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Applications, Challenges and Health issues in Diabetes Management for COVID -19 Pandemic

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Abstract- *This paper intends to integrate the current information about that diabetic patients suffering health issues and many complications are including like Viral infections, Diabetic ketoacidosis(DKA), Pneumonia, Dehydration, High blood sugar ,obesity and high risk factors are caused by the novel coronavirus, can lead to serious complications in diabetic patients in times of Coronavirus disease (COVID-19). This paper presents , Diabetes Mellitus describes the group of metabolic disorders ,it is a long term condition that causes high blood sugar levels and Diabetes is a serious problem in public healthcare now a days .This is spreading all over the world due to imbalance of health related issues like improper diet, sleep, exercise. In this paper due to COVID -19 much focused on diabetic people because of poor prognosis in those with the infection. Starting review was mainly depends on people with type 2 diabetes, although recent surveys have shown that individuals with type 1 diabetes are also at risk of severe COVID-19. The main reason for bad diagnosis in diabetic people likely to be multi-factorial, thus reflecting the syndromic nature of diabetes. Coronavirus having these effects on β-cell function might also cause diabetic ketoacidosis in individuals with diabetes, hyperglycaemia at hospital admission in individuals with unidentified antiquity of diabetes and potentially new-onset diabetes. This paper clearly explains due to Glucose-lowering agents and anti-viral treatments can modulate the risk, but limitations to their use and potential interactions with COVID-19 treatments should be carefully assessed. These papers briefly review the general characteristics of the novel coronavirus (SARS-CoV-2) and provide a better understanding of the coronavirus disease (COVID-19) in people with diabetes and its management.*

Keywords:- Diabetic ketoacidosis (DKA, Pneumonia, High blood sugar , Obesity and COVID-19.

Introduction

COVID-19 is a highly infectious disease caused by the novel coronavirusCOVID-19 (Corona virus Disease-2019), a disease caused by the coronavirus SARS-CoV-2 (Severe Acute Respiratory Syndrome-Coronavirus-2), has emerged as a rapidly spreading communicable disease affecting more than 100 countries across the globe at present. This disease is primarily spread through large respiratory droplets, though the possibility of other routes of transmission cannot be ruled out, as the virus has been found in stool and urine of affected individuals [1]. The disease acuteness has changed from mild self-limiting flu-like illness to fulminate pneumonia, respiratory failure and death. There are divisional fluctutations in the mortality rates and these estimates are rapidly changing as more data are

becoming available. People around 95,333 confirmed cases of COVID- 19 worldwide with a mortality rate of 3.4% according to the situation report of World Health Organisation on March 5, 2020 [2]. However, a much lower mortality of 1.4% has been reported in analysis of data of 1099 patients with laboratory-confirmed COVID-19 from 552 hospitals in mainland China[3].Considering that the number of unreported and unconfirmed cases is likely to be much higher than the reported cases, the actual mortality may be less than 1%, which is similar to that of severe seasonal influenza [4]. India has 39confirmed cases till 10th March, 2020 and contact surveillance of these cases is going on. At present a particular drug or vaccine unavailable for managing COVID-19. Worldwide Uncontrolled SARS CoV-2 pandemic requires novel medical strategies to control the severity of disease and death due to complications of the 15–20% patients that develop pulmonary symptoms, a fragment develops an acute respiratory distress syndrome (ARDS) rapidly progressing into a critical condition. Health-care systems are now focused on addressing this segment of patients who are prone to severe ARDS and are also trying to understand the causality and treatment modalities in the medical arsenal to prevent the associated mortality.

