

Diabetes and the Covid-19 Pandemic in Iraq

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ABSTRACT

The majority of diabetic patients have an enhanced the risk of developing complications and increased the possibility of admission to the (ICU) after infection with COVID-19 due to uncontrolled glycaemia. We aim to find out the relationship between diabetes mellitus and the severity of COVID-19. We compared HbA_{1c} in infected diabetic patients (IDP) who had been admitted to the ICU with IDP who did not require ICU admission. From the admitted demographic, laboratory and clinical data from August 2020 to October 2020 was collected, and the correlation between glycemic control and the severity of COVID-19 was assessed using the phi coefficient. 35 (68.6%) of diabetic patients required ICU treatment, while 16 (31.4%) did not. IDP who needed ICU care had poor glycemic control compared to IDP who did not require ICU care (HbA_{1c} 8.4% vs. 6.4%, respectively, $P < 0.001$), and the average blood glucose levels in diabetic patients that required ICU admission were significantly higher than those of IDP that did not require ICU admission [189.9 ± 40.12 (mg/dl) vs. 121.31 ± 18 , respectively, $P < 0.01$]. Uncontrolled glycemia in IDP predisposes them to COVID-19 infection, and the degree of hyperglycemia in IDP is associated with the severity of the disease.

Keywords: Glycemic control, Infected diabetic patients, Intensive care unit admission

Introduction

As of October 21, 2020, 438,265 cases of COVID-19 have been confirmed in Iraq, with 10,418 deaths and recovered 369,010 patients. The number of patients admitted to the ICU for COVID-19 exceeded 491 around the time the pandemic is thought to have begun, based on Iraq's first positive test result in Al-Najaf city on February 24, 2020, for a student traveling from Iran [1]. Although the Iraqi government imposed full curfew, closed airports and a state of health emergency was declared [2].

Diabetes mellitus increases the likelihood of developing a number of infections, particularly respiratory ones, with enhanced risk of hospitalization due to the decreased capability of antibodies to defend against protein antigens [3]. The rate of infection rises steadily as HbA_{1c} rises and is statistically attributed to inadequate glycemic control, which leads to higher hospitalization rates as a result of infections [4]. It is expected that diabetes mellitus will likewise be significantly associated with COVID-19 progression [5]. Notably, the major pathway by which the SARS-CoV-2 virus enters into host cells is via Angiotensin Converting Enzyme 2 (ACE2). This enzyme is highly expressed and widely distributed in pancreatic cells and plays a critical role in impairing the secretion of insulin and increasing insulin resistance, suggesting that the virus causes inflammatory mediated islets damage [6][7][8]. However, due to the decrease in cytosolic pH in the presence of DM, as well as other comorbidities, SARS-CoV-2 enters host cells more easily via ACE2 because the viral load is high; the resulting COVID-19 infection is thus more likely to be severe in diabetic patients [9].

Methods

Study setting

This study was conducted at Al Amal specialist Hospital in Alnajaf Al-Ashraf city, Iraq. Using laboratory and clinical data from August 2020 to October 2020, we evaluated the severity of COVID-19 among persons with diabetes. A total of 51 Iraqi type 2 diabetic patients with COVID-19 infection were referred to the hospital from August 2020 to October 2020 and were confirmed to be infected. We compared HbA_{1c} in IDP who were admitted to the ICU with that of IDP who did not require ICU admission.

Statistical Analysis

Categorical variables are expressed in numerical values and percentages, and the results are analyzed with chi-squared test to compare ICU and non-ICU diabetic patients. The correlation between laboratory findings and severity of infection was measured using the phi coefficient. $P < 0.05$ were considered to be significant. Data computing was accomplished using SPSS software version 25.

Results

A total of 51 Iraqi diabetic patients with COVID-19 infection were referred to the hospital and confirmed to be infected with the virus. All patients had type 2 diabetes. Most of the infected diabetic patients were women (33 [64.7%] of 51); median age was 51 years. At onset of infection, the most common symptoms were fever (42 [82.4 %] of 51 patients), cough (34 [66.7%]), and dyspnea (30 [58.8%]); less common symptoms were sputum production (20 [39.2 %]) and headache (19 [37.3%]). 35 (68.6 %) patients required ICU care, while 16 (31.4%) did not. There were no deaths. Of the IDP who were admitted to the ICU, 33 (64.7 %) had severe illness. The most frequent comorbidities were cardiovascular disease (15 [29.4%]), hypertension (10 [19.6%]), chronic obstructive pulmonary disease (4 [7.8 %]) and malignancy (4 [7.8 %]) (see Table 1).

