

Impacts of SARS-Cov-2 Infection on Diabetic Patients

Rasool khan Hayat^{1*}, Shahid Ullah Zadran², Abu Zar Shinwari³, Abdul Rafey Popalzai⁴, Ubaidullah Niazi⁵

Abstract

The present pandemic of SARS-CoV-2 coronavirus disease 2019 (COVID-19) is a serious challenge to Diabetes patients. Such patients may experience mild to more severe illnesses, organ failures, comorbidities and high risk of mortality due to pulmonary and cardiac involvement. This study was carried out to investigate the effects of Covid-19 on patients with Diabetes admitted to Afghan Japan Communicable Disease Hospital, Kabul, Afghanistan. The medical records of 102 patients were reviewed who were hospitalized due to Covid-19 from March to July in 2021. Data was collected on Diabetes status, Comorbid conditions and Laboratory Results. The data was analyzed using SPSS 20 (IBM). The data analyzed shows (56.86%) were male with diabetes and (43.14%) were female, and (70%) of patients had age more than 50 years. The mortality rate was much higher than expectations (49%). The most common complications reported in diabetic patients died of COVID19 were Acute Respiratory Distress Syndrome ARDS (82%), Cardiac Pulmonary Arrest (CPA) (82%), Pneumonia (70%), Respiratory Failure (54%), Sepsis (46%), and Chronic obstructive pulmonary disease (COPD) (6%). Diabetic patients who are infected with SARS-CoV-2 are at higher risk of mortality. Our findings suggested that diabetes did not significantly impact the prognosis of Covid-19 patients but negatively affect their clinical course. Further actions should be taken to make a significant step forward in the care for Diabetes patient. Research is needed to find the molecular changes occur in expression level which leads to serious complications in diabetic patients who are infected with SARS-CoV2.

Keywords: SARS-COV-2; Diabetes; Comorbidity; Mortality

- 1 Department of Molecular Biology, Afghan Japan Communicable Diseases Hospital, Bachelor of Medical Laboratory Technology (MLT) Faculty of Medical Technology Spinghar Institute of Higher Education (SIHE), Kabul Afghanistan
- 2 Assistant Professor, Faculty of Biology, Kabul University, Afghanistan, MSC Biotechnology South Asian University, India
- 3 Master of Business Administration (MBA), Bakhtar University, Kabul Afghanistan
- 4 Department of Molecular Biology, City Health Center, Bachelor of Medical Laboratory Technology (MLT), Faculty of Medical Technology (SIHE), Kabul Afghanistan
- 5 Head of Laboratory Department Spinghar Institute of Higher Education (SIHE), Bachelor of Medical Laboratory Technology (MLT), Kabul Afghanistan

Corresponding author:

Rasool khan Hayat

✉ rasoolshinwari94@gmail.com

Tel: 0702054381

Department of Molecular Biology, Afghan Japan Communicable Diseases Hospital, Faculty of Medical Technology, Spinghar Institute of Higher Education (SIHE), Kabul Afghanistan

Citation: Hayat RK, Zadran SU, Shinwari AZ, et al. (2022) Impacts of SARS-Cov-2 Infection on Diabetic Patients. J Biomed Sci, Vol. 11 No. 9: 80

Received: 27-Aug-2022, Manuscript No. IPJBS-22-13000; Editor assigned: 29-Aug-2022, **PreQC No.** IPJBS-22-13000 (PQ); **Reviewed:** 12-Sep-2022, QC No. IPJBS-22-13000; **Revised:** 16-Sep-2022, Manuscript No. IPJBS-22-13000(R); **Published:** 23-Sep-2022; DOI: 10.36648/2254-609X.11.9.80

Introduction

Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) is the novel strain of coronaviruses, which was identified in China, Wuhan in December 2019 that commonly causes respiratory tract infection [1]. SARS-CoV-2 has 70% similarity to (SARS-CoV) [2]. Majority of people having COVID19 may experience mild to moderate illness of respiratory system that recovered without any proper treatment. People who are aged 60 or above [3], having Diabetes, Hypertension, cardiovascular disease and Cancer are at high risk [4].

