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Comorbidity of Diabetes and Covid-19 in 570 Positive Polymerase Chain Reaction Patients in Yazd-2019-2020

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Abstract

Objective: Epidemiological evidence shows that the prevalence of patients with comorbidity of diabetes mellitus (DM), in Coronavirus disease 2019 (COVID-19) is remarkable and they have poor prognosis. We aimed to investigate the comorbidity of diabetes and covid-19 in positive Polymerase Chain Reaction people in Yazd.

Materials and Methods: This retrospective cohort study included data of 570 COVID-19 positive patients, admitted to Shahid Sadoughi Hospital in Yazd, Iran, from February2019 to May 2020, including demographic data and clinical outcome of COVID-19. Study data were analyzed using SPSS software-22 and T-test, Chi-square and a binary logistic regression model were used for modeling.

Results: Prevalence of COVID-19 patients with diabetes was 27% and the percentage of male patients was 62.6%. Additionally, duration of hospitalization significantly higher in diabetic patients (P= 0.004), need to invasive mechanical ventilation in diabetic patients was significantly higher than non-diabetic patients (P< 0.001)

Conclusion: DM is one of the most important comorbidity with COVID-19 patients and this comorbidity affects the severity of the disease and the outcome of patients.

Keywords: Diabetes mellitus, COVID-19, Comorbidity, Yazd

QR Code:

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Introduction

The COVID-19 pathogen was described as a novel beta-coronavirus known as the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (1). SARS-COV-2 is an enveloped RNA virus belonging to the Coronaviridae family and the seventh known beta-coronavirus that can cause human infection (2). Clinical manifestations of covid-19 infection are cough, fever, shortness of breath, fatigue and myalgia. Other symptoms are chest tightness, sputum production, nausea, vomiting, diarrhea, sore throat, headache, and anosmia. Some patients may have no symptoms or have mild fatigue or fever (3). By 20 April 2021, this virus had caused over than 141 million positive RT-PCR cases and 3 million deaths globally (4)**.** The majority of SARS-CoV-2-related deaths have occurred in people over the age of 65, who are also most likely to be admitted and treated in intensive care units (5).

Previous findings have shown that the prevalence of some comorbidity is associated with an increased risk of developing acute respiratory distress syndrome (6). COVID-19, like influenza, MERS-CoV and SARS-CoV, is more likely to cause respiratory failure and death in patients with comorbidity (7-10). As we know, diabetes mellitus (DM) is a risk factor for infections (11).

DM is a metabolic disorder and the major health problem (12). DM is prevalent in 11.9 percent of Iranian adults aged 25 to 70 years. It is expected that about 9.2 million Iranians will be diabetic by 2030(13). In Yazd, the prevalence of DM in people over 30 years old increased from 13.8 percent in 1998 to 16.3 percent in 2012 (14,15). According to recent studies, 24.5 percent of people aged 40 to 80 are diabetic in Yazd (16).

There is no evidence that people with DM are at a higher risk of COVID-19 infection. But, there are various processes that predispose diabetic individuals to increased disease severity. These metabolisms include increasing inflammatory susceptibility, immunological dysfunction and decreasing viral clearance. (17,18) One of the most prevalent underlying diseases among patients with COVID-19 is DM (19,20).

Our objective was to evaluate the comorbidity of DM and covid-19 in positive polymerase chain reaction patients in Yazd.

Materials and Methods

Study design and population

In this retrospective longitudinal study, we selected 570 patients among patients with positive reverse transcription-polymerase chain reaction (RT-PCR) SARS-Cov-2 test who were admitted to Shahid Sadoughi Hospital in Yazd, Iran, from February 2019 toJune 2020.

Data collection

Demographic and clinical features including age, gender, medical history of diabetic status, deterioration of clinical status including Invasive mechanical ventilation and duration of hospitalization were extracted from medical records. Ascertainment of DM has been made through self-expression of patients on admission. Laboratory validation of COVID-19 was performed at Shahid Sadoughi Hospital. After collecting of specimen from upper respiratory tract, swabs were put into the viraltransport solution. Total RNA was extracted using an RNA isolation kit (RT-PCR test kit; Sansure biotech). Patients were divided in to two groups, diabetes and non-diabetes. Both groups were matched for age, gender and other underlying disease.

- **Inclusion criteria**

1. Definitive diagnosis SARS-COV-2 based on PCR test.

- **Exclusion criteria**

1. Failure to complete the treatment process.
2. Dissatisfaction with continuing the study.
3. Having an underlying disease other than DM.