Table 1: Infected Diabetic Patients Characteristics

	Patients (n = 51)	ICU care (n=35)	No ICU care (n=16)	p value
Patient demographics				
Median age (years)	51(range 44–68)	56(range44-67)	50.5(range45-64)	0.56
Sex				0.05
Male	18(35.3%)	9(17.6%)	9(17.6%)	--
Female	33(64.7%)	26(51%)	7(13.7%)	--
Signs and symptoms				
Fever	42(82.4%)	35(68.6%)	7(13.7%)	0.001
Headache	19(37.3%)	13(25.5%)	6(11.8%)	0.98
Cough	34(66.7%)	26(51%)	8(15.7%)	0.11
Sputum production	20(39.2%)	17(33.3%)	3(5.9%)	0.06
Dyspnea	30(58.8%)	25(49%)	5(9.8%)	0.01
Comorbid conditions				
Hypertension	14(27.5%)	10(19.6%)	4(7.8%)	0.79
Cardiovascular disease	17(33.3%)	15(29.4%)	2(3.9%)	0.03
Chronic obstructive pulmonary disease	4(7.8%)	4(7.8%)	0	0.54

Malignancy	4(7.8%)	4(7.8%)	0	0.54
Others	12(23.5%)	2(3.9%)	10(19.6%)	0.29

n = total number of IDP, p values comparing ICU care and no ICU care are from the chi squared test, ICU=intensive care unit.

IDP in need of ICU care had poor glycemic control as compared with IDP who did not need ICU care (HbA_{1c} 8.4 % vs. 6.4 %, respectively, *P* < 0.001) (Figure1).

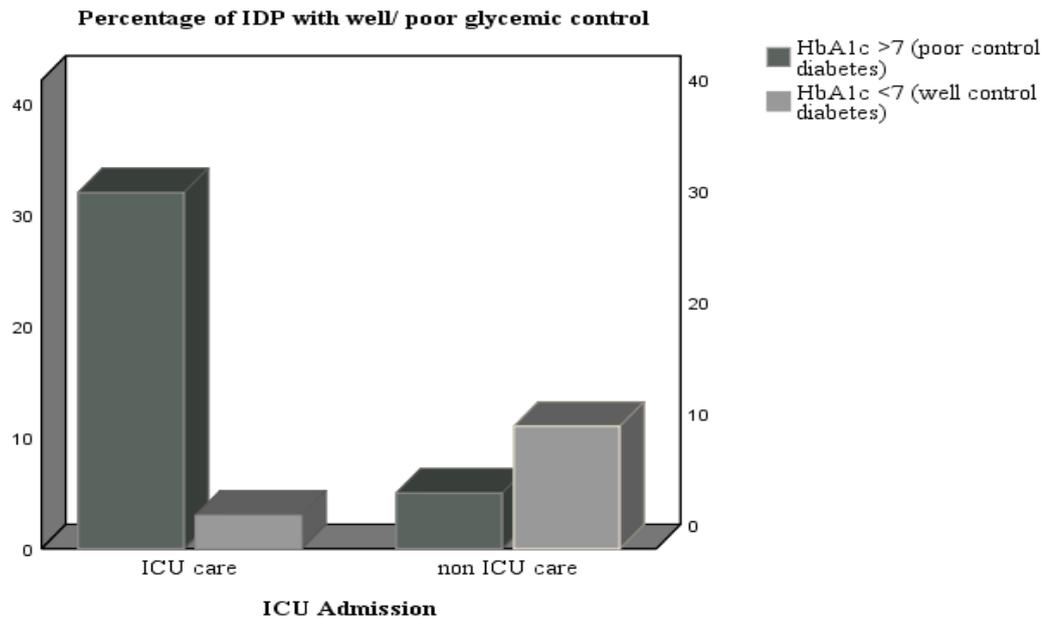


Figure 1:The percentage of IDP with glycemia according to ICU admission

Notably, the phi coefficient showed that the correlation between glycemic control and ICU admission was 0.62 (*p* < 0.001). The increase in HbA_{1c} values is related to a higher risk of ICU admission and contributes to increasing the severity of COVID-19.

Furthermore, in diabetic patients with COVID-19 that required ICU admission, average blood glucose levels [189.9 ± 40.12(mg/dl)] were significantly higher than blood glucose levels [121.31 ± 18] in IDP that did not require ICU admission. (see Table 2).

Variable	ICU care	No ICU care	p value	φ
Glycemic control (%)				
HbA _{1c} >7 (poorly controlled diabetes) n(%)	32(62.7)	5(9.8)	<0.001	0.62

HbA1c <7 (well-controlled diabetes) n(%)	3(5.9)	11(21.6)	
HbA1c value (%) Mean ± SD	8.4 ±1.09	6.4±0.45	0.005
Blood glucose levels (mg/dl) Mean ± SD	189.9±40.12	121.31±18	<0.01

Table 2: Laboratory findings of infected diabetic patients

* ϕ Phi ;HbA1c: glycated Hemoglobin; SD standard deviation.

Discussion

Iraqi cities have been hard-hit by the COVID-19 pandemic, and the rapid spread of this serious virus was due to a failure to enforce public health rules, which increased the risk of contamination [2]. **Figure 2** shows the number of confirmed and recovered cases of COVID-19 infection and the number of deaths in Iraq (since February 24, 2020).

