational places and on the other hand the existence of places, mosques and religious assembly halls in East Ahvaz is the main reason for this statistical difference. It is noteworthy that in both east and west of Ahvaz, due to the presence of areas with villa buildings, there have been fewer cases of infection and mortality, which indicates the importance of population density in the spread of the disease.

The first corona peak occurred in Ahvaz in June 2020 with 10,595 definite positive patients, and the city experienced two more corona waves in November of the same year and in April 2021 of that year. In April 2021, due to lack of proper planning to take advantage of the good opportunity of Nowruz and the lack of proper implementation of communication policies, 16090 definite cases of coronavirus infection occurred with unfortunately 215 deaths, unprecedented since the beginning of the Corona pandemic in this great city. The lowest rates of infection and death were for December 2020 with 5792 cases and 19 deaths, respectively. In this study, we investigated the (economic, social and demographic) factors affecting the probability of corona death in Ahvaz from March 2020 to September 2021 (9).

A) Demographic and health bases

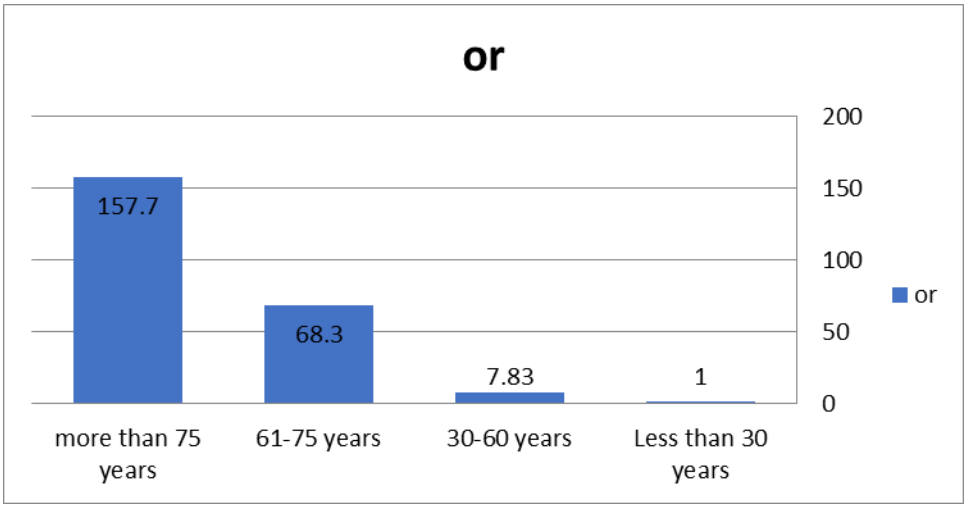
Age is one of the most important variables affecting the probability of death in a population, so that the probability of death is a function of age. As for the importance of its study, the age structure of the population is a consequence of the combination of demographic processes and affects these processes (27). Studies show that corona mortality increases with age among men (28). In another study, Biswas also concluded that increasing the age of patients is associated with a higher risk of death (21). In most domestic and foreign studies, the results show that the risk of death increases with age (29, 21, 14, 30 & 31). In our study also, mortality shows a direct and significant relationship with age (P = .001, OR = 68.3). In the age classification in this study, the mean age of the deceased patients was 66.29 years. In total, out of 1529 patients who died, 617 patients (40.3%) were in the age group of 61 to 75 years, which shows that the frequency of death in this age group is higher than other age groups. With increasing age of patients, the risk of death compared to those under 30 years of age showed a significant increase.

Table 1 and Diagram 1 show the relationship between age and the incidence of death from coronavirus. As we can see, the risk of dying from coronavirus infection has increased more than 68 times, and has increased 157.7 times at age 75 and older.

Table 1
Testing the relationship between age and the incidence of death due to coronavirus

Age group	Death	Infection	OR (CI 95 %)	P-value (chi2)
	Frequency (percentage)	Frequency (percentage)		
Less than 30 years	(1.5)23	(25.9) 39753	1	-
30 to 60 years	(27.5)421	(60.6) 92872	7/83 (5/14-11/9)	0.001
61 to 75 years	(40.3)617	(10.2) 15606	68/3 (45/1-103/6)	0.001
More than 75 years	(30.6)468	(3.3)5127	157/7 (103/7-240/0)	0.001
Total	(100)1529	(100) 153358		

Diagram 1: Risk of death (OR) among patients with corona by age group



Gender differences in health and mortality are a fundamental finding in demographic and epidemiological studies. Men are exposed to health risks more than women and have more harmful behaviors than women that endanger their health (32). Experimental studies show that men are prone to respiratory viral infections due to hormonal and genetic mechanisms, including innate immunity (28). In a study conducted in Iran, 74.5% of deaths were male and 25.5% were female (19). In another study, Biswas showed that the mortality rate in male patients with Covid-19 is significantly higher (21). In this study, 56.9% of the sample of 1529 deaths were male and 43.1 were female, but there was no statistically significant relationship between the occurrence of death and gender.

