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Original Article

Impact of Diabetes on the Clinical outcome of COVID 19 Patients admitted in Tertiary Care Hospital of Khyber Pakhtunkhwa, Pakistan

Muhammad Salman Aamir[1], Huma Liaqat[2], Muhammad Ali[1], Sabina Afzal[1], Alvina Karam[1], Hamza Nazir[1] and Mashal Aamir[3]

[1]Department of Diabetes, Endocrinology and Metabolic Diseases, Hayatabad Medical Complex Peshawar, Pakistan
[2]Department of Rheumatology, Fauji Foundation Hospital, Rawalpindi, Pakistan
[3]Department of Periodontics and Implantology, Rahman Medical Institute, Peshawar, Pakistan

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***Corresponding Author:**
Huma Liaqat
Department of Rheumatology, Fauji Foundation Hospital, Rawalpindi, Pakistan
humakmcite@gmail.com

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ABSTRACT

In November 2019, a virus emerged in Wuhan City of China, named as novel coronavirus. **Objective:** To evaluate the impact of Diabetes on the clinical outcome of COVID 19 patients admitted in Isolation Units at Hayatabad Medical Complex Peshawar. **Methods:** This was a 6 months' prospective longitudinal observational study. Diagnosis was made on the basis of positive PCR nasal and / or pharyngeal swabs, following the provisional guidelines of the World Health Organization. Diagnoses of diabetes was confirmed by medical history of the patient. Data regarding socio demographic aspects, comorbidities, hematological and biochemical findings, chest radiographic images, complications, length of stay, treatments and outcomes were collected from the hospital charts. All known Type 2 Diabetics above 40 years of age with positive PCR for COVID 19 infections were included regardless of gender. Type 1 diabetics and those with prior complications were excluded from the study. **Results:** The ANOVA table *showed the overall model was statistically significant predictor* ((Duration of diabetes, gender, education and age) *of the outcome variable* (length of stay in COVID isolation unit) with P value 0.004 reflecting that diabetes has significant impact on the outcome of COVID 19 patients. There was also significant association (chi-square P value .005) between complications developed and *HbA1C* levels of the admitted patients. **Conclusions:** Diabetes has significant impact on clinical outcome of Covid 19 patients in terms of complications, length of stay and mortality. The complex nature of both the diseases leaves the patient with high risk of developing complications and mortality.

INTRODUCTION

In November 2019, a virus emerged in Wuhan City of China, named as novel coronavirus. Later on the disease was labelled as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) [1-3]. It was so contagious that in split of time, it spread to Asia and rest of the world. Therefore, the World Health Organization announced Covid 19 as a pandemic in March 11, 2020. The current statistics showed that cases exceeded 100 million and among them, more than two million died [4-5]. COVID-19, infection has variable disease symptomology, that can prove fatal. The COVID 19 symptoms are fever, dyspnea, cough, fatigue, headache, myalgia and loss of smell and taste. Even though majority of the patients experience mild symptoms, and do not require hospitalization although few patients develop serious complications. These complications include ARDS, Septic shock, Multiorgan failure and Hyper coagulation, which if not managed in time could lead to death [6]. However, the disease manifestation and disease progression to such extreme complications and the exact outcome is not fully understood yet. The disease progression, prevalence and extreme illness is seen in older males, whereas very mild symptoms and prevalence is reported in pediatric age group [7]. Latest researches about the COVID 19 infections showed that immunocompromised patients and those with chronic diseases including cardiovascular disease, hypertension,