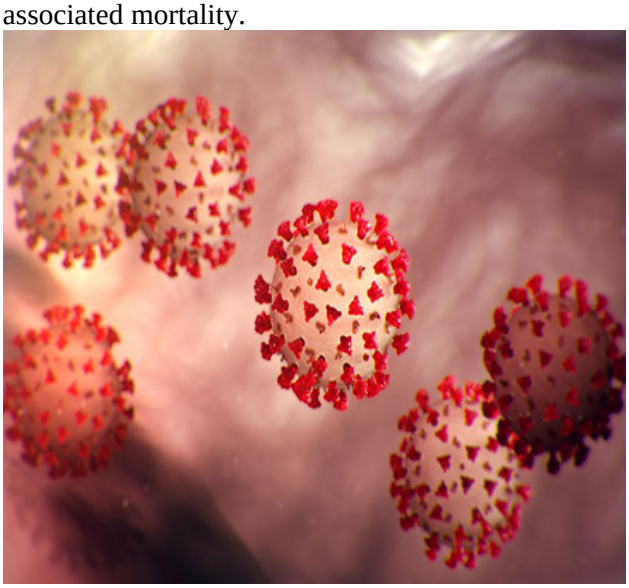


Fig. 1: Corovavirus-2019.

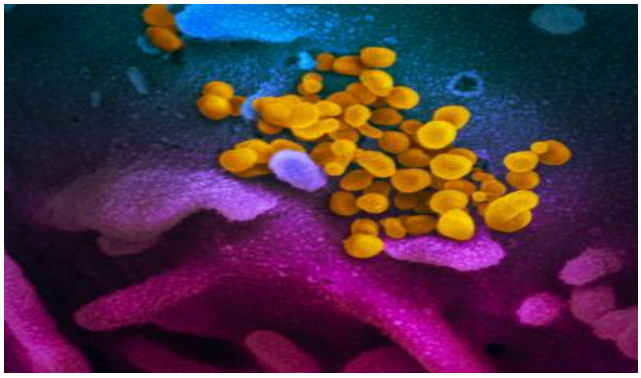


Fig. 2: Novel Coronavirus Sars Cov-2

Previous Study:

1. Diabetes Mellitus :

Diabetes is very complex, chronic disease and an increasingly significant health problem as the incidence increases worldwide. In other words it is a multi-factorial disease. In 2030 the World Health Organization (WHO) estimates 366 million people are prone to diabetesabout (5 % of total world's population). Diabetes is a disease often referred to by doctors as Diabetes mellitus[5-8] . Diabetes mellitus means group of metabolic diseases in which has high blood glucose (blood sugar) the body doesnot produce properly insulin levels that results from defects in insulin secretion .Normally blood glucose levels are tightly controlled by insulin,aharmone produced by pancreas .Insulin is released from the pancreas to normalize glucose levels .In diabetic patients the absence or insufficient production of insulin causes Hyperglycemia. Diabetes mellitus is the major important cause of blindness in adults and additionally it is a very risk factor in coronary heart disease is varies from two to four times higher in diabetic patients. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels.

2. Respiratory infections due to COVID-19 :

The people having with diabetes with are at risk of infections, majorly influenza and pneumonia. This risk can be reduced, though not completely eliminated, by good glycaemia control. People

suffering with diabetes (above 2 years of age) are recommended pneumococcal and annual influenza vaccinations. Not only this, patients with diabetes have a severe disease when infected with respiratory viruses People with certain medical conditions may have a higher risk of severe illness from COVID-19. Severe Acute Respiratory Syndrome (SARS) coronavirus and Middle East Respiratory Syndrome-related coronavirus (MERSCoV) [9-11]. These circumstances encompasses diabetes, heart problems, obesity, and chronic kidney disease. Especially , the available evidence suggests that people with type 2 diabetes have a higher risk of severe illness from COVID-19, according to the Centers for Disease Control and Prevention (CDC).People with type 1 or gestational diabetes may also have an increased risk factor.