Covid-19 spread through different ways like saliva and respiratory droplets of an infected person and enter the body through mouth, nose and eyes, whenever a person come in touch with a patient, there are less chances of infection after 24 hours and

the virus will be active on skin for about 72 hours [5]. To keep ourselves safe from Covid-19 everyone should follow medical

protocols for example, wearing mask, social distance, washing hands, disinfection of surfaces, and healthcare workers must use Personal Protective Equipment's (PPE) [6].

Until now (18-Sep-2021) there have been 228,421,913 detected cases, 4,692,937 died and 205,000,803 people recovered from Covid-19 around the world [7]. As it is known that SARS-CoV-2 is a worldwide pandemic and the first confirmed case in Afghanistan was registered in Herat province on 24-Feb-2020, a 35 years old man that had recent travel history to Iran, since then the virus spread to all over the country and most cases were reported in Kabul [8]. As of 18-Sep-2021, there have been 154,532 confirmed positive cases, 7,195 deaths, 122,080 recovered and 25,257 active cases across 34 provinces [9].

According to World Health Organization (WHO) Covid-19 generally cause mild to moderate symptoms in patients who doesn't have any continues illness, they may experience fever, dry cough, headache, body pain, weakness, confusion, loss of smell or taste and shortness of breath. Patients with Diabetes, Obesity, Hypertension, Cardiovascular disease, Respiratory Disease, old age, Cancer and patients with immune system disorders may experience mild to more severe symptoms and are at high risk of comorbidity and mortality, they may experience Acute Respiratory Distress Syndrome (ARDS), severe Pneumonia, Shortness of Breath (SOB), Sepsis to Septic Shock, Ischemic Heart Disease (IHD), Acute kidney infection (AKI), Respiratory Failure, Cardio Pulmonary Arrest (CPA) [10].

Diabetes is a long-lasting disorder of endocrine system that occurs when your body doesn't use insulin properly or doesn't make enough insulin, it requires continues care that body changes food to energy [11], such as regular physical activity, weight control, Medication, healthy diet, avoid eating sugar and fats and stay away from smoking as it increased risk of diabetes and cardiovascular disease [12]. Diabetes can cause damage to many body's organs, leading to deactivating and life-threatening health complications such as cardiovascular diseases (CVD), destruction of nerves (neuropathy), kidney destruction (nephropathy) and eye disease (leading to retinopathy) [13]. The present pandemic of SARS-CoV-2 coronavirus disease 2019 (COVID-19) is particular challenge to Diabetes patients. Diabetic patients infected with SARS-CoV-2 may experience mild to more severe illnesses, organ failures, comorbidities and High risk of mortality due to pulmonary and cardiac involvement.

Materials and Methods

Sample Collection

Sample from all covid-19 suspected patients was collected through proper WHO guidelines. Both Oropharyngeal and Nasopharyngeal swabs were taken from each patient using VTM and Swab.

Transport and Storage

After collection, the samples were properly labelled with patient unique ID and shifted in Ice-box to laboratory. Inside lab the sample were either directly processed for RNA extraction or stored below 4C⁰ in refrigerator for further processing.

Extraction of RNA

Total RNA from samples was extracted using Qiagen RNA extraction kit. 140 ul sample was transferred to a sterile micro centrifuge tube, then added 560 ul lysis buffer and mixed immediately. Incubated at room temperature for 10 minutes and then briefly centrifuged. 560 ul absolute ethanol was added and mixed by vortexing the micro centrifuge tube [14]. The mixture was transferred to mini spin column in two steps and centrifuged at 8000 rpm for 1 minute. Spin column was then washed with 500 ul wash buffer 1 and wash buffer 2 and centrifuged at 8000 rpm for 1 minute respectively. Spin column was centrifuged again at full speed for 1 minute for complete dehydration. 60 ul elution buffer was added to spin column and centrifuged for 1 minute at 8000 rpm to elute the total RNA into a 1.5 ml micro centrifuge tube. The extracted RNA was stored below -20C⁰ for amplification.

