A Deadly Combination- Coronavirus and Diabetes Mellitus: Where are we now?

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Abstract **- Individuals with diabetes are increased risk for bacterial, viral, and parasitic infections and one of the most common co-morbidity and correlated with higher mortality. Coronavirus attacked on 160 countries and spread through animals, human to human transmission also possible. COVID-19 highlights the importance of understanding shared disease potential mechanism through two coronavirus receptor protein angiotensin converting enzyme2 (ACE2) and dipeptidyl peptidase-4 (DPP-4) establish pathway regulating inflammation, we review the basic interaction between coronavirus and Diabetes, highlighting the gap in knowledge that require further studies pertinent to deadly combination of COVID-19 patients with Diabetes Mellitus. Old age was a significant risk factor for development of severe acute respiratory syndrome (SARS-CoV-2) and the progression from SARS-CoV-2 to death.**

Index Terms **- COVID-19, Co-morbidities, Diabetes mellitus, ACC-2, DPP-4, SARS-CoV-2.**

1.INTRODUCTION

At the end of 2019, recently known Coronavirus has promptly transfer through China and rest of the World. The disease caused by is was named Corona Virus Disease 2019 (COVID-19) by WHO. Coronavirus are wrapped virus with non-segmented, single-stranded and positive-sense RNA genome known to cause respiratory infection in human i.e Sever acute respiratory syndrome coronavirus (SARS-CoV-2) and Middle east respiratory syndrome (MERS-CoV). COVID-19 with Diabetes Mellitus Potentiate progress of (SARS-CoV-2) and Septic shock hence multiple organ failure particularly in elderly patients. Diabetes is second most prevalent co-morbidity after hypertension in peoples hospitalized with COVID-19. The surface receptor for (SARS-CoV-2) is Angiotensin Converting Enzyme 2 (ACE2). The link between COVID-19 and Diabetes is dipeptidyl peptidase-4 (DPP-4) enzyme which functional receptor for human coronavirus-Erasmus Medical Center (hCoV-EMC), the virus responsible for (MERS-CoV).

Aim is to analyze the negative outcomes behind the combination of Coronavirus and Diabetes Mellitus with death rate and provide answers to caregivers and patients regarding the risk factor related to diabetes for COVID-19 prognosis. The mortality rate of COVID-19 with Diabetes Mellitus up to 7.3% higher than patients without any co-morbidities 0.9% and this overview explanation for Why COVID-19 patients died of multiple organ failure. Old age and diabetes are associated with an increased risk of Frailty (Multisystem Dysregulation Syndrome). In some cases, COVID-19 infection suggests increased prevalence of frailty. Found that pneumonia, release of tissue related enzymes, excessive uncontrolled inflammation responses and hypercoagulable state associated with dysregulation of metabolism, serum ferritin and coagulation index higher in diabetic patient more susceptible to coronavirus.

2.POTENTIAL MECHANISMS THAT INHANCE COVID-19 PATIENTS DEATH RATE WITH DIABETES

Angiotensin converting Enzyme 2 (ACE2) and Dipeptidyl Peptidase-4 (DPP-4) are protein receptors of corona virus. (ACE2) In various organ system including brain, intestine, kidney, pancreas, alveolar AT2 cells, myocardium, lungs and shows more expression in diabetic patient. ACE2 capable of binding set of coronavirus spike proteins, including SARS-Cov-2 spike protein. More cellular binding. Hypoglycemic agents, statins, antihypertensives, ACE inhibitor upregulate ACE2. COVID-19 reduces ACE2 expression inducing cellular damage, hyperinflammation and respiratory failure. ACE expression on pancreatic B-cell which directly effect

on B-cell function induce new onset diabetes. Greater for diabetes complication like diabetic ketoacidosis (DKA).

