



Effects of COVID 19 Pandemic on Diabetic Patients

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Authors' contributions

This work was carried out in collaboration among all authors. All the authors contributed evenly with regards to conceptualizing, literature searching, drafting, writing and proofreading the final draft. All authors read and approved the final manuscript.

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ABSTRACT

Ever since the pandemic started in March 2020, the whole world and the healthcare system were overburdened with an extremely difficult task of curbing COVID-19 as much as possible to decrease the death rate and to understand its effects. Diabetic patients are no different as they constitute a large group globally. Therefore, understanding the biggest factors that affects their day-to-day life is crucial to be able to treat them well and decrease the chances of having high mortality rates among diabetics. COVID-19 in diabetes is susceptible to high mortality rates making them prone to develop nutritional and psychological effects. Further studies are needed to provide better care in the future for diabetic patient's psychological and nutritional wellbeing and alleviate their healthcare by developing targeted programs, awareness and scheduled home visits.

Keywords: COVID 19; diabetes; mortality rate; outcome.

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1. INTRODUCTION

Coronaviruses are a kind of an enveloped virion of a single strand of RNA genome. In December 2019, the Coronavirus Disease (COVID-19) first appeared in Wuhan, China. It soon became identifiable as a fast spreading infectious disease and by March 2020 it spread to the whole world and was declared pandemic by the World Health Organization (WHO) [1]. Members of the Coronavirus family are usually highly contagious affecting various systems of the human body such as respiratory, hepatic, enteric and even neurologic [2]. A total of seven coronaviruses has been identified from the early 1960 that are actually capable of infecting humans [2]. They can be divided into those that can cause flu like self-limiting symptoms while some can be the cause of pandemics similar to the most recent one of COVID-19 [2]. Therefore, it is important to explore all aspects of how it affects people with other diseases.

Diabetes is a chronic disease that causes high blood sugar from impairment of insulin action or secretion [3]. Globally, it has been estimated that there are more than 425 million diabetics and the figure keeps rising on a yearly basis. Diabetic are divided into two types, Type 1 Diabetes Mellitus (T1DM) which is considered an autoimmune disease and Type 2 Diabetes Mellitus (T2DM) [3]. Moreover, almost 90% of all diabetic patients develop or have a comorbid disease such as hypertension, hyperlipidemia and more. That with the fact that they are considered immune compromised due to the pathophysiological effect of the disease on the immune system makes them more prone to develop and catch infections more than other healthy individuals [3].

High levels of blood sugar circulating the human body can negatively affect and limit the immune system, however, lowering agents of glucose in the body along with anti-viral treatments can moderate the risk of COVID-19 severe complications, but limits to their usage and possible interactions with the treatment of COVID-19 must be prudently evaluated. In fact, adverse acute respiratory syndrome coronavirus 2 infections may itself signify a deteriorating factor for the people having diabetes, because it can precipitate severe metabolic problems by direct negative impacts on β -cell function [4].

The outbreak of COVID-19 has endangered many lives, especially in immunocompromised patients such as diabetics. With the impact of COVID-19, there are possible chances that a

diabetic may face variable factors from the pandemic [5]. However, COVID-19 has dramatically changed the lives of the people and their healthy routines. On a social level, social distancing and limited interactions with friends and families caused a psychological shift for individuals which led to many unwanted depressive status similar to post-traumatic stress disorders [6]. Therefore, it is important to shed light on how the pandemic of COVID-19 affected diabetic in regards to mortality, nutritional and psychological wellbeing.

2. MORTALITY RATE OF COVID-19 IN DIABETES

Over the course of the COVID-19 pandemic, diabetes has been showing an increase in mortality rate among the group. A nation-wide hospital-based study that was done in the United Kingdom in May of 2020 on 23 thousand COVID-19 patients showed that diabetes had the highest death rates among all hospitalized patients with mortality rate of 33.2%. The study further showed that T2DM was associated with higher rates than T1DM and both types have higher mortality rates than other comorbidities. Meanwhile, the reported death in T1DM were slightly younger with a mean age of 72.2 years compared to T2DM with mean age of 79.2 years [7].