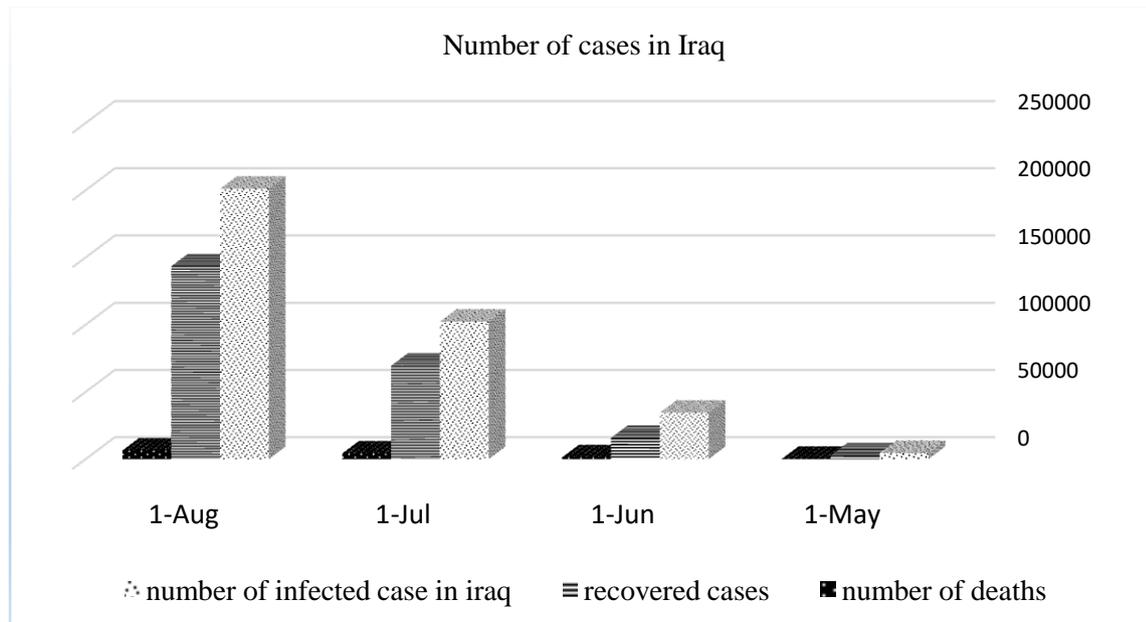


Figure 2: Showing the number of confirmed cases, deaths and recoveries from COVID-19 in Iraq.

Susceptibility to COVID-19 infection is related to individual risk factors such as age, cardiovascular disease, hypertension and DM [10]. DM is a major clinical risk factor in COVID-19 severity due to increased ACE2 expression [11]. In older diabetic patients, and in patients with underlying conditions (particularly cardiovascular ones), potential mechanisms of increased COVID-19 severity include a higher ACE2 expression and more efficient viral entry, a greater viral load and lower clearance of the virus, and a reduction in T-cell function leading to the cytokine storm [12].

Hyperglycemia, meanwhile, stimulates changes in coagulation, overproduction of inflammatory cytokines (tumor necrosis factor- α , interleukin (IL) 6, D-dimer), and a

deterioration of endothelial function leading to the intravascular dissemination of clotting and septic shock. Thus, uncontrolled glycaemia may exacerbate the risk and complications of COVID-19 in diabetic patients, necessitating ICU care[13].

In addition, inadequate glycemic management for diabetic patients with COVID-19 may be caused by unavailability of the special diabetic diet, inability to exercise because of low pulmonary function and limited indoor space in medical centers, and stimulation of hyperglycemia due to anxiety [14].

Although the pathophysiological mechanisms of the correlation between DM and COVID-19 are not fully clear, some studies from Italy and China have shown that older diabetic patients were at a greater risk for severe cases of COVID-19 [15].

A number of recent studies have found that IDP with COVID-19 and uncontrolled glycemia were more likely to become critically ill as compared with controls and had a 2- to 5-fold higher risk of composite outcomes necessitating ICU admission [16][17]. Finally, we suggest that IDP with COVID-19 and inadequate glycemic control should have their blood glucose levels carefully managed to decrease the risk of complications or death [18].

Limitations of the study

The limitations of our study include: 1) a lack of detailed evaluation of factors that may affect blood glucose levels, such as dietary compliance, stress factors, lifestyle, and medications; 2) the low sample size of diabetic patients and the relatively short period of the study; 3) since this study was conducted in a single isolation hospital with a homogeneous population, the overall findings may not be representative.

Conclusion

Uncontrolled glycemia in diabetes predisposes patients to COVID-19 infection, and the degree of hyperglycemia in IDP is associated with an increase in the severity of infection, with the incidence of many complications leading to ICU admission. Healthcare providers should devote special attention to diabetic patients by carefully managing blood glucose levels to decrease the risk of complications.

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