Clinical outcomes comparison in diabetic and non-diabetic COVID-19 patients: A case-control study

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Abstract---Aim: To compare the clinical outcomes of a severe attack of COVID-19 in patients with diabetes and patients with no diabetes. Study design: A case-control study. Place and Duration: This study was conducted at Liaquat University of Medical and Health Sciences Jamshoro Pakistan from October 2020 to October 2021. Methodology: Out of 62 patients who visited the emergency department during the

study period with shortness of breath, 55 participants tested positive for COVID-19. Those 55 were included in the present study. All the patients were admitted to ICU. A detailed demographic and clinical history was taken. All the patients were categorized as diabetic and non-diabetic based on their blood sugar levels. The clinical outcomes were assessed by monitoring blood pressure, rate of shock, renal function tests, and level of troponin. Result: Out of a total of 55 patients, 33 (60%) patients were detected with diabetes and the remaining 22 (40%) did not have diabetes. A total of 21 (63.64%) of the diabetic patients needed invasive ventilation and 9 (27.27%) needed non-invasive ventilation. A total of 20 (60.6%) diabetic patients had acute kidney injury and 29 (87.88%) had elevated levels of troponin. Conclusion: Severe symptoms of COVID-19 are seen in diabetic patients compared to those patients that do not have diabetes.

Introduction

Diabetes mellitus (DM) is known to be a severe health threat on an international level for more than 20 years [1]. The figure for patients has increased to 285 million compared to that in 1985 when it was only 30 million. The number of diabetic patients in 2019 was 463 million as per the data of the International Diabetic Federation. It is presumed that it will rise to 700 million by the year 2045 [2], [3]. It is a leading cause of some other morbid conditions such as end-stage renal injuries, amputations of lower extremities, and the onset of blindness due to retinopathy [4]. The complications associated with diabetes are responsible for causing more disability. It is more life-threatening at a later age [5].

In December of 2019, a patient with pneumonia was detected with an unknown origin. This case was first seen in China. The pathogen causing pneumonia was RNA-enveloped beta-coronavirus [6]. The virus started spreading quickly in China and then all over the World [7]. The death toll was highly increased. Commonly seen symptoms were fever, dyspnea, dry cough, lymphopenia, and fatigue [8]. The spread of the virus is primarily by droplets, with direct contact with the patient, and by fecal matter [9]. As it was a new virus, the factors mainly responsible for severity and mortality were initially unknown. However, it has been seen that patients with already undergoing health conditions have more tendency to develop severe symptoms. Co-morbidities such as diabetes, hypertension, and old age are one of those potential conditions [10].

The rate of increase in the gravity of symptoms of COVID-19 in diabetic patients is suggestive of increasing the supervision of those patients more than others. This is necessary for reducing the chances of complications and mortality. Research data related to the correlation between diabetes and COVID-19 is scarce, hence, it is uncertain how the supervision should be made stricter. The present study focuses on the determination of clinical outcomes of COVID-19 in patients with diabetes and patients not having diabetes. It can help in

maintaining a better mode of prevention and treatment for diabetic patients suffering from COVID-19.

Methodology

A total of 62 patients visited the emergency department during the study period with severe symptoms of COVID-19. A detailed history of clinical symptoms was acquired from all the patients. Based on their clinical symptoms, a PCR of COVID-19 was done for all the patients. They all were given symptomatic treatment as per protocols. After the collection of the PCR test, it was seen that 55 of the patients were COVID-19 positive. All the COVID-19 positive patients were admitted to ICU. A detailed demographic and clinical data of all the patients was collected on a proforma. Written informed consent of all the patients was taken after describing the research. Permission was taken from the ethical review committee of the institute. A blood sample of all the patients was collected for the assessment of blood sugar levels, renal function tests, and troponin levels. The patients were categorized as diabetic and non-diabetic based on findings of blood sugar levels. The symptoms of all the patients were monitored along with blood pressure monitoring. All the patients were given treatment according to their clinical condition of the patients. The data was collected and analyzed by Stata version 15.1.