Furthermore, Zhu et al. in a retrospective study on 250 T2DM patients with COVID-19 showed that they had a higher incidence rate of fatigue and dyspnea compared to non-diabetics. Furthermore, inflammatory markers such as C-Reactive Protein (CRP), Procalcitonin and D-Dimer were higher in T2DM compared to non-diabetics. Regarding treatment intensity, T2DM patients required more intensive treatment and had a higher need of antibiotics in 61.3% compared to 56.9% in non-diabetics. Meanwhile, when comparing well controlled blood sugar patients with non-controlled glucose levels, well controlled diabetics showed an overall less severity of the disease as well as lower mortality rate than non-controlled diabetic patients [8].

Similarly, Guo et al. reported a similar pattern of laboratory characteristics concerning patients with diabetes who were hospitalized due to COVID-19 infection. They found in their study that diabetic COVID-19 patients are more prone to develop pneumonia and their inflammatory biomarkers, which includes, Interleukin-6, D-Dimer, CRP and serum ferritin were statistically significant ($P < 0.01$). As a result, diabetics with COVID-19 are more susceptible to inflammatory

and cytokine storms which makes them more prone to rapid deterioration [9].

Even though diabetes can lead to greater mortality by itself, having other factors may also contribute to worsening the outcome of diabetics' patient by developing severe COVID-19 as well as Acute Respiratory Distress Syndrome (ARD). A study that was done by Huang et al. analyzing 30 studies on COVID-19 patients and their relationship with diabetes showed that some other factors can increase the severity of the disease in diabetics. Surprisingly, age and hypertension when weighed against diabetes can have the same high mortality in COVID-19 patients. For instance, a study by Hung et al. showed that hypertension in young diabetic patients have more severe effect than older diabetics with hypertension [10].

Hypothetically, the reason behind why diabetics develop more severe course of the disease has been linked to Angiotensin Converting Enzyme – 2 (ACE2) as the Coronavirus utilize it on the surfaces of the epithelial cells to trick the cell and enter and infect it. As many diabetics are also treated with hypertension, they are often prescribed Angiotensin Converting Enzyme Inhibitor (ACEI) which can increase the expression of ACE2 in the cells. Therefore, increasing the viral chances of binding to cells. However, there has not been any study to this date stating that diabetics are more prone to infection than older nor hypertensive patients [10,11].

3. NUTRITIONAL EFFECT

COVID-19 can have nutritional adverse effects on diabetic patient. The first, discussing the effect of restrictions and their effect on diabetics during the time of lockdowns. The latter, being the effect of COVID-19 itself on the nutritional status of the diabetic population.

A study in Poland done through distributing a questionnaire among diabetic population to see the impact of restrictions on the lifestyle of diabetics demonstrated that 60% of the respondents actually had better consumption of healthy meals while 65% started eating more regularly than before the restrictions occurred. Surprisingly, with home restrictions, diabetics reported that they had more sense of control over their time and that made their dietary habits healthier than when they were busy with life. An increase in water, vegetables, fresh fruits and grains was almost doubled than the time before

the pandemic in comparison a substantial decrease in fast food and unhealthy meals to almost half the amount [12].

Another study was done in Spain during the time of lockdown on T2DM patients to explore the effect of lockdowns on their dietary and exercising habits. Ruiz-Roso et al. reported an increase in vegetables consumption when compared to that before the lockdown. Furthermore, the number of meal consumption per day showed another jump from 1-2 meals per day to up to 5 meals and snacks on a daily basis [13]. This can be attributed to the fact that during the lockdown, individuals started to have more self-awareness, leading them to be less prone to self-neglect by taking control of their lives and the disease itself.

Generally, any inflammatory response in the body results in shifting the metabolic status to a catabolic state [14]. As COVID-19 disease can be complicated by severe inflammatory storms, the human body puts itself in the catabolic state which is characterized by increased rates of inflammatory biomarkers and breaking down molecules to provide more energy, followed by a decrease in anabolic state, which leads to decreased insulin anabolic state resulting in greater insulin resistance [15]. Due to the increased rate of stress on COVID-19 diabetics during hospitalization from fever or mechanical ventilation, an increase in the shift of the metabolic status can make the body go into a hypercatabolic state. This can greatly alter the field of combat in trying to minimize mortality rate in such patients. Similarly, being affected in the gastrointestinal tract can further lead to more nutritional deterioration which makes nutrition a focus when treating critically ill COVID-19 diabetic patients [16]. Lastly, more studies have been studying the effect of nutrition in combating and even preventing the infection of COVID-19 by seeing the effect of Vitamins, good nutrition habits and consumption of healthy meal. Generally, Vitamin D and Zinc can tailor and optimize the immune system making it optimal as Vitamin D levels are commonly decreased in critically ill patients. Furthermore, Zinc also have a level of influence on leukocytes with regards to their proliferation, differentiation and maturation [16]. Therefore, nutrition can play a vital role in COVID-19 patients, especially in diabetics.

