

Comorbidity and Its Impact on Mortality of COVID-19 in Yazd Province, a Central part of Iran: a Hospital-based study

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ABSTRACT

Introduction: The World Health Organization on March 11, 2020 declared the outbreak of severe acute respiratory syndrome Corona virus 2 disease (COVID-19) a pandemic situation. The main aim of this study was investigating mortality of COVID-19 by considering chronic diseases.

methods: This study was conducted as a cross-sectional in which all confirmed cases were examined. The variables considered in this study were age, sex, diabetes mellitus, cancers, hypertension, heart diseases, kidney diseases, and liver diseases. Independent sample t test, Chi-square and binary logistic regression were used for data analysis. All statistical analysis was done in SPSS 16 and significant level was set at 0.05.

Results: Out of 22849 PCR and CT scan tests, 16061 were positive. According to the confirmed cases, prevalence of COVID-19 was calculated about 0.019. Also hospital case fatality rate and mortality rate were calculated 156 and about 8.2 per 100000 respectively. Hypertension, and age had significant relationship with morbidity of COVID-19, in other hand, age (OR: 4.51, $p < 0.001$), kidney diseases (OR: 1.84, $p < 0.001$), diabetes mellitus (OR: 1.31, $p < 0.001$), cancer (OR: 2.73, $p < 0.001$), liver diseases (OR: 2.27, $p < 0.001$) had impact on mortality of covid-19. Population Attributable Fraction (PAF) showed the most fraction of death was due to diabetes mellitus, cancers, kidney diseases, and liver diseases.

Conclusion: Age and some underlying diseases increase odds of death due to COVID-19. It seems that preventing high-risk people from being infected is an effective solution to reduce COVID-19 death rate. To do this, health protocols need to be implemented more seriously for these sensitive groups.

Keywords: SARS-COV-2, Risk Factors, Population attributable fraction, pandemic, Yazd, Iran

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Introduction

The World Health Organization on March 11, 2020 declared the outbreak of severe acute respiratory syndrome Corona virus 2 disease (COVID-19) a pandemic situation(1). For the first time, COVID-19 was reported in Wuhan (Hubei Province, China) in late December(2). From the beginning of the pandemic, there have been over 79.2 million cases and over 1.7 million deaths reported(3).

According to the latest results, the clinical symptoms of COVID-19 are heterogeneous. At the admission, 20–51% of patients have at least one co-morbidity (diabetes (10–20%); hypertension (10–15%); other cardiovascular and cerebrovascular diseases (7–40%) (4).

Thirty nine percent patients in severe disease group and twenty-one percent patients in non-severe group have previous coexisting illness (5). Co-occurrence of non-communicable diseases such as diabetes, cardiovascular disease, cancer, hypertension, kidney disease, and other chronic diseases is taken as a proven risk factor for increasing risk of acute outcome or even death from COVID-19 (6, 7). Treatment of COVID-19 in patients with underlying co-morbidity may be associated with intensive cares and ventilator supports (4). Identifying risk factors for mortality is an important component for COVID-19 management strategies. These evidences are important at a time when demand for intensive care is increasing and resources are limited (8-10).

Non-communicable diseases have been the leading causes of death in Iran in recent years so that, more than 76% of deaths are due to non-communicable diseases in Iran. Cardiovascular diseases accounted for 45.7%, cancers for 13.5% and respiratory diseases for about 4% of deaths (11). On February 19, 2020, the first cases of corona virus disease were detected in Iran (12). Based on the article by Peykari & et al., patients with at least one co-morbidity were 30.2% and the percent of death due to COVID-19 that had at least one co-morbidity was 37.9% (13).

Due to high prevalence of some chronic diseases in Yazd province, this study was designed to

investigate deaths related to COVID-19 by considering chronic diseases such as diabetes, malignancies, hypertension, kidney disease and cardiovascular disease.

Methods

Data source and data extraction

All suspected cases of COVID-19 would be referred to central hospitals in order to get confirmed through PCR or CT scan test. The data have been recorded in the data registry. After making the necessary arrangements, all data included suspected, confirmed, recovered cases and deaths due to COVID-19 became available.

Study Design

In this analytical cross-sectional study, all people who had test were included. In the next step, all people were divided in two groups, including confirmed cases with Covid-19 and not confirmed cases. The variables considered in this study were age, sex, diabetes mellitus, cancers, hypertension, heart diseases, kidney diseases, and liver diseases.

Statistical analysis

Frequency (percentage), mean (SD) were used for description. Independent sample t test, Chi-square and binary logistic regression were used for data analysis. Also, population attribute fraction was estimated using the prevalence and the odds ratio of these risk factors among the control group (Eq.1).

Population attribute fraction =

$$\frac{P_e \times (OR-1)}{P_e \times (OR-1)+1} \quad (Eq. 1)$$

In this formula OR indicates odds ratio adjusted for all risk factors and P_e represents associated prevalence risk factors in control group. All statistical analysis was done in SPSS 16 and significant level was set at 0.05.

Results

Out of 22849 PCR and CT scan tests, 16061 were positive. According to the confirmed cases, prevalence of COVID-19 was about 0.019. Also hospital case fatality rate and mortality rate were

156 and about 8.2 per 100000, respectively.

Mean (SD) of age between confirmed cases and nit confirmed cases were significantly different (p<0.001); also, some of chronic diseases such as diabetes mellitus and hypertension were shown to be associated with result of COVID-19 test (p<0.05) (table1).