Results

A total of 55 patients were admitted to ICU for the treatment of COVID-19. The mean age of the patients was 62.53 years. A total of 36 (65.45%) were male and 19 (34.55%) were female patients. The mean BMI of all the patients was 33.63. The mean duration of symptoms before hospitalization was 5.9 days. Table 1 depicts the baseline characteristics. Comorbidities were seen commonly with a Charlson comorbidities index of 3 or more than that in 43 (78.18%) of the patients. Common comorbidities have been given in table 2. The most common comorbidities seen in the admitted patients were hyperlipidemia, diabetes, and hypertension. A total of 36 (65.45%) patients had hypertension. 33 (60%) patients had diabetes and 19 (34.55%) patients were seen with hyperlipidemia. The occurrence of severe symptoms in the admitted patients has been given in table 3. A total of 21 (63.64%) of the diabetic patients needed invasive ventilation and 9 (27.27%) needed non-invasive ventilation. On the other hand, 6 (27.27%) non-diabetic patients needed invasive ventilation, whereas, 4 (18.18%) non-diabetic patients needed non-invasive ventilation. The clinical management of all the patients did not have any significant difference. Table 4 shows a summary of clinical outcomes in diabetic and non-diabetic patients.

The rate of shock was similar in both groups of patients. A total of 58% of the diabetic patients required vasopressors for shock and 48% of the non-diabetic patients required vasopressors. Similarly, renal replacement therapy was needed in 26% of diabetic patients and 24% of nondiabetic patients. The rate of acute kidney injury in diabetic patients was 60% and 40% in non-diabetic patients. Acute hepatic injury was seen in 28% of the diabetic patients and 21% of the non-diabetic patients. A higher rate of elevation of troponin level was seen in 90% of the diabetic patients compared to 70% of the non-diabetic patients.

Table 1. The baseline characteristics		
Characteristics	Frequency	Percentage
Age (years) 55-50 51-55 56-60 61-65 >66	5 7 4 27 2	9.1 12.72 7.27 49.1 3.63
Gender Female Male	19 36	34.55 65.45

Table. 2. Common Comorbidities in all the patients		
Comorbidity	Frequency	Percentage
Hypertension	36	65.45
Diabetes	33	60
Hyperlipidemia	19	34.55

Table 3. Occurrence of severe symptoms in patients admitted for COVID-19		
Symptoms	Number of patients suffering from the symptom	Percentage
Dyspnea	44	80
Cough	41	74.55
Fever	37	67.27

Table 4. Clinical outcomes in diabetic and non-diabetic patients		
Clinical outcomes	Diabetic	Non-diabetic
Rate of shock requiring vasopressors	58%	48%
Requirement of renal replacement therapy	26%	24%
Acute kidney injury	60%	40%
An elevated level of troponin	28%	21%

Discussion

Diabetes is a common disease that is a root cause of multiple complications. The prevalence of diabetes in patients with COVID-19 was 14.5% [11]. The common symptoms of patients with COVID-19 are fever, sore throat, fatigue, diarrhea, and dry cough [12]. Similarly, the symptoms are typically not different in diabetic patients with COVID-19 infection [10]. The same has been reported by the international diabetes federation (IDF) [13]. However, the study of Wang et al suggests that the symptoms are more severe in diabetic individuals [14].

The study of Zhou et al suggests that diabetic individuals are more prone to develop disease followed by an infection caused by COVID-19. They also concluded that diabetes is also a risk factor for potentially poor outcomes [15]. A similar study was conducted by Yeung et al which included 8422 patients having SARS infection. They concluded that diabetes is a risk factor for higher mortality

followed by SARS infection [16]. Another such study conducted by Peric et al describes that diabetic individuals usually have other comorbidities as well. Those comorbidities are also responsible for poor outcomes of COVID-19 in diabetic patients. The glycemic control gets suboptimal in infectious diseases, therefore, insulin therapy is recommended [17].

According to the study by Rubino et al, there is a bidirectional association between diabetes and COVID-19. In patients with diabetes, when infected with COVID-19, new metabolic complications are seen including hyperosmolarity and diabetic ketoacidosis. Insulin therapy is warranted in such complicated conditions. These conditions result in complex pathophysiology related to COVID-19 infection [18]. Abdi et al conducted a literature review of various types of research and case studies. They concluded that diabetes is a potential risk factor for higher mortality and complications as a result of COVID-19 infection. Their research also presented preventive and therapeutic guidelines for diabetic patients [19].

Conclusion

Diabetic patients have to face a higher mortality rate compared to non-diabetic patients, once hospitalized. Diabetes must be taken into account as a potential risk factor for the gravity of infection caused by COVID-19. An appropriate solution is a prevention and reduced exposure to the virus in diabetic patients.

Funding source

The source of funding was not specific for the present study

Conflict in the interests

Not any kind of conflict was seen in the interests in the present study

Permission

A due permission was acquired from the ethical committee before the conduction of the research.

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