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Diabetic Care with Coronavirus

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Abstract

The spread of coronaviruses (COVID-19) universally resulted in many deaths and hospitalizations. It affects respiratory tract and causes fatal lung disease in humans. The pandemic virus can spread from patients carrying the virus through droplets, direct contact, aerosols, touching any surface contaminated surface; closed places may be a cause of spread also. All of the people are prone to have this pandemic virus, especially diabetic patients, as the increment of their blood glucose levels enhance glycosylation end-product formation, pro-inflammatory cytokines, oxidative stress and can activate the production of adhesion molecules that mediate tissue inflammation. Monitor blood glucose level is the main cause to avoid the complication of COVID-19. This review aims to discuss the relation between COVID-19 and diabetic patients and provides some solution to manage COVID-19 and diabetes

Keywords: Viruses • Coronaviruses • Diabetes • Angiotensin-Converting-Enzyme 2

Introduction

Coronaviruses is a single-stranded RNA genome, 26-32 kilobases, has been structured into α-, β- and γ- CoVs [1]. It is pandemic virus; it can spread from patient carrying the virus through droplets, direct contact and aerosols. Moreover, touching any surface contaminated with the virus may cause infection with it [2], closed places may be a cause of spread this pandemic virus as it may be inhaled into the lungs [2], and the transmission of this virus is more occur in the early stages of the infection [3].

All of the people of different ages are prone to have this pandemic virus. Especially, old, people with chronic diseases. The manifestation of it summarized in influenza (fever, cough, fatigue, sputum, headache), shortness of breath, in some times nausea and diarrhea are occurring also, moreover, acute respiratory distress syndrome, respiratory failure, arrhythmias, acute cardiac injury, shock, multiple organ failure, and finally death [4].

Diabetes mellitus is a metabolic disturbance identified by increase blood glucose levels, resulted as a result of insulin insufficiency in secretion and/or action [5]. Diabetic persons are prone to many diseases as cardiac, peripheral arterial, cerebrovascular disease [6], virus as influenza A (H1N1) [7], SARS-CoV [8] and MERS-CoV [9]. Influenza and pneumonia are common in aged people with type 2 diabetes mellitus [10]. Increase blood glucose levels enhance glycosylation end-product formation, pro-inflammatory cytokines, oxidative stress and can activate the production of adhesion molecules that mediate tissue inflammation [11], these describe the reason in which diabetic patients are prone to infections [12]. As there are numerous people suffering from diabetes, so it is an important comorbidity in patients with COVID-19 [13]. COVID-19 can have an effect on the pathophysiology of diabetic patients. Monitor blood glucose, is very important in all people with or without diabetes [13], as it has been discussed above some people may become diabetic with COVID and if the diabetic patient do not take care the case will progress and complications will occur that can raise the risk of morbidity and death-rate during acute infections as a result of suppressed innate and humoral immune functions, the level of hemoglobin A-1c showed an incredible increase of hospitalization and pneumonia-related severity during bacterial infection [14].

The angiotensin-converting-enzyme 2 is the main receptors for both SARS-CoV and SARS-CoV-2 [15,16], it is widely expressed on many tissues as respiratory tract, heart, kidneys, intestines, cerebral neurons, both arteries, and veins endothelium, also in immune cells, and pancreas. So, SARS CoV-2 utilizes ACE-2 as a receptor for entry cells [17]. When the host is exposed to the virus, all steps of CoVs, through a Spike protein, bind to cells that express specific receptors, after that protease cleaves the spike and allow the virus entry and reproduction [15]. SARS CoV2 surface S-glycoprotein binds to angiotensin-converting-enzyme 2 (ACE-2) and resulted in a change in the S-glycoprotein which permits proteolytic digestion by host cell proteases leading to internalization of the virion [18], the entry of the virus elicit an inflammatory response with the recruitment of T helper cells that produce interferon γ, which leads to more production of other inflammatory cells that called a cytokine storm that affect many organs by the damage it as in severe disease like diabetes. Moreover, an Increased Furin level which is a type1 membranebound protease, belonging to the proprotein convertase subtilisin/Kexin family, it also facilitates the entry of coronaviruses into the cell and also enhances viral replication [19]. in a study by Chinese, they compared 39 SARS-CoV patients not suffering previous diabetes, did not receive any steroid compounds, with another 39 matched healthy, they found about 20 individuals of the 39 SARS-CoV developed diabetes during the hospitalization period, the immunostaining for ACE2 was very strong in their pancreatic islets, that may be due to SARS-CoV has damaged Langerhans' islets and causes type one of diabetes [20].

Laboratory Examination

RT-PCR is the main technique that can be used to detect COVID 19 by detecting the positive nucleic acid of coronavirus in sputum, throat swabs, and secretions of the lower respiratory tract [21], but as it is very expensive diabetic patients can follow up their case by another biochemical analysis as complete blood picture as approximately most patients have normal or

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decreased white blood cell counts, especially lymphocytopenia [22], and increase in neutrophil, kidney function also is very important to follow as they also increase, furthermore inflammatory markers as Interleukin-6 which increased in both diabetes and COVID 19, that may cause a harmful role in both [23], also you can measure D-dimer which also increase [24]. Beside biochemical parameters, a diabetic patient should do Computerized tomography scanning as it particularly shows the opacities of ground glass, with or without acute deformations. They may be bilateral, have a peripheral distribution and include the lower lobes [24]. While some confirmed cases may display normal CT scans [25], the abnormalities were also identified before the developing Symptoms [26].

Care of Diabetic Patients

Monitor blood glucose, is very important in all people with or without diabetes [13]. As the evidence that angiotensin-converting-enzyme 2 is the main receptors for coved 19, some use angiotensin-converting enzyme inhibitors to it which may affect diabetic patient, it has been found that the administration of angiotensin-converting enzyme inhibitors with DPP4 inhibitors leads to an increase in sympathetic tone and a cause adverse hemodynamic effect [27]. Also, Brown [28] reported that interaction has been noticed between converting enzyme inhibitors and vildagliptin that cause increased risk of angioedema as a result of diminishe degradation of bradykinin or substance P.

Flavonoid ingredient component as hesperidin and naringin possesses a diverse pharmacological activity [29], they can ameliorate the elevated levels of blood glucose and glycosylated hemoglobin (Hb A1C) [30], and also can manage coronavirus [29]. Moreover, vitamin C as lemon, orange or guava can increase immunity, manage a variety of viral infections and can kill the host of coronavirus [31], furthermore, Ginger was effective in blocking viral attachment and internalization and can prevent plaque-forming which results in respiratory syncytial virus infection. Furthermore, green tea, Fenugreek possesses anti-inflammatory, antiviral activity and curcumin has the ability to cut off virus adhesion to the cell, which prevents virus spread [31], these natural compounds also can manage and decrease blood glucose levels and have an immunomodulatory effect [32,33].

Conclusion

The angiotensin-converting-enzyme 2 is the main receptors for COVID-19, it is widely expressed on many issues like the pancreas, so SARS CoV-2 utilizes ACE-2 as a receptor for entry cells. Diabetic patients are the main persons to prone COVID-19. COVID-19 can have an effect on the pathophysiology of diabetic patients. Monitor blood glucose, is very important in all people with or without diabetes. Diabetic patients should eat foods that have a potential role in lowering blood glucose and also can fight coronavirus as flavonoid hesperidin, naringin. Furthermore, natural compounds that have an immunomodulatory effect as vitamin C, curcumin and also have the ability in blocking viral attachment and internalization and can prevent plaque-forming which results in respiratory syncytial virus infection as Ginger, green tea, Fenugreek and also can lower blood glucose level.

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