DOI: https://doi.org/10.53350/pjmhs2023174117

ORIGINAL ARTICLE

Association between Covid-19 and Diabetes Mellitus

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ABSTRACT

Aim: To determine the association between Covid-19 and diabetes mellitus.
Study Design: Retrospective study.
Place and Duration of Study: Department of Medicine & Respiratory Physiology, Independent Medical College Faisalabad from 1st July 2022 to 31st December 2022.
Methodology: Fifty five patients received at outdoor patient department of Independent University Hospital with confirmed diagnosis for Covid-19 through naso-pharyngeal reverse transcription polymerase chain reaction (RT-PCR) and aged 13-65 years were included. The complete medical files of each confirmed Covid-19 case was completely studied in relevance to diabetes mellitus association and compared with normal matched controls that only visited the OPD against the suspicion of the disease and underwent complete biochemical profiling. The baseline levels of HbA1C and glucose monitoring in each patient and control was done and compared.
Results: The mean age of the CoVid-19 cases was 39.5±5.3 years while of controls as 25.65±4.3 years. There was an obvious significant variance in the odds ratio of Covid-19 patients and those of controls in reference to diabetes mellitus. A significant increase was observed in Odds Ratio of Covid-19 cases within the age group of 51-65 years. The Elixhauser Comorbidity Index (ECI) categories also presented, ECI >5 to be higher in Covid-19 cases than controls.
Conclusion: There is a higher risk of diabetes new onset in Covid-19 confirmed cases as compared to matched controls.
Key words: Covid-19, Incidence, Alarming, Diabetes, Socioeconomic

INTRODUCTION

Severe acute respiratory syndrome was declared as pandemic of twenty-first century by world health organization. Covid-19 caused millions of deaths within the span of one year and hit almost every part of the world. This disease was first detected in china in year 2019 and spread all around the world. It causes mild flu like symptoms to severe respiratory distress and number of other complications. Post-Covid-19 immunomodulation cause wide range of ongoing health problems in affected persons. Studies have revealed the diabetes mellitus onset can also be caused by Covid-19 incidence[1,2].

Covid-19 has been described to be related with escalation of inflammatory markers and autoimmune system of the body. Diabetes mellitus is also associated with raised levels of inflammatory markers including TNF–alpha which can also initiate the insulin resistance. It might be possible that due to autoimmune responses in Covid-19 as well as increase in inflammatory markers the risk of insulin resistance also increases resulting in development diabetes mellitus type 2in adults after exposure to Covid-19[2,3].

Diabetes mellitus is a metabolic disorder and also have become one of the major public health problems of modern world. Its incidence is increasing on an alarming rate all over the globe and also poses serious socio-economic burden on the development of the third world country suffering from economical inflation. According to the recent published data on prevalence of diabetes it suggested that, 463 million people are currently suffering from diabetes within the age of 20-79 years with an increase up to 700 million people by year 2045[3,4]. Most of those people were unaware of their condition and very high number of individuals are at risk of getting diabetes mellitus as they undergo insulin resistance[5-8].

Exact underlying mechanism of development of diabetes mellitus type 2 in post covid-19 population is still not well-understood but it could likely be due to stress hyperglycemia, effect of corona virus on β-cells of pancreatic islets and steroid induced hyperglycemia. Result of previous study highlighted that, there is 40% more probability of getting diabetes in Covid-19 survivors as compared to those individuals who were not detected with Covid-19[9-11].

Present study was designed to find the association of Covid-19 with diabetes mellitus. Incidence of diabetes and its relation with Covid-19 would be studied in present study. Result will prove valuable for health care practitioners and health policy makers for better evaluation and consideration of this issue before the exact diagnosis of the disease.

MATERIALS AND METHODS

This retrospective study was conducted at department of respiratory physiology and medicine of Independent University Hospital, Independent Medical College Faisalabad from 1st July 2022 to 31st December 2022. All patients who visited our outdoor patient department and confirmed for Covid-19 through naso-pharyngeal RT-PCR were included in this study. The complete medical files of each confirmed Covid-19 case were profoundly studied and compared with matched controls that only visited the OPD against the suspicion of the disease and underwent complete biochemical profiling including HbA1c. Those patients who were already having diabetes as chronic illness were not included in this study. All patients baseline HbA1C was already found documented in their medical records.HbA1C was conducted through calorimetric method using EDTA 3cc blood as a SOP. The patients who were confirmed for Covid-19 were considered as a group where 55 cases were selected for analysis. The controls were considered as another group (n=50). All patient's complete demographic, clinical history as well as symptoms were documented in a well-structured questionnaire. The related details in accordance with their diabetes status were also documented. The patient's age and gender details were compared with the controls in context with the diabetes status. Data was statistically analyzed using SPSS version 26.0 through Fisher exact test and odds ratio. P value <0.001 was taken as significant.

RESULTS

The mean age of the Covid-19 cases was 39.5±5.3 years while of controls as 25.65±4.3 years. The numbers of males were lower than females in Covid cases while it was equal in controls (Table 1).

Received on 03-01-2023
Accepted on 28-03-2023

There was an obvious significant variance in the odds ration of Covid patients and those of controls in reference to diabetes mellitus. There was highest odds ration increase observed in cases of Covid-19 within the age group of 51-65 years which was further followed by 36-55 years and p value was <0.001 (Table 2).

The association of gender with diabetes within Covid cases in comparison with controls presented higher odds ration within males than females with a high prevalence rate as 0.26% in Covid male cases (Table 3).

The ECI categories also presented. ECI >5 to be higher in Covid cases than Controls with an increased percentage of insulin pump requirement in Covid cases than Controls. A higher glucose monitoring was required by Covid cases (Fig 1).