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Statistical analyses

After extracting the data, all of them entered SPSS software version 22. Quantitative data were described by the mean ± standard deviation (M±SD) and categorical variables as number (percentage). In this study, diabetic and non-diabetic patients were compared using Student's T-test, and a Chi-square test was used. A binary logistic regression model was used for modeling. $P< 0.05$ was considered statistically significant. Excel 2010 software was used to draw the figures.

Ethical considerations

This study was approved by ethical committee of Islamic Azad University (number: IR.SSU.REC.1399.028).

Results

A total of 570 hospitalized patients with SARS-Cov-2 were enrolled in this study with median age of 56 ±17. The youngest and the oldest were 19 and 94 years old, respectively. Table 1 presents the demographic data. In this study, male (63%) were more than female (37%) and about 83 percent of patients were married and about 43% were employed.

Comorbidity of COVID-19 and diabetes with 515 data without missing, 137 (27%) were calculated (Figure 1).

The mean blood sugar was 186 ± 100 in diabetic patients and 118 ± 48 in non-diabetic patients. This mean was significantly higher in diabetic patients than non-diabetics ($P< 0.001$).

The mean number of hospitalization days in patients with diabetes was 7.5±6 and in non-diabetic patients was 6±4. This value was significantly higher in diabetic patients ($P= 0.004$) (Figure 2).

In the patients studied, the percentage of Invasive mechanical ventilation in diabetic patients (24.8%) was higher than non-diabetic patients (9.9%) (P: 0.001). The modeling results showed that the chance of Invasive mechanical ventilation in diabetic patients was

Table 1. Demographic data of COVID-19 patients in the study

Variable		Frequency (%)*
Gender	Male	356 (63.6)
	Female	213 (37.4)
Marital status	Single	20 (4)
	Married	477 (83)
Occupation	Employed	171 (43)
	Jobless	223 (57)

* Due to lost data above 20% so instead of percent, valid percent was reported.

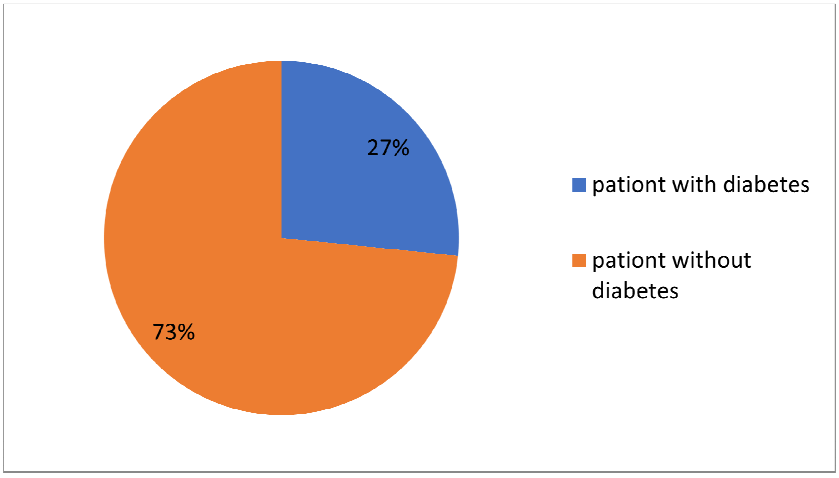

Figure 1. Prevalence of comorbidity of diabetes mellitus and covid-19

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three times higher than in non-diabetic patients. And after age adjustment, the odds ratio decreased to 2 but remained significant as a risk factor.

Discussion

In this retrospective study, we evaluated the comorbidity of DM and covid-19 and predicting factors for bad outcomes, such as the need for invasive mechanical ventilation. DM has been identified as common comorbidity and a risk factor for the severity and prognosis of Covid-19 (21,22). The Previous studies showed that the proportion of COVID-19 disease was high in Iranian patients with DM and mortality of this comorbidity was 0.549 fold increased. Because of the high prevalence of diabetes in Yazd, it was very important to evaluate comorbidity of DM and covid-19 and the differences among the diabetic and non-diabetic COVID-19 patients (23).