4. PSYCHOLOGICAL EFFECT

The psychological burden of the pandemic is affecting all groups of individuals, healthy or

diseased, young or old. However, diabetes is often a disease that can affect the psychology and mental status of patients greatly in normal days. One of the most important factors that needs exploring according to the World Health Organization (WHO) is the mental health status of individuals. Lockdown regulations on diabetics have been explored in many studies throughout the last couple of months. General disasters have always been linked to disruption of the psychological status of the diabetic population. Depression and anxiety have been reported as the most common effects of epidemics, disasters and pandemics. In the United Kingdom, it was found that during the lockdown, diabetic patients were more likely to cancel their hospital appointments for fear of contracting the virus, or thinking that they will be disturbing the healthcare system further during these unprecedented times. As a result, non-COVID-19 deaths during the pandemic appeared to be rising [17].

Alshareef et al. studied the impact of lockdown restriction that happened in Saudi Arabia in Jeddah City. The study utilized the Kessler Psychological Distress Scale 5 points system and showed that out of 349 participants, the psychological impact of the lockdown the first 4 weeks did not greatly affect the mental status. However, some reported that they experienced fatigue that they never felt before, and only few were feeling nervous about the whole situation. Moreover, medication compliance have been greatly impacted by lockdowns during the pandemic leading to worse glycemic control which further the complications more [18]. Furthermore, another great undermined psychological effect is the burden of self-management which can increase the susceptibility of being depressed further leading to what is known as psychological insulin resistance [19]. For instance, developing anxiety and stress from the burden of continuous self-monitoring such as measuring blood sugar, hypoglycemic emergencies and arranging follow up visits.

5. LIMITATION AND FUTURE IMPLICATIONS

Diabetic complications are varied ranging from metabolic, renal, ophthalmic, neurologic to vascular. Nonetheless, the aftermath of the lockdown that occurred in many countries due to the spread of COVID-19 is yet to be well known completely. There are many factors that are yet to be discovered when it comes to diabetes and

the burden it carries during disasters and lockdowns. For example, peripheral arterial disease has been well connected with diabetes [20]. It is more common with increasing age and pre-existing peripheral neuropathy making it a further potential factor that should be explored among the population. Many studies showed great variation of the incidence of diabetic foot ulceration, with some studies reporting decreased monthly rate [21] while some studies reported an increase in overall complications by up to 14% in some factors [22].

A wide hospital-based studies should be targeting all diabetic patients to assess the amount of complication they witnessed during lockdown, as until now some countries are still implementing lockdown measures whenever a spike of infection happens. It can be done on a basis of phone interviews in a systematic manner assessing every system at a time and suggest a program specially made for diabetics for home visits. This can greatly reduce the burden of the disease from the patients and alleviate their psychological status making them feel cared for and less worried. This is extremely important to even provide governments and scientists more accurate statistics related to the issue as the spread of the disease started to take a toll on countries and governments, the media became a tool that is faster than peer reviewed papers, making those cites an official citation sources.

6. CONCLUSION

COVID-19 have a higher mortality rate in diabetic patients with established increase in inflammatory biomarkers and producing a hypercoagulable state. Furthermore, nutritional value and self-awareness was noticed to be better among them during lockdowns when compared to before the pandemic. Regarding the psychological impact, diabetic patients are reporting more rates of anxiety and depression. Lastly, some other diabetic complications have not been reported enough in the literature such as retinopathy, neuropathy and ulceration. Constructing a nation-wide study assessing all the possible complications that may arise in diabetics is a must to provide us with a better approach in the future during disasters or pandemics.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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