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chronic obstructive pulmonary disease, chronic kidney disease and melanomas are among those with poor outcomes in terms of treatment [8]. Diabetes (DM) has been emerged as a twenty first century pandemic and the estimated figure is expected to increase to 640 million patients by 2040 [9]. Between 2010 and 2030, there will be a 69% rise in patients with diabetes in developing and 20% in developed nation [10, 11]. According to Pakistan's national statistics, the prevalence of diabetes is estimated to be 26.3%, among which 28.3% are in urban and 25.3% resides in rural areas [12]. Previous articles confirmed that uncontrolled diabetes is associated with poor clinical outcome of COVID 19 infection and the extreme complications are major indications for ICU admissions in the hospital [13]. Some researchers also showed that uncontrolled diabetes was the only associated factor to cause death among COVID-19 patients [14]. It has been observed that patient with hyperglycemia combined with chronic inflammation leads to deranged inflammatory markers in COVID patients [15, 16]. Keeping in view the back ground of these two pandemic diseases, it is of immense importance to evaluate the impact of diabetes on the Clinical outcome of patients admitted in COVID isolation units. The current study elaborates the average length of stay and mortality of diabetic patients admitted in COVID isolation units which will provide baseline evidence for better planning and administration of these patients in a hospital setup.

METHODS

This was a 6 months' prospective longitudinal observational study of diabetic patients admitted with COVID-19 infection between June 2021 and December 2021 in COVID Isolation Unit at the Hayatabad Medical Complex Peshawar. Ethical approval was obtained from Ethical Committee of the hospital. The data was collected from charts of confirmed COVID 19 cases admitted in HMC Peshawar. As per provisional Guidelines of the World Health Organization, samples were taken from nasal/pharynx of patient through swabs and the diagnosis of the COVID-19 was confirmed through a positive PCR assay. Already diagnosed cases of diabetes were included in the study as per their medical history. The Berlin definition was used for acute respiratory distress syndrome (ARDs) [17]. Acute kidney injury (AKI) was assessed following the definition kidney disease [18]. The cardiac injury was determined based on blood biomarkers, Echocardiography and ECG. All known Type 2 Diabetics above 40 years of age with positive PCR for COVID 19 infections were included regardless of gender. Type 1 diabetics and those patients who were having prior complications were excluded from the study. Data regarding socio demographic aspects, comorbidities, hematological and biochemical findings, chest radiographic images, complications, length of stay, treatments and outcomes were collected from the hospital charts. Statistical analyses were done through SPSS version 21.0 statistical software. The Chi Square test was used for association of categorical variables, such as HbA1C levels and complications developed.

RESULTS

The results of the study showed that there is positive association of impact of diabetes on the Clinical outcome of the patients admitted in COVID Isolation units at Hayatabad Medical Complex. Table 1 shows demographics and characteristics of the Diabetic patients admitted in COVID Isolation Unit. Total Population under study was N=145 where mean age was 54.3 and Male to female ratio was 2:1. Body Mass Index (BMI) calculated was within normal range 21.6. Patients were admitted in isolation unit in second week since positive PCR with mean of 8.3 days and stayed in hospital for mean duration of 9.8 days. Diabetes profile in terms of mean HbA1C and RBS was 9.3% and 245.4 mg/dl respectively.

Variables	Minimum	Maximum	Mean ± SD
Age	41	73	54.3 ± 2.72
Height (Feet)	5.2	5.8	5.4 ± 0.84
Weight (Kg)	62	78	74.6 ± 2.38
BMI	18	24	21.6 ± 1.47
Duration Since Positive PCR	4	14	8.3 ± 4.76
Length of Stay in Isolation Unit (days)	6	21	9.8 ± 2.1
Duration of Diabetes (Years)	6	24	12.4 ± 2.87
HbA1C Levels (%)	6	24	9.3 ± 2.12
Random Blood Glucose (mg/dl)	128	382	245.4 ± 22.78

Table 1: Demographics and Characteristics of Population under study N 145

The ANOVA table showed the overall model was statistically significant predictor ((Duration of diabetes, gender, education and age) of the outcome variable (length of stay in COVID isolation unit) with P value 0.004. This reflects the statistical significance of the duration of diabetes and other independent variables on the duration of length of stay of the COVID patients admitted in Isolation unit in Hayatabad medical complex Peshawar. Hence, the hypothesis of no effect is rejected (Table 2).