Table 2 shows the relationship between gender and the incidence of death from the Coronavirus.

Table 2
Testing the relationship between gender and the occurrence of death due to coronavirus

Age group	Death	Infection	OR (CI 95 %)	P-value (chi2)
	Frequency (percentage)	Frequency (percentage)		
Male	(56/9) 870	(55/2) 84643	1/07 (0/96-1/18)	.182
Female	(43/1) 659	(44/8) 68715		
Total	(100/0) 1529	(100/0) 153358		

As we can see, out of 1529 patients who died, 870 (56.9%) were male, which showed that the frequency of death was higher in male patients, but there was no statistically significant relationship between the occurrence of death and gender. Marital status has always been a demographic variable in determining health status and promoting social health, especially for men. Marriage reduces risky behaviors in men (33). In this study, out of 1529 patients who died, 1163 (76.1%)

were married, which shows that the frequency of death is higher in married patients. Therefore, we observed a statistically significant relationship between the occurrence of death and marital status. The risk of death in married people was 2.5 times compared to single people (P = 0.001, OR = 2.49). Table 3 shows the relationship between marital status and death due to corona. This finding is different from previous findings on the effect of marital status on the probability of death, below the probability of death of married people was higher than single ones. The third variable is likely to play a role here and it is less level of interaction and social contacts of single people.

Table 3
Testing the relationship between marital status and the occurrence of death due to coronavirus

Marital status	Death	Infection	OR (CI 95 %)	P-value (chi2)
	Frequency (percentage)	Frequency (percentage)		
Married	(56/0)85948	(76/1) 1163	2/5(2/21-2/80)	0/001
Single	(44/0) 67410	(23/9) 366		
Total	(100/0) 153358	((100/0) 1529		

Residence can be associated with an increased risk of exposure to pathogens and the possibility of a higher prevalence of infectious diseases. The direct link between population density and residence place and the prevalence of the disease is exacerbated by the dramatic spread of urbanization and even increased global communication because the presence of viruses that are transmittable from person to person, for example through insects or oral and nasal secretions, is a catastrophic urban problem. In crowded and dense environments, their propagation and expansion rate increases several times (34). In this study, 96.7% of patients were urban. It shows that the frequency of death is higher in urban patients, but there was no statistically significant relationship between the occurrence of death and residence (P = 0.518, OR = 1.09). Table 4 shows the relationship between residence and the occurrence of corona death.

Table 4
Testing the relationship between residence and the occurrence of death from coronavirus

Residence	Death	Infection	OR (CI 95 %)	P-value (chi2)
	Frequency (percentage)	Frequency (percentage)		
City	(96/7) 1478	(96/3) 147765	1/09 (0/82-1/45)	0/518
Village	(3/3) 51	(3/7) 5593		
Total	(100/0) 1529	(100/0) 153358		

Numerous studies have emphasized the role of underlying diseases in corona mortality, and consequently the people with underlying diseases are at higher risk of death (30). Simultaneous exposure to other serious illnesses puts a person at greater risk (18). A study conducted by Biswas (2020) showed that underlying

diseases were associated with a significant risk of death (21). Bono's study (2020) concluded that those most at risk of death were the elderly, especially the elderly, who had underlying diseases, including cardiovascular disease (35).

In this study, we observed also a significant relationship between having underlying disease and coronavirus caused death, so that patients with underlying disease were 1.5 times more likely to die (p = / 001, OR = 1.5). Table 5 shows the relationship between underlying disease and corona death.

Table 5
Testing the relationship between underlying disease and the occurrence of death due to coronavirus

Underlying disease	Death	Infection	OR (CI 95 %)	P-value (chi2)
	Frequency (percentage)	Frequency (percentage)		
Yes	(59/0) 902	(50/9)78104	1/5 (1/2-1/5)	0/001
No	(41/0) 627	(49/1)75254		
Total	(100/0) 1529	(100/0) 153358		

As we can see, out of a total of 1529 patients who died, 902 patients (59%) had underlying disease. It showed that the frequency of death was higher in patients with underlying disease. Statistically, there was a statistically significant relationship between the occurrence of death and disease. Patients with the underlying disease were 1.5 times more likely to die.

