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Comparative analysis of CURB 65 score between diabetic & non – diabetic in hospitalized COVID patients

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***Abstract*---**Introduction: Diabetes Mellitus is a chief reason for morbidity and mortality globally. It is also a major comorbidity contributory factor in COVID-19. Patients with diabetes have an increased susceptibility to viral and bacterial infections, including those affecting the respiratory tract. Numerous scoring systems have been developed to evaluate and stratify the risk of Community-acquired Pneumonia (CAP). CURB 65 scorings are one of the time tested and relatively easy methods. However, comparative CURB 65 SCORE data analysing its correlation between diabetes mellitus (DM) & non – diabetic mellitus (NDM) in hospitalized covid 19 patients is lacking. Therefore, this study aimed to evaluate and perform a comparative analysis of CURB 65 scores between diabetic & non–diabetic hospitalized COVID 19 confirmed patients. Methods: This cross-sectional single-centre research evaluated hundred and forty COVID 19 positive patients with and without diabetes from April to June 2021. Following the evaluation of the glycemic status of the patient, CURB 65 scores were calculated. Cohorts were grouped as mild, moderate and severe illnesses, based on the CURB 65 score. Duration of hospitalisation, the requirement of the ventilator, ICU admission and mortality were recorded. Patients were monitored until they were discharged or deceasement. Results: Of the sixty-nine patients who were diabetic, 65.2 % had a mild illness, 30.4% had

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moderate and 4.3 % had severe illness. Of the rest 71 patients who were non-diabetic 97.2 % had mild, 2.8% had moderate and none had severe illness. There is a significant association between patients with and without diabetes when compared with their CURB 65 score with a p-value <0.0001 and a chi-square value of 24. Seventeen DM patients were hospitalised in ICU and 13 required ventilation, whilst only 4 NDM patients were in ICU and 3 required ventilator support. The mean value of the duration of hospital stay for the DM group was 9.25 days with an SD of ± 5.0. In comparison mean value for NDM cohorts was 7.01 days with an SD of ± 4.30. The difference was statistically significant with a p-value of 0.005. No mortality was noted in NDM patients. In contrast, 17 DM patients succumbed. The difference in mortality was statistically significant with a p-value of <0.0001. Conclusion: CURB 65 was found to be of increased value for diabetic patients. The severity of illness is more in the diabetes population than in the non–diabetic population.

***Keywords*---**CURB 65, COVID-19, diabetes mellitus, non-diabetic.

Introduction

COVID-19 is a novel viral, acute immunogenic, thrombogenic, inflammatory, and highly contagious pandemic disease, which is treatable. In COVID-19, several risk variables such as advanced age, diabetes mellitus (DM), obesity, metabolic syndrome, and obstructive sleep apnea were linked to poor outcomes.[1] Diabetes mellitus, after hypertension, is the most common concomitant disease among COVID-19 patients. Diabetes Mellitus is associated with higher severity of illness in COVID 19 pneumonia patients, as well as a higher mortality rate. Immune dysfunction, low-grade chronic systemic inflammation, and decreased lung function are common in diabetic individuals.[2] When a patient with COVID-19 is hospitalised, predicting the risk of developing a severe or critical illness is crucial. Timely detection of serious cases can result in more aggressive treatment and a lower fatality rate.

The pandemic of COVID-19 is accompanied by a high rate of community-acquired pneumonia (CAP). Several prognostic ratings have been established to identify patients who are at high risk of mortality. The most widely used and recommended clinical scoring systems for predicting mortality from CAP, are the pneumonia severity index (PSI) and CURB65 score. Due to its complexity of use and the need to calculate the score based on 20 variables, PSI may not be practical for routine use in an already overwhelmed hospital, emergency division or primary care environment. The CURB-65 criteria include five variables: confusion (C); urea >7 mmol/L (U); respiratory rate ≥30/min (R); blood pressure, systolic ≤90 mmHg or diastolic ≤60 mmHg (B); and age ≥65 years. Each component has scores ranging from 0 to 1, with a total score of 5. It has been shown to provide a wider range of sensitivities for specificity, and comprehensively and accurately predict 30-day death in CAP patients. Further, it allows patients to be stratified into three different treatment options based on scoring. It distributes patients into 3 groups: score 0–1: low risk of 30–day