Model	Sum of Squares	Df	Mean Square	F	P-Value
Regression	297.434	4	74.359	2.141	.040
Residual	4272.784	123	34.738		
Total	4570.219	127			

Table 2: Impact of diabetes, Gender, Education and Age on Average Length of Stay

Among the individual effects of each independent variable on dependent variable (average length of stay), the effect of gender, age and education was insignificant having p-value of 0.094, .183 and 0.136 respectively. However, the p-value for the duration of diabetes was 0.049 which was significant. Thus, concluding that the duration of diabetes

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had a significant effect on the length of stay of COVID patients(Table 3).

Variables	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
Gender	1.772	1.049	.148	1.690	.094
Age	-.091	.068	-.156	-1.339	.183
Education	1.927	1.285	.132	1.500	.136
Duration of diabetes	.224	.113	.231	1.986	.049

Table 3: Individual effect of independent variables (duration of diabetes, Gender, Education and Age) on Dependent variable (average length of stay)

The Chi-square significance is 0.005 reflecting statistical significance between the complication developed and HbA1c among COVID admitted in isolation. Therefore, we reject the null hypothesis with 95% confidence that determine that there is evidence of an association between complication developed during admission and HbA1c of COVID patients admitted in Isolation unit(Table 4).

Complication development during Admission	HbA1c Control			Total	p-value
	Excellent	Good	Poor		
AKI	1	9	9	19	0.005
MI	0	2	8	10	
Stroke	0	1	1	2	
Diabetic Foot Ulcer	2	15	10	27	
Bed sores	0	5	20	25	
Other	14	22	26	62	

Table 4: Complication developed vs HbA1c

DISCUSSION

COVID-19 shows variation in symptomology which could prove fatal. Several factors influence disease consequences including gender and age. Severe chronic conditions such as Diabetes and Hypertension have been associated with the COVID 19 infection. In current study we determined the impact of diabetes on the outcome of COVID-19 patients admitted in Isolation units at Hayatabad Medical Complex Peshawar. Normally we found that a patient having diabetes with COVID-19 positivity shows severe outcomes in terms of length of stay and complications which ultimately puts greater burden on hospital administration in terms of work load. Our study results confirmed and agreed to findings of studies carried out at China where diabetic patients had 7.3 times higher risk of complications, that prolonged the average length of stay at hospital and fatality of 2.3 times higher [19]. According to another British cohort study, COVID-19 patient with uncontrolled diabetes and their complications showed higher risk of death as compared to other non-diabetic patients. These findings endorsed our study findings, where we calculated P value of 0.005 of HbA1c level and complications developed among COVID patients [20]. Hyperglycemia was considered as an indicator of poor outcome in diabetics during COVID 19 [21]. It has been found that poor outcome is associated with hyperglycemia due to interleukin-6 (IL-6) that causes lung injury [22]. Hence, researchers showed that patients who received IV insulin during hospitalization has displayed positive outcome as compared to those who were on oral medications. However, Chen et al., stated that COVID-19 patients who were diabetics already on insulin showed aggressive inflammatory response ending up with complications. However, it remains statistically insignificant in terms of severity of complications for those who were on oral anti-diabetic medications [23]. Complex nature of diabetes is associated with variation in severity of COVID 19 patients. In our study, we found that diabetic patients had a higher number of complications, which increased the length of stay at hospital as compare to those who were non diabetic. Our study results agreed to studies carried out at Wuhan, China [24]. Studies also suggested that a Hypertensive patient with COVID-19 positivity had adverse prognosis as far as clinical outcome is concerned in terms of complications like MI and stroke [23]. To conclude, those diabetic patients who were admitted in COVID isolation units were prone to develop complications due to complex inflammatory response of both the diseases that affected the ultimate clinical outcome in terms of average length of stay at hospital and mortality.

CONLCUSIONS

The complex nature of COVID-19 and diabetes leave the patient with higher risk of developing complications. Special care and management is required for diabetic patients in COVID isolation units with the view to manage the complications and thus minimizing mortality and average length of stay.

Conflicts of Interest

The authors declare no conflict of interest.

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