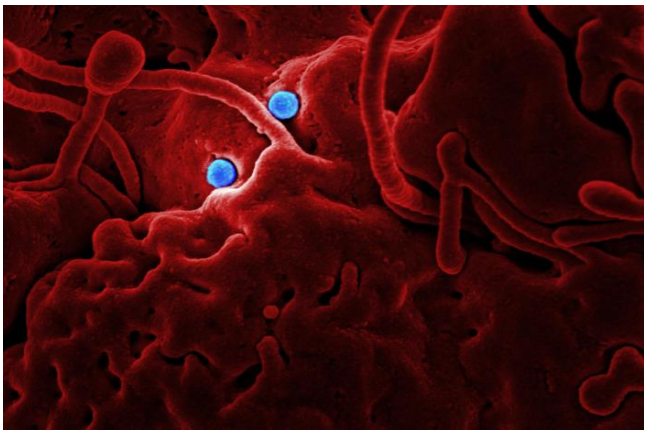
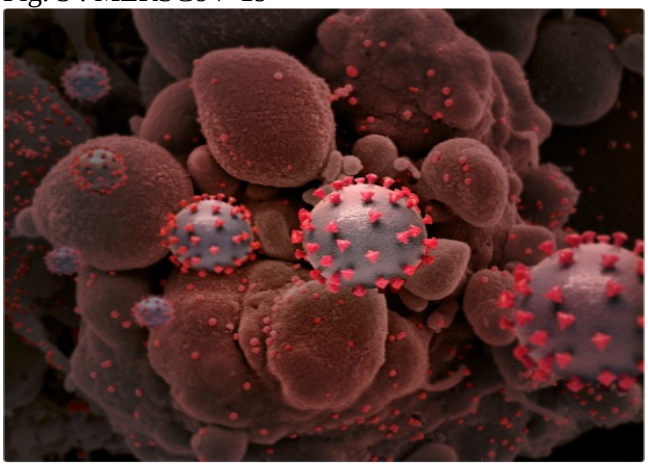


Fig. 3 : MERSCoV-19



e **Fig.4 :** Severe Acut3 Respiratory Syndrome SARS CoV-2.

3. Symptoms of COVID-19 in diabetic patients: Majority of people the symptoms of COVID-19 are relatively mild and do not require specialist treatment in a hospital. Sensitive Inications may include a fever, a cough, a sore throat, tiredness, and shortness of breath. However, people suffering with diabetes may have a higher risk of developing severe complications like difficulty breathing or pneumonia. We can understand how COVID-19 may affect people with diabetes. It tends to appear 2–14 days after exposure to the virus SRS-CoV-2 and can includes Fever, Cough, shoretness of breath, fatigue, headache, loss of smell or taste. In general, infections are very severe in people with diabetes. One reason is that diabetes affects the way the immune system works, making it harder for the body to fight viruses diabetes causes high blood sugar levels and the International Diabetes Federation (IDF)[12] observe that the novel coronavirus “may thrive in an environment of elevated blood glucose.”Diabetes also keeps the body in a low-level state of inflammation which makes its healing response to any infection slower. High blood sugar levels combined with a persistent state of inflammation make it much more difficult for people with diabetes to recover from illnesses such as COVID-19. However, by controlling their blood sugar levels well, people with diabetes can reduce the problems of getting severely sick from COVID-19. Infections of Diabetic patients with Type 1, type 2, and gestational diabetes:

More than 425 million people having diabetes disease worldwide. Mainly three types of diabetes are type 1 and type 2, and gestational diabetes can develop during pregnancy. Type 1 diabetes usually develops in children and adolescents 10%of all people with diabetes have Type 1 Diabetes [13-14]. It is an autoimmune condition that causes the immune system to destroy the beta cells of the pancreas. Due to this results in little to no production of the hormone insulin. A person with this condition needs to take insulin daily to keep their blood sugar levels healthy. Type 2 diabetesis the most common form, accounting for around 90–95% of all diabetes cases. The body produce enough

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insulin or using any existing insulin efficiently, due to an issue called insulin resistance.

II. Materials and Methods

Sample Code	Frequency v(MHz)	Ultrasonic Velocity	Absorption coefficient α/f^2	Modulus of Elasticity(x 10^{11} dyne/cm^2)	Loss Modulus(x 10^8) dyne/cm^2
DB1	1	1585	0.017	0.440	2.162
	2	1771	0.028	0.510	5.550
	3	1595	0.029	0.976	28.789
	5	1676	0.026	1.015	157.275
	10	1770	0.013	6.456	541.341
DB2	1	1545	0.026	0.213	0.676
	2	1632	0.028	0.561	6.549
	3	1736	0.038	0.607	11.266
	5	1904	0.035	1.108	67.738
	10	1932	0.020	3.004	616.626

Table 1: Data on average values of Ultrasonic, Acoustic and Elastic parameters of Diabetic Blood.