mortality (0.7–3.2%) and to be managed as outpatients, score 2: intermediate risk (13%), to be hospitalized and score 3–5: high risk of 30–day mortality (17–57%) to be considered for ICU admission. [2,3,4,5,6]

Past research has suggested that CURB 65's relevance in guiding inpatient or outpatient care decisions or intensive care is limited.[7,8] In addition, it is still unclear about the applicability of CURB - 65 scores in COVID - 19 positive diabetic patients. Further, recent literature suggests that the COVID-19 patients >65 years with comorbidities had an elevated. [5] Hence, this study intended to compare and analyse CURB - 65 scores in both diabetic and non-diabetic hospitalized COVID – 19 positive patients. It aimed to evaluate the severity of illness in both groups, which could serve as a mortality predictor. This research is also based on the understanding that early evaluation of the disease severity aids in the early commencement of effective treatment, which ultimately helps in reducing morbidity & mortality.

Material and Methods

A total of 140 patients with COVID 19 hospitalised from April 2021 to June 2021 were the cohorts in this cross-sectional single centre study. The study was approved by the local institutional review board. Informed consent was also obtained from all the participants or the next of their kin. The patients were grouped into those with diabetes mellitus (n=69) and those without diabetes mellitus (n=71). Both diabetic type1 and type 2 were included in the study. DM status was based on the current or previous biochemical diagnosis of DM according to WHO definition either on or without treatment. Those patients in whom COVID-19 was established by a positive reverse transcription-polymerase chain reaction of throat and nose swab specimens from the upper respiratory tract or those with the positive radiological finding of CORADS 4/5 presenting to the hospital with mild symptoms were included in the study. Those patients who refused consent for scoring evaluative process, pre-diabetics, and gestational diabetics were excluded from the study. Demographic data of age and gender were obtained. Each patient's glycemic status (RBS) along with other triage vitals (including fever, blood pressure, respiratory rate, oxygen saturation at rest, heart rate), state of consciousness, essential blood biochemistry, and time to death were recorded. CURB 65 scores were calculated for both groups. A comparative analysis of the data was then performed between the groups. Patients were monitored until they were discharged. IBM SPSS version 21 (IBM Corp., Armonk, NY, USA) was used for statistical analysis of the data. P-value ≤ 0.05 was statistically significant. The chi-square test was used to compare qualitative data between groups.

Results

The primary endpoint of this study was analyzing the association between CURB 65 scores between diabetic (DM) & non–Diabetic (NDM) in COVID-19 positive hospitalized patients. 140 COVID-19 positive hospitalised patients were assayed as a part of this study. There were no significant differences between diabetic and non-diabetic patients' demographic parameters.

Table 1
Distribution of demographic parameters between groups

Parameters		Diabetics	
		No	Yes
Age group	<30	11	0
	31-40	10	2
	41-50	17	6
	51-60	12	26
	61-70	18	26
	>71	3	9
Gender	Male	45	41
	Female	26	28

Amongst the diabetics 16 had the respiratory disease, 12 had cardiac problems, 24 were hypertensive and 7 had other co-morbidities. In comparison only 7 had the respiratory disease, 11 had cardiac problems, 29 were hypertensive and 9 had other co-morbidities in non-diabetics. Ten among diabetics and 15 among non-diabetics had no co-morbidities. Patients were grouped as mild, moderate and severe illnesses, based on the CURB 65 score. Off the sixty-nine patients who were diabetic, 65.2 % had a mild illness, 30.4% had moderate and 4.3 % had severe illness. Of the rest 71 patients who were non-diabetic 97.2 % had mild, 2.8% had moderate and none had severe illness. There is a significant association between patients with and without diabetes when compared with their CURB 65 score with a p-value <0.0001 and a chi-square value of 24.