According to the researcher, one of the most important factors in preventing the disease dissemination cycle is to know about the infection. Considering the nature of the disease, its contagiousness, and its rapid spread, this awareness requires behavior change. In a study conducted by Chadori, of all reported corona-related deaths, 62% concerned local transmission (internal displacement) because these had no history of international travel (36). In this study, the risk of death was higher and more significant in patients who participated in family gathering and public assembly (P = 0.001, OR = 1.47). Table 6 shows the relationship between the way of infection (attending various ceremonies and gatherings, etc.) and the occurrence of death due to coronavirus.

Table 6
Testing the relationship between attending various ceremonies and gatherings and the occurrence of death due to coronavirus

Infection through	Death	Infection	OR (CI 95 %)	P-value (chi2)
	Frequency (percentage)	Frequency (percentage)		
Wedding or mourning	(16/6) 253	(24/1) 37375	1	-
Family gathering	(53/9) 824	(53/2) 82646	1/47 (1/27-1/69)	0/001
Public	(20/9) 319	(20/6) 31998	1/47 (1/24-1/73)	0/001

assembly				
Unknown	(8/7) 133	(2/1) 3339	5/88 (4/75-7/28)	0/001
Total	(100/0)1529	(100/0) 153358		

As we can see, out of 1529 patients who died, 824 of them (53.9%) got coronavirus infection following the familial gathering, which was the most common cause of death among patients. Compared to those who take infection at weddings or funerals, the risk of death was higher and more significant through infection in family gathering, public assemblies and indefinite infections.

B) Economic and social bases

According to the researcher, the higher the level of education, if the education rank increases the knowledge and awareness of the nature of the disease, ways of prevention and transmission, etc., it will be directly associated with the reduction of disease, especially infectious diseases. In this study, patients with undergraduate and higher education had a statistically significant difference in mortality rates compared to those with high school education or lower (P = 0.009, OR = 1.3). On the other hand, the education of 855 patients (55.8%) was high school education or lower, which shows that the frequency of death is higher in patients with low education (OR = 1, P <0.05). Table 11 shows the relationship between education and corona death.

Table 7
Testing the significant relationship between education and the occurrence of death due to coronavirus

Education level	Death	Infection	OR (CI 95 %)	P-value (chi2)
	Frequency (percentage)	Frequency (percentage)		
High school education and lower	(55/8)855	(54/7) 83859	1	-
Diploma and two year diploma	(34/4) 528	(33/2) 50955	0/98(0/88-1/09)	0/983
BSc degree and higher	(9/8) 150	(12/1) 18544	1/3 (1/05-1/5)	0/009
Total	(100/0) 1533	(100/0) 153358		

As we can see, out of 1529 patients who died, the education of 855 patients (55.8%) was high school education or lower, which shows that the frequency of death is higher in patients with low education. Patients with a BSc degree or higher had a statistically significant difference in mortality compared to those with high school education or lower. However, patients with diploma and two-year diploma had a lower risk of death but it was not statistically significant (Table 7).
A study done by Mutambodezi (2020) in the United Kingdom found that medical support staff, social care workers, and transportation workers had the highest risk in a wider range of groups for Covid-19 infection (8). In this study, the

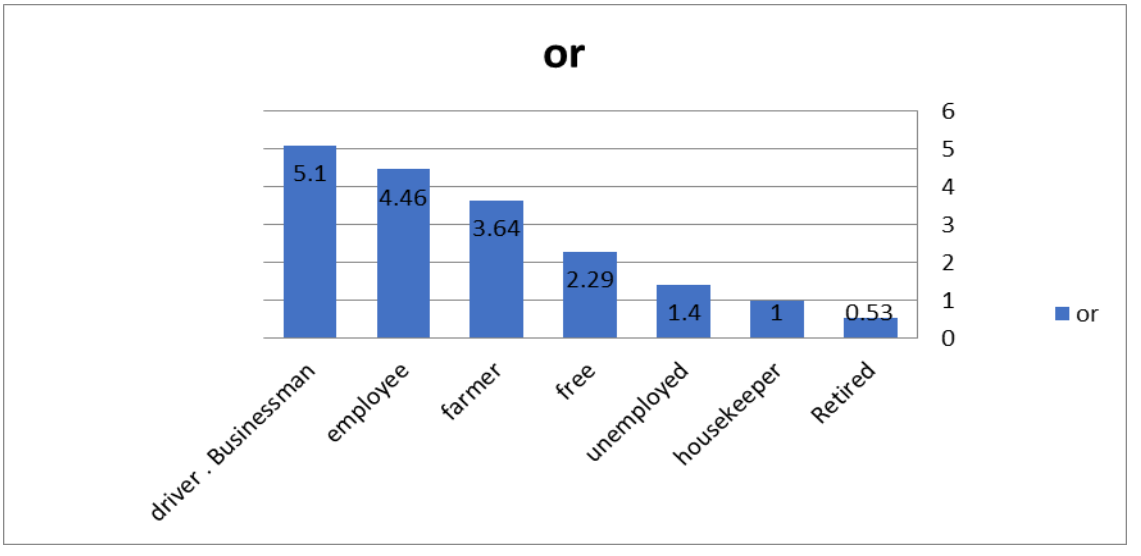
relationship between job type and corona death was significant. This means that (36.8%) of deaths were housekeepers who had the highest mortality rate. It shows that they had more deaths than other occupations, but people with free jobs, employees, farmers, drivers and businessmen had a higher risk of death than housekeepers, which was statistically significant (P = 0.001, OR = 5.10). Table 8 and Diagram 2 show the relationship between job type and the probability of corona death.

