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PROGRESSION & PROGNOSIS OF COVID-19 PATIENTS HAVING DIABETES MELLITUS

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Background: Diabetes patients experience a variety of internal health issues, including immune deficiencies, inflammatory storms, hyperglycemia, coagulation risks, and elevated levels of ACE2 receptors. They also suffer from various illnesses like high blood pressure, cardiovascular disease, kidney problems, visual issues, and a host of others. None of these factors raise the chance of contracting SARS-CoV-2. However, once they are infected, the condition worsens to the point that the death rate is high. **Objective:** This study aimed to examine the severity of symptoms between COVID-19 participants with and without diabetes. **Methods:** A total of 347 patients with confirmed SARS CoV-2 were selected by a purposive sampling method for this retrospective, single-center study that took place from June 1, 2020, to August 31, 2020, at the Department of Medicine, TMSS Medical College, and Rafatullah Community Hospital, Bogura, Bangladesh. We investigated and compared their sociodemographic information, clinical traits, morbidities, lab results, and CT scan results. The study was approved by the ethical committee of the mentioned hospital. All of the

patients tested positive for COVID 19. Patients with a COVID 19 negative result and those younger than 18 years old were, however, eliminated based on the study's exclusion criteria. **Results:** Diabetes patients experienced worse hospital outcomes, including a death rate of 19.4% (p=0.002163), and longer hospital stays (p = 0.0001) compared to non-diabetic patients. Additionally, diabetic patients got more oxygen therapy (32 hours, p 0.05), injectable antiviral drugs (161, p 0.05), and low molecular weight heparin (105, p 0.05) than non-diabetics. These findings suggest that diabetes affects the prognosis of COVID 19. **Conclusion:** Diabetes worsens the prognosis and is a risk factor for the Covid-19 symptoms' quick progression. Therefore, individuals with Covid-19 infection and diabetes should receive additional attention because they could deteriorate at any time.

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1. INTRODUCTION

The first patients with novel RNA beta coronavirus infections were found in Wuhan, China, at the end of 2019. It quickly began to spread at a worrying rate, and because of its potential to cause serious illness and even death, it has now turned into a public health emergency [1]. Around two million confirmed cases in 215 nations had been reported as of July 29, 2020. Around 3000 deaths have been attributed to this rapidly developing and changing scenario in our nation [2], and the number is continuously rising daily. This disease's mechanism is still not completely understood. However, there are many theories. The spike glycoprotein (Protein S) used by SARS-CoV2 to attach to the receptor has an affinity for ACE2 surface receptors [3]. Many organ systems, particularly the heart, kidney, pancreatic islets cells, lungs, and brain, contain ACE 2. Therefore, the SARS-CoV2 virus receptor binding domain contact with the ACE receptor results in the virus spreading quickly and affecting various organs [4,5]. Though the majority of COVID-19 infections result in mild acute respiratory infections with little or no symptoms, some patients can potentially get unusual & severe pneumonia, acute respiratory distress syndrome, septic shock, multiple organ failure, and death [6]. Acute Respiratory Distress Syndrome (ARDS), which rapidly deteriorates into septic shock and creates a cytokine storm of IL-6, IL-10, and TNF at & a hypercoagulable condition that results in Multiple Organ Failure Mortality [7], is the cause of death in individuals infected with COVID 19. One of the most prevalent non-communicable diseases is diabetes mellitus. Adult diabetes prevalence was 6.4% globally in 2010 and is predicted to reach 7.7% by 2030[8]. Numerous organ problems and immunological dysregulation that increases susceptibility to infection are known to be linked to diabetes [8,9,10]. Diabetes can affect the mortality and morbidity of several infections, including bacteremia and pneumococcal pneumonia, as well as our susceptibility to both common and rare infections like staphylococcal skin infection, tuberculosis, emphysematous infection of the kidney, gallbladder, and urinary bladder. Additionally, having diabetes makes you more vulnerable to viral infections. Diabetic individuals in 2003 also had a bad prognosis for SARS-CoV infection [11]. Diabetic patients' hospitalization and ICU admission increased by 2-4 times in 2009 during the Influenza A H1N1 infection [11,12]. Although no study has demonstrated that diabetes increases the risk of exposure to COVID 19[14], investigations have revealed that it is a risk factor for increasing the

severity and mortality of COVID-19 [13]. Other studies have demonstrated that elevated mortality & morbidity in COVID-19 patients is caused by poor glycemic management in diabetes mellitus [15,16]. Additionally, it has been noted that diabetes and plasma glucose levels are separate predictors of death and morbidity in SARS patients [17]. To determine the prevalence of diabetes in verified COVID-19 cases as well as their development and prognosis, TMSS Medical College and Rafatullah Community Hospital undertook a retrospective study.