Table 2
Crosstabulation of CURB 65 score between groups

			DIABETIC		Total	P-value
			NO	YES		
CURB 65	MILD	Count	69	45	114	<0.0001
		% within DIABETIC	97.2%	65.2%	81.4%	
	MODERATE	Count	2	21	23	
		% within DIABETIC	2.8%	30.4%	16.4%	
	SEVERE	Count	0	3	3	
		% within DIABETIC	0.0%	4.3%	2.1%	
Total		Count	71	69	140	
		% within DIABETIC	100.0%	100.0%	100.0%	

Seventeen DM patients were hospitalised in ICU and 13 required ventilation, whilst only 4 NDM patients were in ICU and 3 required ventilator support. There was a significant difference between DM and NDM requiring ventilation (p-value 0.007) and those requiring monitoring in ICU (p-value = 0.002).

Table 3
Crosstabulation of ICU stay between groups

		ICU		Total	P-value
		NO	Yes		
DM	No	67	4	71	0.002
	Yes	52	17	69	
Total		119	21	140	

Table 4
Crosstabulation of ventilation between groups

		Ventilation		Total	P-value
		NO	YES		
DM	No	68	3	71	0.007
	Yes	56	13	69	
Total		124	16	140	

Table 5
Crosstabulation of mortality between groups

		Mortality		Total	P-value
		No	Yes		
DM	No	71	0	71	<0.0001
	Yes	52	17	69	
Total		123	17	140	

The mean value of the duration of hospital stay for the DM group was 9.25 days with an SD of ± 5.0. In comparison mean value for NDM cohorts was 7.01 days with an SD of ± 4.30. The difference was statistically significant with a p-value of 0.005. No mortality was noted in NDM patients. The difference in mortality was statistically significant with a p-value of <0.0001.

Table 6

		Mortality		Total	P-value
		No	Yes		
CURB 65	Mild	114	0	114	<0.0001
	Moderate	18	5	23	
	Severe	1	2	3	
Total		133	7	140	

In the DM group with 7 cases of mortality, 5 cases had moderate and 2 cases had severe CURB 65 score

Discussion

In this single-centre comparative cohort study, we assessed the difference in CURB 65 scores in COVID – 19 positive diabetics and non-diabetics. The study documented an increased CURB 65 values in the diabetic population, with severe illness category more in diabetic than NDM population. COVID-19 positive diabetics also required a longer duration of hospitalisation and ICU admission, with a significant number requiring ventilator support. The rate of mortality was also high in COVID -19 positive diabetics cohorts. A retrospective, unicenter cohort study examined 74 severe and critically ill adult SARS-CoV-2 positive patients in China between January - February 2020, with the primary aim of analysing the prognostic value of CURB-65. Of the 13 diabetic patients in their study, nine survived, while 4 succumbed. Sixty-one percent of patients had a CURB-65 score of 0 or 1, while 28% had a score of 2 and 11% had a score of 3 or above. A higher CURB-65 score on admission and older age were associated with a higher risk of in-hospital death. In our study 81.4% had mild, 16.4% moderate and 2.1% severe CURB 65 scores. [5]

A prospective observational study in Bangladesh assessed 47 diabetic and 43 non-diabetic adult hospitalized patients with CAP. CURB-65 score was calculated. CURB 65 scores of 0-1 were noted in 11 DM compared to 27 NDM, while score 2 was documented in 9 DM and 7 NDM and score ≥3 in 27 DM and 9 NDM patients. In line with the findings of the current study, diabetic patients in this study had significantly higher CURB-65 scores compared to non-diabetic patients. Also noted was a longer mean duration of hospital stay 13.5 days (±2.6), more (27.6 %) number of ICU admissions, and more mortality (10.6%) with diabetics as compared to non-diabetic CAP patients.[9] The similarity in results is noted with another retrospective study in China that compared the strength of CURB-65 and pneumonia severity index for predicting in-hospital mortality of 2365 CAP in patients with and without type 2 diabetes (n=531 patients). All the evaluated scores were significantly higher in T2DM patients than in non-diabetes patients. [10]