In the Present study people with only diabetic disease the coefficient of viscosity in diabetic blood and its constituents is high when compared to normal blood and its constituents . This is because of either low insulin level or insulin resistance at many body cells. Therefore hem rheological parameters in diabetes mellitus are often disturbed. In diabetes mellitus, there is sufficient evidence that the elevated blood viscosity is a pathogenetic factor of diabetic microangiopathy, altering microcirculation and leading to insufficient tissue nutrition.Using Ultrasonic Interferometer we can determined Ultrasonic parameters like Acoustic ,Elastic of different constitutents in Normal an Diabetic persons and we can calculated and tabulated ultrasonic velocity of Normal and Diseased blood at different frequency ranges using Ultrasonic interferometer those results showing the coefficient of viscosity and volume flow rates are gradually increases which depends on glucose levels with corresponding increase of radius because of blood nature is a viscous

In this method Diabetic People are suffering with COVID-19 disease more difficult than usual to obtain medicines, including diabetes medications, during the ongoing COVID-19 pandemic.

Fig. 5: Experimental Setup: Ultrasonic Interferometer.

From the above table gives the data on average values of ultrasonic, acoustic and elastic parameters of diabetic human blood and its constituents. Ultrasonic velocity, absorption coefficient, modulus of elasticity and loss modulus were calculated at different frequency ranges and tabulated using Ultrasonic Interferometer.

Complications or Health effects in Diabetic patients due to COVID-19:Viral infections, Diabetic ketoacidosis(DKA), Pneumonia, Dehydration, High blood sugar , obesity and high risk factors are caused by the novel coronavirus, can lead to serious complications in diabetic patients in times of Coronavirus disease (COVID-19).People with type 2 diabetes, although recent surveys have shown that individuals with type 1 diabetes are also at risk of severe COVID-19. The reason bad diagnosis in people with diabetes is likely to be multifactorial, thus reflecting the syndromic nature of diabetes. High risk factors are in Age, sex, ethnicity, comorbidities such as

hypertension and cardiovascular disease, obesity, and a pro-inflammatory and pro-coagulative state all probably contribute to the risk of worse outcomes. In this Coronavirus pandemic season leads to various complications in diabetic patients follows.

Diabetic ketoacidosis: During periods of stress or illness, blood sugar levels may rise. Diabetic ketoacidosis (DKA) occurs when a person with diabetes does not have enough insulin available to deal with this elevation. The body starts with break down fats for energy, resulting in a buildup of ketones in the blood. Ketones produces the blood more acidic, which can quickly cause serious health problems.

Pneumonia: Pneumoniastems are produced from an infection that causes inflammation of the air sacs of the lungs. As the CDC note, people with diabetes who develop COVID-19 have a higher risk of developing a more severe form of COVID-19 — one that involves pneumonia. Few investigations are suggest that everyone with diabetes who is older than 2 years should receive pneumococcal and annual influenza vaccinations.

High blood sugar: Infections cause a stress response in the body, increasing the production of glucose. This results in higher-than-normal blood sugar levels , As a result, a person may need extra insulin during an infectious illness. Main factor is to monitor blood sugar levels more frequently than usual, as they can suddenly spike.

Obesity Many reports have linked obesity to more severe COVID-19 illness and death.6,23,49 Several mechanisms can account for this association. The first concerns the detrimental restrictive ventilatory effect of abdominal fat.50 In a French study,51 the risk for invasive mechanical ventilation in patients with COVID-19 admitted to an ICU was more than seven times higher in those with a BMI of more than 35 kg/m² than those with a BMI of less than 25 kg/m². Second, in addition to the ventilatory defect, the respiratory dysfunction in patients with severe COVID-19 might depend on impaired lung perfusion due to intravascular disseminated coagulation.

Measures to prevent COVID-19:

Specific Measurements in diabetic patients: It is important that people with diabetes maintain a good glycaemic control, as it might help in reducing the risk of infection and also the severity. More frequent monitoring of blood glucose levels (with use of self-monitoring blood glucose) is required. Good glycamic control [15] may lessen chances of superadded bacterial pneumonia as well.

We can understand about the prevalence of COVID-19 and disease course in people with diabetes will evolve as more detailed analyses are carried out. For now, itis reasonable to assume that people with diabetes are at increased risk of developing infection with SARS-CoV-2. Coexisting heart disease, kidney disease, advanced and frailty are likely to have further increase in the severity of disease.