Amplification of RNA

SanSure Biotech SARS-CoV-2 amplification kit was used to amplify the extracted RNA. This kit targets the ORF1 gene and N Genes of SARS-CoV-2. Before using the kit all the reaction components of the kit were brought to room temperature. The IC provided in amplification was used in Extraction process for better result. 30ul of master mix and 20ul of extracted sample/ positive control/ negative control were mixed into a separate PCR tubes. All tubes were placed into the reaction chamber and set up the profile according the protocol provided in the kit. A thermocycler named Rotor Gene 5Plex HRM Q (MDx S/No 0717331, Germany) was used for the amplification. The assay was considering valid when had IC amplification curve, positive control graph and no graph in negative control. The sample was considering positive when had amplification of both ORF1 gene and N gene or any one of them. Samples with no amplification in ORF1 gene and N gene were considered negative for SARS-CoV-2.

Blood Glucose Level

Patients random glucose level (RBS) and fasting glucose level (FBS) were checked regularly using semi-automated analyzer MicroLab300. Patients having FBS level above 120 mg/dl and RBS above 140 mg/dl were considered in diabetic category.

Clinical Data Collection

To collect the data of patients who were covid19 positive and diabetes, the clinical record file of every patients was examined daily and noted accordingly. Fever, body pain, cough, shortness of breath, sore throat, weakness, nausea, chest pain and loss of smell were the parameters that are checked and noted routinely. Beside that severe complications such as pneumonia, respiratory failure, cardiac pulmonary arrest, acute kidney failure, sepsis, and diarrhea were also observed and noted.

Data Analysis

Data was analyzed using IBM SPSS Software version 20.

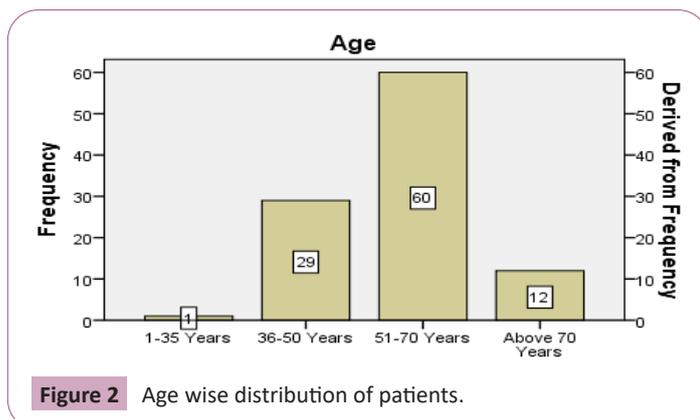
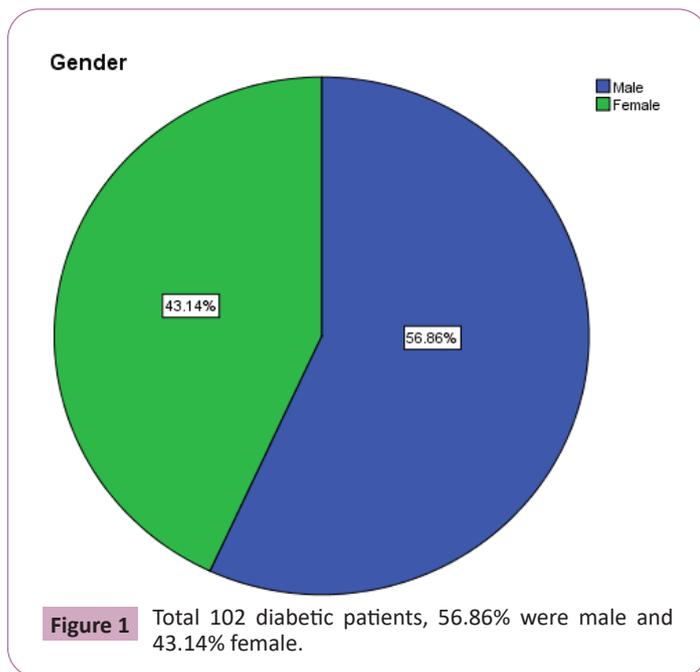
Results

Gender

Total 102 diabetic patients who were confirmed by RT-PCR for SARS-CoV-2 infection were admitted in Afghan Japan hospital of Communicable diseases. Out of 102 patients, 58 were male patient and 44 were female patients. This data was collected during 3 months from March to July (**Figure 1**).