Table 8
Testing the relationship between job and corona death

Occupation	Death	Infection	OR (CI 95 %)	P-value (chi2)
	Frequency (percentage)	Frequency (percentage)		
Housekeeper	(36/8) 562	(23/0) 35307	1	-
Free	(19/7) 301	(28/3) 43364	2/29 (1/99-2/63)	0.001
Unemployed	(10/7) 164	(7/0) 10775	1/04 (0/87-1/24)	0.616
Retired	(20/7) 317	(7/0) 10674	0/53 (0/46-0/61)	0.001
Employee	(9/8)136	(24/9) 38177	4/46 (3/70-5/39)	0.001
Farmer	(0/5) 7	(1/0)1601	3/64 (3/64-7/68)	0.001
Driver, business man	(2/7) 42	(8/8) 13460	5/10 (3/72-6/98)	0.001
Total	(100/0)1529	(100/0) 153358		

As we can see, out of 1529 patients who died, 562 patients (36.8%) were housekeepers who had the highest mortality rate. It shows that they had more deaths than other occupations. People with free jobs, employees, farmers, drivers and businessmen were more likely to die than housekeepers, which was statistically significant. Retirees had a low risk of death.

Diagram 2: Risk of death (OR) due to coronavirus infection by occupation groups



The income is an amount that a person receives from the sale of goods and services, etc. on a daily, weekly or monthly basis. If routine health care is disrupted and access to food is reduced (resulting in unavoidable shocks, health system collapse, or deliberate choices in response to an epidemic), increased child and maternal mortality will be devastating (37). In this study, the frequency of death was lower in patients with higher incomes, but there was no statistically significant relationship between the occurrence of death and patients' income status (P=0/799, OR=1/0 2 (84-1/24). Table 8 shows the relationship between income level and the incidence of deaths from the Coronavirus.

Table 9
Testing the relationship between income level and the incidence of death due to coronavirus

Income level	Death Frequency (percentage)	Infection Frequency (percentage)		OR (CI 95 %)	P-value (chi2)
Less than 5 million	(26/0) 398	(25/4) 38919		1	-
5-10 million	(23/9) 366	(23/9) 36710		-1/18) 1/02(0/89	0/811
10-15 million	(41/6) 636	(41/6) 63791		(0/9-1/16) 1/02	0/629
15 million and more	(8/4) 129	(9/1) 13938		1/02 (84-1/24)	0/799
Total	(100/0)1529	(100/0) 153358			

As we can see, out of 1529 patients who died, 129 patients (8.4%) had income of 15 million or more. It indicates that the frequency of deaths in patients with higher income was lower. There was no statistically significant relationship between the occurrence of death and patients' income status.

According to the researcher, one of the most important ways of transmitting viral diseases such as corona is the history of contact with infected people and traveling to areas and cities of color in the warning range (orange and red). The Corona crisis changed many behaviors, attitudes and even values. Due to the nature of the disease and its high prevalence, the governments imposed many restrictions including quarantine and restrictions on access to high-risk cities (38). In a study conducted in Iran, from among all patients, (6.81) had a history of traveling to Qom, which was the first infected area in Iran, and (20.90%) had close contact with infected or suspected individuals. The mortality rate is by 2.95 (30). In this study, there was a significant relationship between contact with an infected person (definite positive) and the occurrence of corona death (P = 0.001, OR = 1). Table 9 shows the relationship between travel history and the occurrence of corona death.