Second potential mechanism is related to DPP-4 enzyme which is bind to MERS-CoV undergoes proteolytic activation through the cellular serine protease TMPRSS2 which allows transmembrane unit, s2, of MERS-Cov S to fuse the viral membrane to cellular membrane. DPP4 cleaves wide range of peptide hormones, chemokines and bioactive immunomodulatory proteins. Increase DPP4 expression detects lungs disease, inducing COPD. Diabetes Mellitus inhibit the neutrophil, chemotaxis, lower secretion of cytokines, polymorphonuclear leukocytes, phagocytosis and intracellular killing of microbes so impairment in adaptive immunity.

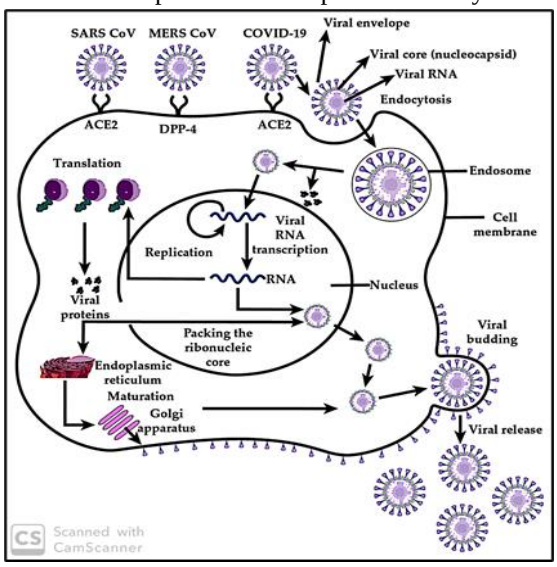

Fig. Pathogenesis of Coronavirus infection

Fig. Infected Body by Coronavirus

3. METHODS

A precise search was performed on studies published from January 2020 to May 7, 2020, in web of science database. To identify missing studies, I checked the reference list for each search paper. According to the indices of the various databases, use the search term “2019 novel coronavirus and COVID-19” and “co-morbidities, clinical characteristics, epidemiological” without any language restriction. Ratios are used to describe the risk of diabetes in severe patients compared with non-severe patient.

4.CONCLUSION

The available evidence shows Diabetes Mellitus is second important death factors impacting the clinical severity of coronavirus infection. ACE2 and DPP-4 this two are important physiological regulators of glucose homeostasis and the related pathways produce harm to the coronavirus infection. Patients with diabetes were older (65-99) had higher mortality but hand no significant difference in gender and other symptoms.

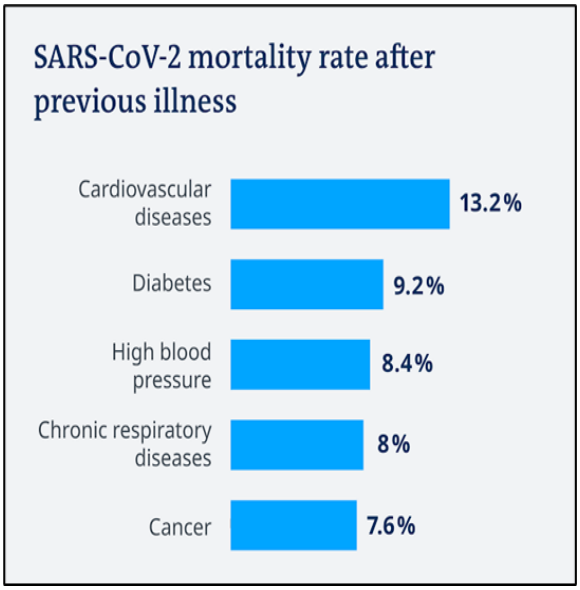

Fig. Mortality rate of COVID-19 patients with Diabetes

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Important Links

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2. https://www.sciencemediacentre.org/expert-reaction-to-questions-about-high-blood-pressure-diabetes-and-ace-inhibitor-drugs-and-risk-of-covid-19-infection/
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