Following measures are suggested for prevention of this disease in patients with diabetes:

1. The novel coronavirus spreads through tiny droplets that spray into the air when a person with the infection sneezes or coughs. People with 6 feet, or 2 meters, of the person can inhale these droplets.
2. The virus can also transmit via surfaces that a person with the infection has touched.
3.People with diabetes can protect themselves from contracting the virus in the same way as everyone else,

- Frequently wash your hands with soap ,using an alcohol-based hand sanitizer when soap and water are not available, avoiding frequently touched surfaces when possible, frequently disinfecting any potentially contaminated surfaces, such as countertops, tabletops, and door handle not touching the eyes, nose, or mouth with unwashed hands, practicing physical distancing by staying 6 feet, or 2 meters, away from others in public. In case a person with diabetes develops fever, cough, running nose or dyspnoea, the appropriate health authority needs to be notified as testing for this disease is available at selected places..Patients with type 1 diabetes[16] should measure blood glucose andurinary ketones frequently if fever with hyperglycemia occurs.

- Frequent changes in dosage and correctional bolus may be required to maintain normoglycemia., Anti-hyperglycemic agents that can cause Anti-hyperglycemic agents that can cause volume depletion or hypoglycaemia[17] should be avoided. Dosage of oral anti-diabetic may need to be reduced. Patients should follow sick day guidelines and may need more frequent monitoring of blood glucose and drug adjustment .Hospitalised patients with severe disease need frequent blood glucose monitoring. Insulin is the preferred agent for control of hyperglycemia in hospitalised sick patients.

III. Results and Discussions

It is evident that observed from Diabetic mellitus , the previous study deals People with diabetes the coefficient of viscosity in diabetic blood and its constituents is high when compared to normal blood and its constituents because of either low insulin level or insulin resistance at many body cells ,hence hemrheological parameters in diabetes mellitus are often disturbed. Using Ultrasonic Interferometer determined acoustic ,elastic parameters of different constitutents in Normal and diabetic persons of blood and showing the coefficient of viscosity and volume flow rates are gradually increases which depends on glucose levels with corresponding increase of radius because of blood nature is a viscous. During COVID-19 Pandemic are at a greater risk of worse prognosis and mortality. Given the high worldwide prevalence of diabetes, these individuals represent a large vulnerable segment of the COVID-19 [18] population. The poorer prognosis of people with diabetes is the likely consequence of the syndromic nature of the disease hyperglycaemia, older age, comorbidities, and in particular hypertension, obesity, and cardio vascular disease all contribute to increase the risk in these individuals. The picture, however, is more complicated as it requires factoring in societal factors such as deprivation and ethnicity as well as factors that become relevant at the time that a patient with severe COVID-19 needs to be managed. Physician has to give account for not only the health status of the person with diabetes but also to balance carefully glucose-lowering treatments with specific treatments for the viral infection. Once again, diabetes management in patients with COVID-19 poses a great clinical challenges.

IV. Conclusion

COVID-19 pandemic situation the development of new drugs should focus on and expedite the strategies where safety and efficacy are proven. Antigenic immunotherapeutic approaches such as convalescent plasma, intravenous immunoglobulin's, and mAbs have a proven record of safety and efficacy and are in use for decades. Few are already being used to manage COVID-19 patients and found to be useful. Physician has to give account for not only the health status of the person with diabetes but also to balance carefully glucose-lowering treatments with specific treatments for the viral infection. Diabetic Management is helpful to extent ,for the identification and evaluation of Diabetes mellitus it has many possible applications in medical field also study bio physical aspects of normal and diabetes mellitus of plasma, it is essential in different drug delivery systems in medical field as provided by physicist and developed in Biological, Biochemistry and Pathological divisions HowevermAbs having virus neutralization potential is the need of the hour during this COVID-19 pandemic to be more specific and virus targeted. The research and developments needs to be accelerated to bring them into clinical use for prophylactic and therapeutic purposes against COVID-19. Once again, diabetes management in patients with COVID-19 poses great clinical challenges.

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