2. METHODOLOGY

347 patients were chosen by purposive sampling from a total of 654 COVID-19-positive patients who were admitted to this hospital during the study's retrospective, single-center period of 1 June 2020 to 31 August 2020 at the Department of Medicine, TMSS Medical College, and Rafatullah Community Hospital, Bogura, Bangladesh. The evaluation of patients was based on their medical history, physical examination, investigations, including HRCT and any inpatient department treatments they received. The collected data was organized and checked for inconsistencies. Statistical Package for the Social Sciences (SPSS®) for Windows, version 25, was used to enter the revised data onto its template. For categorical variables, descriptive statistics included frequency analysis (percentages), and for continuous variables, mean standard deviation, or median and interquartile range. When comparing continuous variables, the one-sample t-test or Mann-Whitney U-test was used, and when comparing categorical variables, the Chi-squared test or Fisher exact test was used. SPSS Windows version 25 was used to process, manipulate, and analyze the variables of interest. A p value of 0.05 with a 95% confidence interval was regarded as statistically significant. Tables and charts will be used to display the results. There was no informed consent obtained because this was a retrospective study. There were no additional investigative procedures, major risks, or financial costs to the patient in this investigation. Additionally, the study was carried out with the proper ethical approval of the hospital authorities.

3. RESULT

This study had 347 patients in total. There were 103 female patients and 244 male patients. The patients' ages ranged from 18 to 105 years old, with a mean age of 52.14 (± 14.83). Demographic information for the patients who were chosen is shown in Table I here. Of the patients who were admitted, 70.9% lived in cities, 28.5% had just an elementary education, and 28.5% were employed, people. Fever (91.6%), cough (86.2%), and shortness of breath (55.7%) were the most prevalent symptoms. Patients with diabetes also have higher rates of weariness (34.4%) and sore throat (37.8%) (Table II). In comparison to non-diabetic patients, 65.1% of patients have hypertension, 14.5% have cardiovascular disease, and 15.6% have CKD in addition to diabetes (Table III). Table IV & Fig 1 shows the treatments that were given & the clinical outcomes. Out of 347 patients with covid-19, 337 (97.1%) received injections of corticosteroids, 270 (77.8%) received injectable antiviral medication, 76 (21.9%) received oral antiviral medication, and 159 (45.7%) received low molecular weight heparin. Diabetes patients got significantly more oxygen therapy (32 hours, p 0.05), injectable antiviral medication (161, p 0.05), and low molecular weight heparin (105, p 0.05) than non-diabetic patients, indicating that diabetic patients experienced a higher rate of problems.

Table 1: Socio-Demographic Data of the Study Population (N= 347)

Variables		Non diabetic (n_1=161)	Diabetic (n_2=186)	Total (n=347)	*P* Value
Age group	<60	126 (54.3%)	106	232	0.000
	≥60	35 (30.4%)	80	115	
Sex of the patient	Male	105 (43%)	139	244	0.053049
	Female	56 (54.4%)	47	103	
Residency	Urban	62 (61.4%)	39	101	0.128039
	Rural	99 (40.2%)	147	246	
Education	Illiterate	17 (54.8%)	14	31	0.009734
	Primary	26 (26.3%)	73	99	
	SSC	23 (56.1%)	18	41	
	HSC	53 (54.5%)	48	101	
	Graduate and above	42 (56%)	33	75	
Occupation	Unemployed /Retired	19 (31.7%)	41	60	0.001594
	Service	44 (58.7%)	31	75	
	Business	39 (39.4%)	60	99	
	Farmer	09 (37.5%)	15	24	
	Housewife	50 (56.2%)	39	89	