Previous studies have reported that men are more prone to COVID-19 and at high risk for poor prognosis and outcomes (24). Our results were in line with previous findings. Li et al., in a study demonstrated that the mean age of Covid-19 patients was 46.7 years (25). Chen et al., reported that the mean age of hospitalized patients was 55 years (26). The present study results showed that among COVD-19 patients, 27% had diabetes comorbidity. Some studies showed 9-14% prevalence of diabetes in SARS-CoV-2 patients (27-29). We found a greater frequency of DM in these individuals, which might be attributed to the fact that our study included a larger number of patients and probably elderly patients infected with SARS-CoV-2. Liang et al., reported that 40% of Covid-19 patients had an underlying disease that included heart, lung, cerebrovascular, DM and cancer, respectively (30). Elemam et al., showed that 30% of Covid-19 patients had diabetes and symptoms were more severe in diabetic patients, resulting in serious clinical effects such as ICU admission and death (31). The results of Zou's study also showed that 51.59% of people had the comorbidity, including DM, cardiovascular disease, high blood pressure and chronic respiratory disease (32). Moftakhar et al., showed that Of all participants, 8.32% of patients had DM and the most common comorbidities in all patients were hypertension and DM (33). Our COVID-

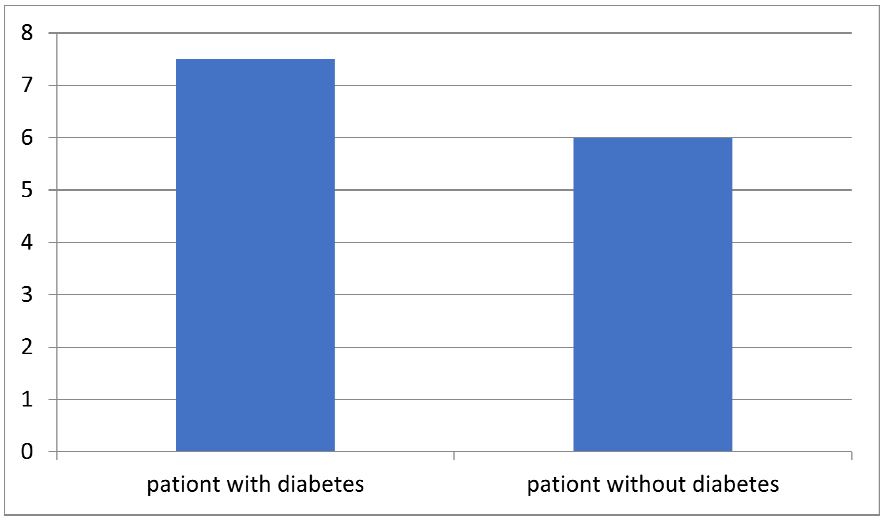

Figure 2. Comparison of mean duration of hospitalization in diabetic and non-diabetic patients

Table 2. Investigation of OR of Invasive Mechanical Ventilation in diabetic patients

Variable	Crude odds ratio (confidence interval)	Adjusted odds ratio (confidence interval)
Diabetes	3 (1.80-5)	2 (1.21-3.6)

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19 positive diabetic patients had significantly longer duration of hospitalization compared to non-diabetic patients. Soliman et al., demonstrated that diabetic patients had significantly longer duration of hospitalization (34). Akbariqomi et al., also noted that number of hospitalization days in diabetic patients was longer compared to non-diabetic patients (35). The results of Chen's retrospective study revealed that there was no statistical significance in median duration of hospitalization between the diabetic and non-diabetic groups (36).

According to a meta-analysis of 33 studies, DM is significantly associated with COVID-19 mortality and poorer prognosis. In addition, DM was associated with aggravating disease severity of COVID-19 patients (37). The results of this study are consistent with our findings; SARS-CoV-2 patients with DM were more predisposed to develop severely illness condition including need of invasive mechanical ventilation. Akbariqomi et al., revealed that requirement of invasive mechanical ventilation in patients with diabetes compared with those without diabetes was not significantly higher (35).

Self-reporting of comorbidity on admission, failure to collect all data accurately, lack of follow-up of discharged patients were the limitations of this study. We did not know diabetic patients' pre-hospital status, particularly their glycemic control which might be linked to a number of clinical risk factors for bad outcomes. However, the strengths of this study include the large overall sample size of patients and the study of various factors. Using the results of the present study can be effective in physicians' clinical decisions.

Conclusions

We have demonstrated that proportion of underlying DM in patients with confirmed COVID-19 is relatively high and causes to poorer clinical outcomes. This is very important to prevention of SARS-CoV-2 infection in DM peoples and increase awareness in diabetic patients for COVID-19.

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None.

Conflict of Interest

None.

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