Original Research Article

EVIDENCE AND FREQUENCY OF NEWLY DIAGNOSED DIABETES MELLITUS IN THE PATIENTS ADMITTED WITH COVID-19 INFECTION

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Abstract *To find out how often individuals with covid-19 infection develop new cases of diabetes mellitus. The study was conducted at Mirpur Azad Jammu and Kashmir Teaching Hospital, Divisional Headquarter of the Department of Medicine, from January 2021 to June 2021. Adult patients between 18 and 70, regardless of gender, who were diagnosed with the virus showing mild to moderate symptoms determined by RT-PCR test and were not previously reported with diabetes met the inclusion criteria. Within 24 hours of admission, 5cc of each patient's blood was drawn and sent for testing to determine the BSF, BSR, and HBA1C levels before commencing steroids. Data obtained were analyzed by using (SPSS) version 24.0. Total 130 patients of covid-19 were included who met the inclusion criteria. Mean age of patients was 39.60+ 9.76 years. There were 108 (83.1%) males and 22 (16.9%) females. Twenty-six patients (20%) were diagnosed with DM during admission. The mean age of patients in non-diabetic group was 39.75+ 9.5 years, while in diabetic group it was 51.38+ 12.74 years which was statistically significant (0.001). 24 (92.3%) patients with newly diagnosed DM had HBA1C levels of more than 6.5 which was statistically significant (0.001).We conclude that newly diagnosed DM significantly relates to covid-19 infection. Elderly patients already in pre-diabetic state with increased HBA1C levels are more prone to develop DM after this viral infection.*

Keywords: *covid-19, diabetes mellitus, hyperglycemia*

Introduction

Diabetes mellitus (DM) is a commonly encountered metabolic disease that adds a significant morbidity and mortality to sufferers and puts a huge financial burden on health departments worldwide. According to international diabetes federation, almost 463 million people were suffering from DM in 2019, reaching upto 700 million by 2045 (Abdi et al., 2020). Most severe complications associated with diabetes mellitus are acute respiratory syndromes, blindness, lower limbs amputations and multiorgan failure (Pearson-Suttard et al., 2016). Covid-19, which is an open myth now, and everybody in the world is quite familiar with the term, is officially known as COVID-19 named by WHO replacing the term SARS-Cov-2 for this viral infection (Abdi et al., 2020). Most. 650 million confirmed cases reported worldwide, including 6.6 million deaths from coronavirus by 2022, as reported by WHO (Sachs et al., 2022). As it is a novel pandemic, the complications of this disease and possible consequences are still debatable. It was assumed that patients with known comorbid and late

referrals to hospitals with old age are the contributory factors to the severity of the disease (Guan et al., 2020). Diabetes mellitus is associated with covid-19 in two ways (Apicellaet al., 2020). Firstly in patients with known DM who got covid-19 infection to, complications like diabetic ketoacidosis, which ultimately leads to the poor outcome of disease (Prete et al., 2020). Secondly new-onset diabetes is commonly reported in the literature in covid-19 patients (Wu et al., 2020). This may be due to covid-19 virus entering the beta cells of the pancreas through angiotensin converting enzyme 2 receptors causing damage to pancreas ultimately decreasing insulin production leading to new onset DM or complicating the already existing disease (Sathish and Anton, 2021). Another probable cause reported in the literature is insulin resistance secondary to amplified levels of TNF alpha and IL- 6 in the COVID-infected persons causing new-onset DM (Grasselli et al., 2020). A study in Hong Kong by WU et al., 2020 stated that the mortality rate in patients of DM suffering from

pneumonia over 75 years of age is higher than that of cardiovascular disease and cancer (Zhang et al., 2020). Although there are numerous studies on the association between diabetes and the viral corona gene, enough data is not available for the patients infected with covid-19 who have recently developed diabetes and disease outcomes in Pakistani population. This current study aimed to find out how frequently individuals treated with covid-19 infections had recently diagnosed diabetes mellitus and its various forms.

Methodology

The study was designed by receiving approval from the ethics committee of hospital. The method adopted for the study was cross-sectional investigation at the Department of Medicine from January 2021 to June 2021 in Divisional Headquarter Teaching Hospital Mir Pur Azad Jammu and Kashmir. Utilizing a 95% confidence level, a 5% margin of error, and a percentage of newly diagnosed DM of 20.6%, a sample size of 130 patients from COVID-19 was determined (Lim et al., 2021). RT-PCR test i.e. reverse transcriptase polymerase chain reaction, was conducted for adult patients between the ages of 18 and 70, designed to identify corona virus. Patients showing mild to severe infections, regardless of gender, who were admitted but had not yet been given a diagnosis of diabetes mellitus (DM) underwent this test. Pregnancy, kidney and thyroid illness, and other concomitant conditions, were excluded criteria. Non-probability consecutive sampling was used to include patients. Those meeting the eligibility requirements provided their informed permission. Within 24 hours of admission, 5cc of each patient's blood was drawn and sent for testing to determine the BSF, BSR, and HBA1C levels before commencing steroids. Blood samples were sent to the pathology lab of the teaching hospital at the divisional headquarters Mir Pur Azad Jammu and Kashmir. According to test results, patients were classified as diabetic following American Diabetes Association guidelines. The guidelines state that if the glucose level in plasma (fasting condition) is greater than or equal to 126 mg/dL, it is considered as a marker for newly diagnosed DM. Moreover if normal blood glucose level is more than or equal to 200 mg/dL and HbA1c less than 6.5%, it is also regarded as marker of DM (Lim et al., 2021).SPSS version 23.0 was used to analyze the data that was collected. Fasting blood sugar levels, age, gender, and HbA1C levels were all calculated using SPSS and considering the deviation standard. The Chi-square test and t-test were employed to ascertain the relationship between the different variables. Significant data was defined as P value greater or equal to 0.05.