A prospective study in Iran evaluated 317 diabetic COVID-19 patients, with the primary aim of assessing the association of obesity-related mortality in COVID -19 patients. The mean age of cohorts was 65.09±13.29 years and 51.4% were male. After adjustment of the confounding factors (age, sex, smoking, and comorbidities), obese diabetic COVID-19 patients demonstrated a 2.72 times higher death rate than the non-obese. Also, mortality, admission to ICU, and ventilator odds for hospitalized diabetic COVID-19 patients are statistically higher for the obese. CURB-65 score between the groups did not show any statistically significant values.[2] Our results are in tandem with another single centre, retrospective, observational Chinese study conducted in 2020. Researchers analysed the clinical as well as immunological features of 129 diabetics and 177 non-diabetic hospitalized COVID-19 positive patients. sepsis-related organ failure assessment SOFA and CURB-65 scores were determined. The percentage of critical illness patients was higher in the diabetic group than in the non-diabetic group (10.9% vs. 4.5%, $p<0.0001$). When combined with the SOFA and CURB-65 scores, the results showed a strong correlation with diabetic patients having a higher disease severity than NDM patients. [11]

Our results are in line with prior prognostic research, which found that if a patient was hyperglycemic during admission it was related to increased mortality. [13,14] A meta-analysis by Bianca de Almeida-Pititto et al examined 40 articles and evaluated the data of 18,012 COVID-19 patients and co-related it with various parameters including diabetes. They opined that diabetes is an important risk factor for COVID – 19 patients.[15] Similar findings were echoed by Zhu et al who noted that diabetics required additional medical interventions and also had significantly higher mortality the non-diabetics. [16] A retrospective single-centre study in Turkey evaluated the applicability of CURB-65 and the pneumonia severity index (PSI) scoring systems in predicting 30-day mortality in COVID-19 confirmed cases. 681 patients of which 49% were female and with a mean age of 56.9 ± 15.7 years, were assessed. Diabetes mellitus was the second most common comorbidity. Of the 191 COVID 19 positive diabetic patients 23 were lost to the disease. CURB 65 gave a sensitivity of 73 % and specificity of 85 %. In comparison PSI showed 80 % sensitivity and 89 %, thus demonstrating better efficacy. [12]

Discordant results were obtained by Nguyen et al, who verified the efficacy of CURB-65 in deciding the need for hospitalisation in COVID-19 patients. They opined that the CURB-65 score is not strong enough to guide in deciding the need for inpatient or outpatient care for COVID-19.[4] Both diabetes mellitus and COVID19 are linked to acute and chronic inflammation, Both medical conditions can influence each other in terms of clinical course and health outcome. Therefore, it is essential to review studies on the effects of these diseases on each other. This study revealed a higher CURB 65 score, increased mortality and ICU admission in diabetics as compared to non-diabetics. Notwithstanding the significant findings of the study, additional parameters like HbA1C level, the influence of other co-morbidities and a larger sample size with long term evaluation would have added more substance to the analysis.

Conclusion

Diabetes is linked to more clinical complications and raises the probability of ICU admission in individuals. Furthermore, in COVID-19 patients, diabetes is connected to a higher mortality risk. Considering the highly mutant characteristic of the COVID- 19 virus, the data about the interaction between diabetes and COVID19 continues to grow. Therefore, it is critical to comprehend the relationship between the viral pandemic and the worldwide diabetes crisis and accumulate Robust evidence to be able to provide evidence-based practise to better health outcomes.

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