Table 2: Clinical Characteristics of COVID-19 patients (N= 347)

Variables	Non diabetic	Diabetic	Total	*P* Value
Fever	139 (86.3%)	179 (96.2%)	318 (91.6%)	0.000889
Cough	134 (83.2%)	165 (88.7%)	299 (86.2%)	0.140344
Shortness of breath	81 (50.3%)	111 (60.3%)	192 (55.7%)	0.061743
Fatigue	33 (20.5)	64 (34.4%)	97 (28.0%)	0.003980
Sore throat	29 (18.0%)	70 (37.8%)	99 (28.6%)	0.000047
Headache	27 (16.8%)	52 (28%)	79 (22.8%)	0.013200
Nausea/vomiting	25 (15.5%)	57 (30.6)	82 (23.6%)	0.000947
Cheat pain/tightness	3 (1.9%)	19 (10.2%)	22 (6.3%)	0.001453
Mayalgia	27 (16.8%)	46 (24.9%)	73 (21.1%)	0.065659
Diarrhoea	16 (9.9%)	38 (20.4%)	54 (15.6%)	0.007169

Table 3: Presence of Co-Morbidities in SARS CoV-2 patients (N= 347)

Variables	Non diabetic	Diabetic	Total	*P* Value
HTN	60 (37.3%)	121 (65.1%)	181 (52.2%)	0.000
Heart disease	8 (5.0%)	27 (14.5%)	35 (10.%)	0.003229
Bronchial asthma	21 (13.0%)	29 (15.6%)	50 (14.4)	0.500
CKD	1 (0.6%)	29 (15.6%)	30 (8.6%)	0.000
CVD	0 (0.0%)	7 (3.8%)	7 (2.0%)	0.012892

COPD	1 (0.6%)	5 (2.7%)	6 (1.7%)	0.140723

Table 4: Treatments Given to 347 SARS CoV-2 Patients (N= 347)

Variables	Non diabetic	Diabetic	*P* Value
Duration of oxygen therapy (mean)	24 hours	32 hours	0.008470
Paracetamol	161 (100%)	184 (98.9%)	0.501158
Antihistamins	158 (98.1%)	182 (97.8%)	0.849185
Steroids	155 (96.3%)	182 (97.8%)	0.523253
Injectable Antiviral	109 (67.7%)	161 (86.6%)	0.000025
Oral antiviral	47 (29.2%)	29 (15.6%)	0.002250
Low molecular weight heparin	54 (33.5%)	105 (56.5%)	0.000019
Antibiotics	159 (98.8%)	180 (96.8%)	0.293684
Providone iodine gurgling	99 (61.5%)	147 (79.0%)	0.000334
Duration of oxygen therapy (mean)	24 hours	32 hours	0.008470