Results

Total 130 patients of covid-19 were included who met the inclusion criteria. Mean age of patients was $39.60\pm$ 9.76 years. There were 108 (83.1%) males and 22 (16.9%) females. No patients on presentation had diabetic ketoacidosis on urine ketone analysis. Table-I shows the Demographics of the diagnosed patients.

TABLE- I. Demographics of patients

Variable		N (%)
No of patients		130
Age (years)		39.60 ± 9.76
Gender	Male	108 (83.1%)
	Female	22 (16.9%)
Diabetic ketoacidosis at presentation		-

26 patients (20%) were diagnosed with DM during admission. Mean age of patients in non-diabetic group was $39.75\pm$ 9.5 years, while in diabetic group it was $51.38\pm$ 12.74 years which was statistically significant (0.001). Out of 26 patients diagnosed with DM 20 (76.9%) patients were males and 6 (23.1%) were females. Fasting blood sugar (FBS) in non-diabetic group was $100.96\pm$ 19.58 mg/dl, and in newly diagnosed group was 202.12 ± 54.82 mg/dl (*P* value 0.001). 24 (92.3%) patients with newly diagnosed DM had HBA1C levels of more than 6.5 which was statistically significant (0.001). All variables with their *P* values are mentioned in table II.

Table II: Clinical presentation and lab values of patients

variables		Non diabetic group	Newly diagnosed DM	*P* value
Age (years)		39.75 ± 9.5	51.38 ± 12.74	0.001
Gender	Males	88 (84.6%)	20 (76.9%)	0.35
	females	16 (15.4%)	6 (23.1%)	
HBA1c levels (raised)		-	24 (92.3%)	0.001

Fasting plasma glucose(mg/dl)	100.96$\pm$ 19.58	202.12$\pm$ 54.82	0.001

Discussion

DM is most common comorbidities after hypertension and obesity in developed countries (Rahmat et al., 2022). Since the beginning of the viral corona pandemic, Diabetes is linked to a deterioration of the COVID 19 prognosis by causing several complications that result in high mortality, as stated in the literature (Sathish et al., 2021). This is due to a high inflammatory response and weakening of immune system due to hyperglycemia (Suwanwongse et al., 2021). One meta-analysis suggests that COVID-19 has increased the incidence of DM in the pediatric population, further enhancing the risk of diabetic ketoacidosis (DKA) in this age group (Alaqeel et al., 2021).

Twenty six individuals (20%) of the admitted patients in our study had recently been diagnosed with diabetes. A study by Sathish et al., 2021 found that, generally, of the admitted patients of viral corona disease, 20.6% were diagnosed with diabetes (Zhang et al., 2020). Instances of recently detected diabetes in people with corona ranged between 0.6% to 46.2%, per Sathish et al., 2021's meta-analysis across overall studies, with an average prevalence of 14.4% (Shrestha et al., 2021). Additionally, in a case study involving three people, Suwanwongse *et al.,* 2021 disclosed novel DM in corona patients (Smith et al., 2021) According to a study in Saudi Arabia, 26% probability was reported in COVID-19 patients to develop DM (Wang et al., 2020).

In our study, newly diagnosed DM was more commonly seen in the older population as compared to the younger population i-e 51.38$\pm$ 12.74 years vs 39.75$\pm$ 9.5 years which was statistically significant (0.001), and patients with new onset DM (92.3%) had raised HBA1C levels as compared to non-diabetic group which indicates that these patients DM status triggered after covid-19 infection. Similar results were shared by Sathish and Anton, 2021 that newly diagnosed DM was more commonly seen in elderly patients i.e., with an average age of 50.2 $\pm$13.1 years with 90.% ahd raised HBA1C levels (Sathish and Anton, 2021). Alaqeel *et al.,* 2021 also reported that HBA1C levels were higher in patients of new onset DM. Additionally, Shrestha *et al.*, 2021's meta-analysis revealed that prevalence of new onset DM was 19.7% with more commonly seen in older patients. A study by Smith *et al.,* 2021 also reported that 15.7% of patients had newly diagnosed diabetes; they included all patients above 60 years of age. Wang *et al.,* 2020 also reported that patients of new onset DM had raised HBA1C levels showing pre diabetes in these patients. The limitation of this study is that we have included patients between 18-70 years, excluding children and more than 70 years of patients. These groups should be included in next studies to know which age groups are more prone to DM after covid-19 infection.

Conclusion

We conclude that newly diagnosed DM significantly related to covid-19 infection. Elderly patients already in pre-diabetic state with increased HBA1C levels are more prone to develop DM after covid-19 infection.

Conflict of Interest

None of the authors of this paper have disclosed any conflicts of interest.

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