Age

Patients on the basis of age were categorized into 4 groups. Group A (1-35 yrs), Group B(35-50 Yrs), Group C (50-70 yrs) and Group D (above 70 yrs). Among them only one patient was included in group A. 28.4% patients were present in group B, 58.8% patients in group C and 11.7% were in group D which were above 70 years old. The percentage of diabetic patients which had positive covid19 infection was higher in age group C (58.8%) as compare to other groups. Age group B (28.4%) included second highest number of patients positive for diabetes and covid19 (**Figure 2**).



Blood Sugar Level of Patients

The fasting and random blood glucose level of all admitted patients were checked and noted on regular basis. 95% of patients had their blood glucose level above the normal range and were categorized as strongly diabetes, other 5% of patients have variable range of glucose level. Sometimes their glucose level was above the normal range and sometimes was recorded on the borderline. Those patients were categorized as pre diabetic. Only one patients had variable glucose level between diabetic and non-diabetic. Fasting blood glucose and random blood glucose were checked for all patients (**Figure 3**).

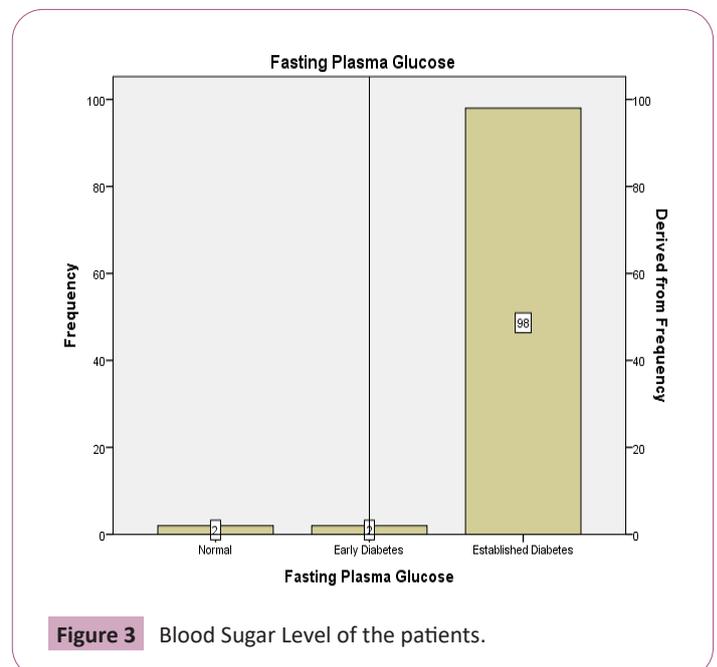
Death Rate

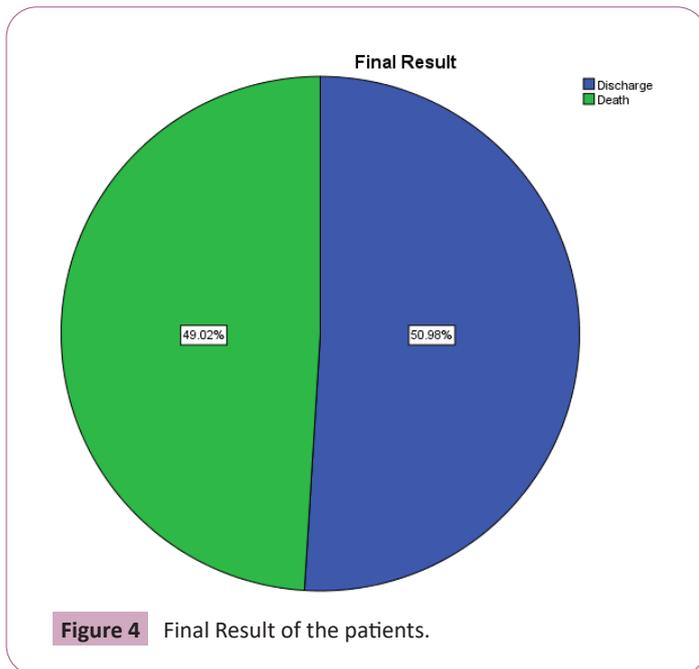
Death rate in diabetic patients was much higher than expectations. Total 102 diabetic patients were positive for covid19 that were admitted to Afghan Japan hospital of communicable diseases. 49% death rate was recorded in 102 diabetic patients. 50 patients were dead during their covid19 infection and 52 patients were successfully recovered and discharge after prolong stay in hospital. The recovered patients also experienced the same complications that were reported in patients who were dead (**Figure 4**).