Table 1: Demographic information of the patients

Variable	Covid 19 (n=55)	Controls n=50	Total
Age (years)			
13-17	5 (9.09%)	15 (30%)	20 (19%)
18-35	10 (18.18%)	16 (32%)	26 (24.7%)
36-50	19 (34.54%)	10 (20%)	29 (27.6%)
51-65	21 (38.18%)	9 (18%)	30 (28.6%)
Gender			
Males	26 (47.2)	25 (50)	51 (48.6)
Females	29 (52.7)	25 (50)	53 (51.4)

Table 2: Association of age of cases and controls with diabetes

Variable	Diabetes Mellitus		
	%	Odds Ratio	P value
Overall			
Control	0.15	REF=1	<0.001
Covid	0.21	1.43 (1.37,1.46)	
Age			
13-17	0.19		<0.001
Control	0.29	REF=1	
Covid		1.52 (1.39,1.76)	
18-35			
Control	0.19	REF=1	<0.001
Covid	0.18	0.95 (0.97,1.05)	
36-50			
Control	0.16	REF=1	<0.001
Covid	0.25	1.55 (1.45,1.64)	
51-65			
Control	0.15	REF=1	<0.001
Covid	0.27	1.78 (1.65,1.87)	

Table 3: Association of gender of cases and controls with diabetes

Variable	Diabetes Mellitus		
	%	Odds Ratio	P value
Males			
Control	0.17	REF=1	<0.001
Covid	0.26	1.48 (1.42,1.55)	
Females			
Control	0.13	REF=1	<0.001
Covid	0.19	1.36 (1.32,1.43)	

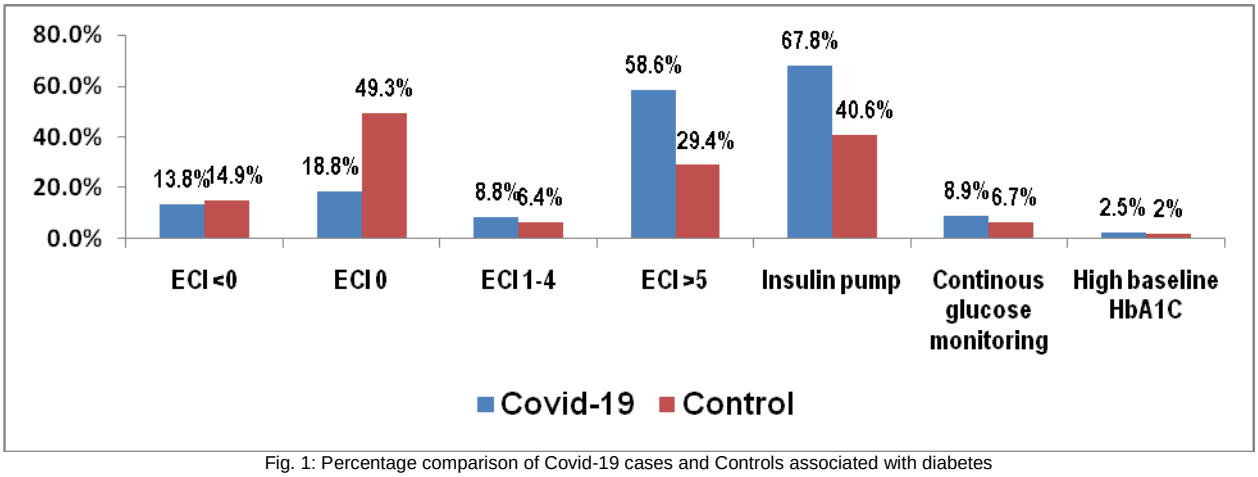

Fig. 1: Percentage comparison of Covid-19 cases and Controls associated with diabetes

DISCUSSION

Corona virus was one of the biggest health challenge faced by the world in 21st century. It affects people of all age, races and ethnicities and pose serious health problems to the majority of world population. Its symptoms vary from mild flu to chronic illnesses includes cancer, heart strokes, brain problems and metabolic disorders. It is also reported that higher mortality rate was observed in Covid-19 patients who already had diabetes thus diabetes could be the sole predictor of death in SARS-CoV patients[12-14]. Present study was designed for the evaluation of Covid-19 relation with diabetes mellitus.

Exact mechanism of diabetes mellitus in corona virus patients is complex and not completely understood. Corona virus binds to the serine protease 2 receptors and angiotensin converting enzyme 2 which are mainly expressed and found in metabolic tissues and organs such as small intestine, beta-cells, kidneys and adipose tissues. Covid-19 might cause apoptosis of pancreatic beta-cells and cause attenuation in pancreatic insulin levels. However, it likely induces pleiotropic effect to glucose metabolism[15-17].

Glucose metabolism is highly affected due to insulin resistance. In the present study results the occurrence of higher HbA1C levels as well as EC>5 score in Covid-19 cases in comparison with normal controls evidently proved the same mechanism as reported above and in other researches. The high baseline HbA1C levels in Covid-19 cases than controls were also the main finding of the current study and were in line with previously mentioned researches[16-18].

For corona virus patients who already have diabetes, their glucose level should be controlled and properly monitored according to the need of age, clinical classification, comorbidities and other risk/ailments. Several experts also recommend glycemic management in Covid patients. Metformin based drugs are generally not recommended in those patients to reduce the risk of metabolic decompensation. Therefore, it is suggested that, insulin level can be managed by IV infusions by close monitoring of glucose level. Potassium and fluid balance is also generally recommended along with insulin infusion[18-21].

CONCLUSION

There is a higher risk of diabetes new onset in Covid-19 confirmed cases in comparison to controls.
Conflict of interest: Nothing to declare

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