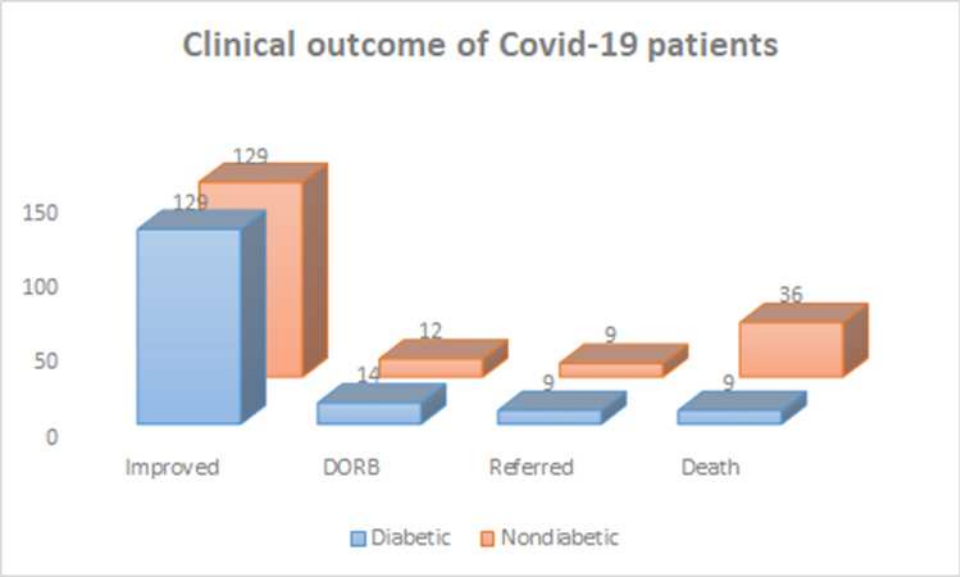

Fig 1: Clinical Outcome of Covid-19 patients

4. DISCUSSION

Other research from the distant and recent past has demonstrated that DM is linked to a higher risk of infection [9]. The metabolic syndrome is linked to diabetes mellitus (DM), which is a chronic, low-grade inflammatory disease [18,19]. On the other hand, research has revealed that some viruses, known as diabetogenic [20] viruses, actually cause diabetes. Diabetes itself has been demonstrated by Guo et al. to be a risk factor for the development and prognosis of COVID-19[13]. The degree of risk associated with DM as a single factor was also found to be higher

than in younger, non-hypertensive individuals, according to a recent meta-analysis. This study also discovered that age and hypertension had an impact on diabetes mellitus (DM) and the poor outcome of SARS Co-V2 infection. Another study found that patients who received glucocorticoids but were less severely ill had greater fasting blood glucose levels [17]. Others have also demonstrated that the COVID-19 virus showed a greater affinity for the DM-causing ACE 2 protein. Therefore, pneumonia caused by DM and COVID-19 can create a vicious loop and worsen the prognosis [13]. Our study found that diabetic patients also experienced greater symptoms than non-diabetics, such as weariness and sore throat. Additionally, it has been suggested in laboratory studies that diabetic patients had considerably greater neutrophil counts, CRP levels, S. Ferritin levels, and D-dimer compared to other non-diabetic SARS Co-V 2 patients. S. ferritin has been identified to be a marker for the activation of the monocyte-macrophage system, which in diabetes patients induces inflammatory storms and has been linked to a rapid exacerbation of COVID-19 symptoms [13]. Diabetes patients are more prone to hypercoagulability, according to D-dimer levels. Recent studies revealed that acute kidney injury, which is a direct result of the virus and may be related to the death of COVID-19 patients, and neutrophilia are all related to the cytokine storm that was brought on by virus invasion. Coagulation activation is related to the sustained inflammatory response. We were unable to include certain other data because of the patients' resource shortage. However, other research has demonstrated through their lab investigations a substantial association between the severity of SARS CoV 2 infection in diabetes patients & the amount of blood total protein, albumin, and pre-albumin which is significantly lower. As a result of receiving greater oxygen therapy (32 hours, p 0.05), injectable antiviral medication (161, p 0.05), and low molecular weight heparin (105, p 0.05) than non-diabetics, diabetic patients in our study also experienced a higher rate of problems. We can safely state that diabetic patients who are infected with COVID-19 have a worse prognosis since diabetic complications indicate the severity of diabetes and patients with diabetic complications have a high mortality rate. Additionally, we discovered that diabetes patients had longer hospital stays, an average of 11 days ($p = 0.0001$), and a higher death rate (19.4%). Therefore, in light of a new study, we should consider the severity of the issue and give SARS-CoV-2-infected diabetic patients greater care and attention because their health can quickly deteriorate. The entire intervention was carried out following the principles of human research outlined in the Helsinki Declaration [21] and was carried out following all applicable laws and the General Data Protection Regulation's rules (GDPR) [22].

Limitation of the study:

This was a single-centered study with small-sized samples. Moreover, the study was conducted over a very short period. So, the findings of this study may not reflect the exact scenario of the whole country.

5. CONCLUSION & RECOMMENDATION

The purpose of this study was to determine the prevalence of SARS CoV-2 in individuals with diabetes mellitus and determine whether their prognosis differed from that of individuals without the condition. The extremely lethal COVID-19 disease affects people of all ages, although old age and the presence of numerous comorbidities are particularly bad for the patient's health. Patients with comorbid conditions had worse hospital outcomes and more severe symptoms. The problems and mortality linked to COVID-19 are influenced by hypertension, chronic renal illness, ischemic heart disease, diabetes mellitus, chronic pulmonary disease, and chronic renal disease.

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