Complications in Diabetic Patients

Diabetic patients with covid19 have experienced serious complications that are uncommon in normal person having covid19 infection. SOB (91%), Dry Cough (85%), Fever (79%), Body pain (64%), Headache (49%), Sore Throat (15%) and Weakness (13%) was reported in patients.

The patients also experienced Acute Respiratory Distress Syndrome ARDS (61.8%), Pneumonia (52.9%), Cardio Pulmonary Arrest CPA (40.2%), Respiratory Failure and Sepsis (26.5%), Chronic Obstructive Pulmonary Disease COPD (8.8%), Septic Shock and Chronic Kidney Injury CKI (5.9%), and (2.9%) have experienced Ischemic Heart Disease (IHD). The patients who had lost their lives have experienced the signs of CPA and ARDS (82%),





Pneumonia (70%), Respiratory Failure (50%), Sepsis (46%), Septic Shock (12%), AKI & IHD (4%) and COPD (6%).

Discussion

This is the first study conducted in Afghanistan about the complications and impacts of covid19 on diabetic patients. The result obtained from this study have an alarming for diabetic patients. Male and female diabetic patients have experienced equal complications during their covid19 infection but the severity was increased with the increased age of the patients. It means that those diabetic patients who were positive for covid19 and have age more than 50 years had severe sign and symptoms as compare to patients whose age was less than 50 years and also the mortality rate was high in diabetic patients whose age was greater than 50 years. The blood sugar level of those patients was always high and it suggests that covid19 infection in diabetic patients positively enhance the blood sugar level and keeps the elevated level of sugar which negatively impacts the patient health and cause multiple disorders in the body.

More than 80% admitted diabetic patients had SOB, dry cough and fever. Such patients have developed symptoms which were uncommon in normal person having covid19 infection such as, ARDS, Pneumonia, CPA, COPD, Kidney failure and IHD. The percentage of above complications was more in those patients

who lost their lives. This study give us the direction that in diabetic patients who are infected with covid19 will experience the above severe conditions and such patients needs extra care during their infection and on time preparation is needed to tackle the above conditions and save their lives.

Conclusion

This study is not enough to know the complete scenario exist between diabetes and covid19 infection. It only gives the information that diabetic patients will have severe complications when infected with covid19 as compare to normal people. This study opens a door towards new research to know how those severe conditions occur on diabetic patients and how to prevent the above conditions which less and uncommon in normal people. Further research is recommended to find the molecular mechanisms and pathways which leads to death or multiple disorders in diabetic patients infected with SARS-CoV-2.

Acknowledgement

I would like to express my deep gratitude to Dr. Tariq Akbari, Dr. Fida Mohammad Andar and Hasamuddin Sayedi, and also my research supervisors, for their patient guidance, enthusiastic encouragement and useful critiques of this research work. I would also like to thank Abu Zar Shinwari for his advice and assistance in keeping my progress on schedule.

Conflict of Interest Statement

All authors declared no potential personal or financial conflicts of interest.

Ethical Approval Statement

This study was ethically approved by the medical bioethics committee of the SIHE ethics committee (code: 1386-1409). The patients/participants provided their written informed consent to participate in this study.

Author contributions

RKH and SZ were involved in the study's conception, design, statistical analysis, and interpretation of the data. ARP, and UN were involved in data collection, data cleaning, AZS, statistical analysis, and manuscript drafting.

Funding

The financial support for this study was provided by me.

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