Table 10
Testing the relationship between travel history inside and outside the country and the occurrence of death due to coronavirus

Contact history	Death	Infection	OR (CI 95 %)	P-value (chi2)
	Frequency (percentage)	Frequency (percentage)		
Contact with an infected person	(75/7) 1157	(76/3) 117046	1	-
Domestic travel	(17/7) 271	(18/4) 28182	0/10 (/08-0/11)	0/001
Foreign Travel	(2/4) 37	(3/1) 4711	0/12(/09-0/17)	0/001
Unknown	(4/2) 64	(2/2) 3419	0/05 (0/04-0/06)	0/001
Total	(100/0)1529	(100/0) 153358		

As we can see, out of 1529 patients who died, 1157 of the patients (57.7%) had infection through contact with an infected person, which was the most common cause of death among patients. Compared to contact with an infected person, domestic and foreign travel history and other cases showed a statistically low risk ratio.

According to the researcher, in the event of any health-related crisis in societies, one of the effective factors to reduce the damage caused by the crisis is to raise the level of health literacy and public awareness of the society about the nature of the crisis. In this study, the lowest risk of death was shown by patients who obtained their information from health workers, which also showed a statistically significant relationship (P = 0.018, OR = 0.80). Table 11 shows the relationship between knowledge of the nature of the disease (source of information) and the occurrence of death in the corona.

Table 11
Testing the relationship between knowledge of the nature of the disease (source of information) and the occurrence of death due to coronavirus

Source of information	Death	Infection	OR (CI 95 %)	P-value (chi2)
	Frequency (percentage)	Frequency (percentage)		
scientific resources	(21/0) 186	(21/0)32206	1	-
TV and satellite	(11/8) 105	(18/4) 28173	1/54 (1/21-1/96)	0/001
Cyberspace	(22/7) 201	(22/7) 34782	0/99(0/81-1/22)	0/994
Friends and acquaintances	(11/6) 103	(11/6) 17835	1/00 (0/78-1/27)	0/999
Health staff	(32/8) 291	(26/3) 40362	0/80 (0/66-0/96)	0/018
Total	(100/0)866	(100/0) 153358		

As we can see in Table 11, the risk of death in patients whose source of information was television and satellite was 1.5 times higher than scientific

sources, which was also statistically significant. Patients who obtained their information from health workers had the lowest chance of death, which was also statistically significant.

Conclusion

Finally, we can conclude that the probability of death among corona patients is associated with their demographic, economic and social backgrounds, especially their age, education, occupation, and on the other hand, with individual behaviors such as contact management, observing health protocols, and awareness on the epidemic. Monitoring, early detection, and rapid response to the spread of emerging and re-emerging infectious diseases require policy-making, planning, education, support, and responsible actions of countries and health systems. This, in turn, owes much to having a resilient, flexible, intelligent and agile health system to deal with any type of public health event. The readiness of health systems for anticipating, preventing, diagnosing, and responding appropriately to the needs of crisis management resulting from the epidemic of emerging diseases is crucial. Accordingly, by having information from similar researches, it is possible to have proper planning during health-related events.

Research suggestions

Due to the novelty of the disease and the creation of different mutations in the corona virus, it seems that conducting similar researches in other parts of the country and metropolises with different climates, customs and cultures may yield different results.

Executive proposals

The significant relationship between age (highest death rate in the age group of 75-61 years), the underlying disease and the occurrence of corona caused death requires special attention in their follow-up and treatment, because it imposed an increase in hospitalization time in this group and the resulting financial burden on the health system. Due to the significant impact of job variables, travel history, marital status and attendance at various events on the risk of death, we recommend the necessary practical policies regarding effective interventions to reduce the incidence and death of higher risk groups.

Limitations

The population under study consisted of the deaths of coronavirus infection. Since the data collection tool was a questionnaire and to find answers to a number of questions we needed to contact the family of the deceased, in some cases, the family was not willing to cooperate, so they answered the questions after our psychological interventions. In some cases, the family did not have a good reminder to answer some questions, such as following the protocols and so on.

Despite examining the acceptable volume of patients, this study has some limitations. Due to the continuation of this disease and the occurrence of

subsequent waves, conducting additional studies on deceased patients is necessary. Information on more centers, cities, and provinces is also necessary to explain the dimensions of Covid-19-related deaths. Moreover, the inclusion of variables such as tobacco use, etc. in future studies, can provide more information for better decisions to the country's health managers.
Conflict of interests: There is no conflict of interests.

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