Results of univariate logistic regression demonstrated that some of chronic diseases could

increase the odds of death due to covid-19, but after adjustment for age and other chronic diseases, it was observed that diabetes mellitus, kidney diseases and cancers significantly increased this odds (p<0.05) (table2).

Prevalence of diabetes mellitus, liver diseases, kidney diseases, and cancers were calculated 14.4%, 0.19 %, 1.66%, and 1.46% respectively. The PAF of these chronic diseases are reported in table2.

Table 1. Baseline characteristics of patients

Variables	Result of Covid-19 test		P
	Positive	Negative	
Age , Mean (SD)	57.3± 0.15	51.34± 0.26	<0.001*
Sex, N(%)	Female	7747(77.3)	0.96**
	Male	8314(70.3)	
Kidney Diseases N(%)	Yes	272(71.8)	0.56**
	No	15789(70.3)	
Hypertension N(%)	Yes	1987(80.3)	<0.001**
	No	14074(69.1)	
Cardiovascular Diseases N(%)	Yes	1290(70)	0.77**
	No	14771(70.3)	
Diabetes Mellitus N(%)	Yes	1988(78.5)	<0.001**
	No	14073(69.3)	
Cancers N(%)	Yes	218(65.5)	0.05**
	No	15843(70.4)	
Asthma N(%)	Yes	157(70.1)	0.95**
	No	15904(70.3)	
Nervous Diseases N(%)	Yes	124(65.6)	0.16**
	No	15937(70.3)	
Liver Diseases N(%)	Yes	27(62.8)	0.28**
	No	16034(70.3)	
Other Diseases N(%)	Yes	683(74)	0.01**
	No	15378(74.1)	
Total (22849)	16061	6788	-

*Independent sample t-test ** Chi-square test

Table 2. Crude and adjusted odds ratio of comorbidities and their impact on COVID-19 death

Comorbidity	Crude Odds ratio(95% CI)	P	Adjusted Odds Ratio(95% CI)	P
Age (upper60 vs. under60 Yrs.)	5.02 (4.48 -5.63)	<0.001	4.51 (4.01 – 5.07)	<0.001
Hypertension	2.06 (1.82 – 2.34)	<0.001	1.06 (0.92- 1.2)	0.4
Kidney Diseases*	2.84 (2.19- 3.68)	<0.001	1.84 (1.4 – 2.4)	<0.001
Heart Diseases	2.36 (2.06 – 2.7)	<0.001	1.32 (1.14 -1.52)	0.18
Diabetes Mellitus**	2.18 (1.93 – 2.46)	<0.001	1.31 (1.14- 1.51)	<0.001
Cancers***	3.53 (2.73 - 4.58)	<0.001	2.73 (2.1 – 3.58)	<0.001
Liver diseases****	2.97 (1.42 – 6.2)	<0.001	2.27 (1.05 – 4.9)	<0.001
Nervous Diseases	1.48 (0.94 – 2.31)	0.06	1.01 (0.63 – 1.6)	0.9
Other Diseases	2.06 (1.82 – 2.34)	<0.001	1.54 (1.26 – 1.88)	<0.001

*PAF: 1.3%, **PAF: 4.2%, ***PAF: 2.4%, **** PAF: 0.2%

Discussion

The results of this study revealed that factors such as aging, diabetes, kidney disease, various types of cancer and liver disease are leading risk factors of death due to COVID-19. Age is a potential risk factor for mortality. A conducted study on the probability of death in COVID-19 patients, which were over 60 years, showed that these people were more likely to die than other age groups (14). So, it seems that age has a significant contribution to assess final outcome of COVID-19.

Diabetes is one of the most common underlying disorders with a relatively high prevalence in Yazd province. It seems that death due to COVID-19 in patients with this diabetes is significantly high. The result of a review study indicated that odds of death due to COVID-19 in people with diabetes is up to three times more than others (5).

Kidney disease is another risk factor for death from COVID-19. Our findings showed that people with kidney disease had higher odds to die than people without the disease. This result is consistent with other studies which reported that kidney disease increases odds of death up to 5 times (5).

Also, the number of deaths due to COVID-19 in people with cancer is high due to the effect that various types of cancer have on the immune system. A review study demonstrated that cancer increases odds of death of infected cases up to 3 times (15).

Chronic liver disease, which elevates the risk of death of people with the virus, can also be one of the determinant factors of the final outcome of patients with COVID-19. Several studies have also shown that people with liver disease are more vulnerable so that liver disease increases the odds of death in contaminated cases (8, 16, 17).

PAF showed that diabetes mellitus, kidney

diseases, cancers, and liver diseases have most impact on death of COVID-19, which could be related to the high prevalence of the chronic diseases in Yazd province (18).

It seems that if we want to reduce the mortality of COVID-19, we should prevent morbidity of COVID-19 in people with these diseases.

The use of all recorded data related to hospitalized patients was one of the strengths of the present study. Also, this study was conducted for the first time in Yazd province, which is located in the central region of Iran. One of the limitations of this study was the lack of coverage of outpatient data.

Conclusion

According to the results of this study, various factors including age and some underlying diseases increase odds of death due to COVID-19. It seems that preventing high-risk people from being infected is an effective solution to reduce COVID-19 death rate. To do this, health protocols need to be implemented more seriously for these sensitive groups.

Conflict of interest

None.

Ethical approval

This study was presented in the ethics committee of School of Medicine affiliated to Shahid Sadoughi University of Medical Sciences, Yazd, Iran and was approved according to the approval ethical code IR.SSU.SPH.REC.1400.030.

Authors' contributions

All authors contributed to writing, editing, reviewing the manuscript for important intellectual content.

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