



# PREDICTORS OF COVID-19 SEVERITY IN DIABETIC AND NON DIABETIC PATIENTS AND ITS PREVALENCE : A RETROSPECTIVE STUDY

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## ABSTRACT

Covid-19 infection became a global pandemic, first starting out of Wuhan, China spreading out to entire parts of the world, causing millions of deaths in its wake and is still an ongoing pandemic. The study on Diabetes and COVID-19 is important as management of covid-19 can only be done successfully once diabetes is brought under control. The study deals to determine and categorize the severity of COVID-19 in diabetes and non diabetes patients. It was carried out among 160 COVID-19 patients out of which 74 were diabetic and 86 were non diabetic. Majority of patients were in age above 65 years. Out of 160 infected patients, 58.1% were male and 41.9% were female. Majority of the patients with diabetes mellitus belong to category B (39.2%) and category C (25.7%) whereas majority of non-diabetic patients belong to

category A (48.8%). In this study we were able to demonstrate that diabetes is associated with increased risk of greater disease severity and poor short term outcome, which includes death. The prevalence of diabetes in COVID-19 is 46.2%. Different predictors of severity were compared and a positive correlation was obtained between COVID-19 severity and age, FBS, SPO2, D-dimer. Different parameters of severity like CT score, SPO2, N/L ratio, D dimer, CRP and FBS differs significantly between diabetic and nondiabetic groups. SPO2 is significantly decreased in diabetic patients. TLC, CRP, FBS, N/L, CT score were significantly increased in diabetic COVID-19 patients. It was found that diabetes was associated with alterations in different parameters of COVID-19 severity indicating the need for more care in diabetic patients. The severity of covid-19 is found to be more in diabetic patients. The study on Diabetes and covid19 is important as management of COVID-19 can only be done successfully once Diabetes is brought under control.

**KEY WORDS:** Coronavirus disease of 2019(covid-19), Diabetes Mellitus, CT Score, FBS (Fasting Blood Sugar)

## INTRODUCTION

Corona virus disease 2019 (COVID-19) is a contagious disease caused by severe acute respiratory syndrome corona virus 2 (SARS-CoV-2). The first known case was identified in Wuhan, China, in December 2019. The disease has spread worldwide, leading to an ongoing pandemic. The WHO characterized COVID-19 as a pandemic as it spreads rapidly throughout china and more than 100 countries in the following months after the outbreak.

## CORONAVIRUS

Corona viruses are spherical in shape with a diameter of approximately 125 nm. The genome of corona virus (27–32 kb) is a single-stranded positive-sense RNA which is larger than any other RNA viruses. Based on its structure it mainly contains four structural proteins namely: Spike(S), Membrane (M), Envelope (E), and Nucleocapsid (N) proteins (figure 2).The single stranded RNA at the core of this virion, acts as a molecular messenger which enables the production of proteins needed for the synthesis of other elements of the virus. The

proteins which are attached to the string of RNA known as nucleoproteins, helps the virus to replicate. Viral envelope that encapsulates the RNA genome, will protect the virus from the host cells which are externally present. The spike proteins, which are seen as the bulbous projections outside the corona virus serves the role for the attachment and penetration into the host cell.

## PATHOPHYSIOLOGY OF COVID-19

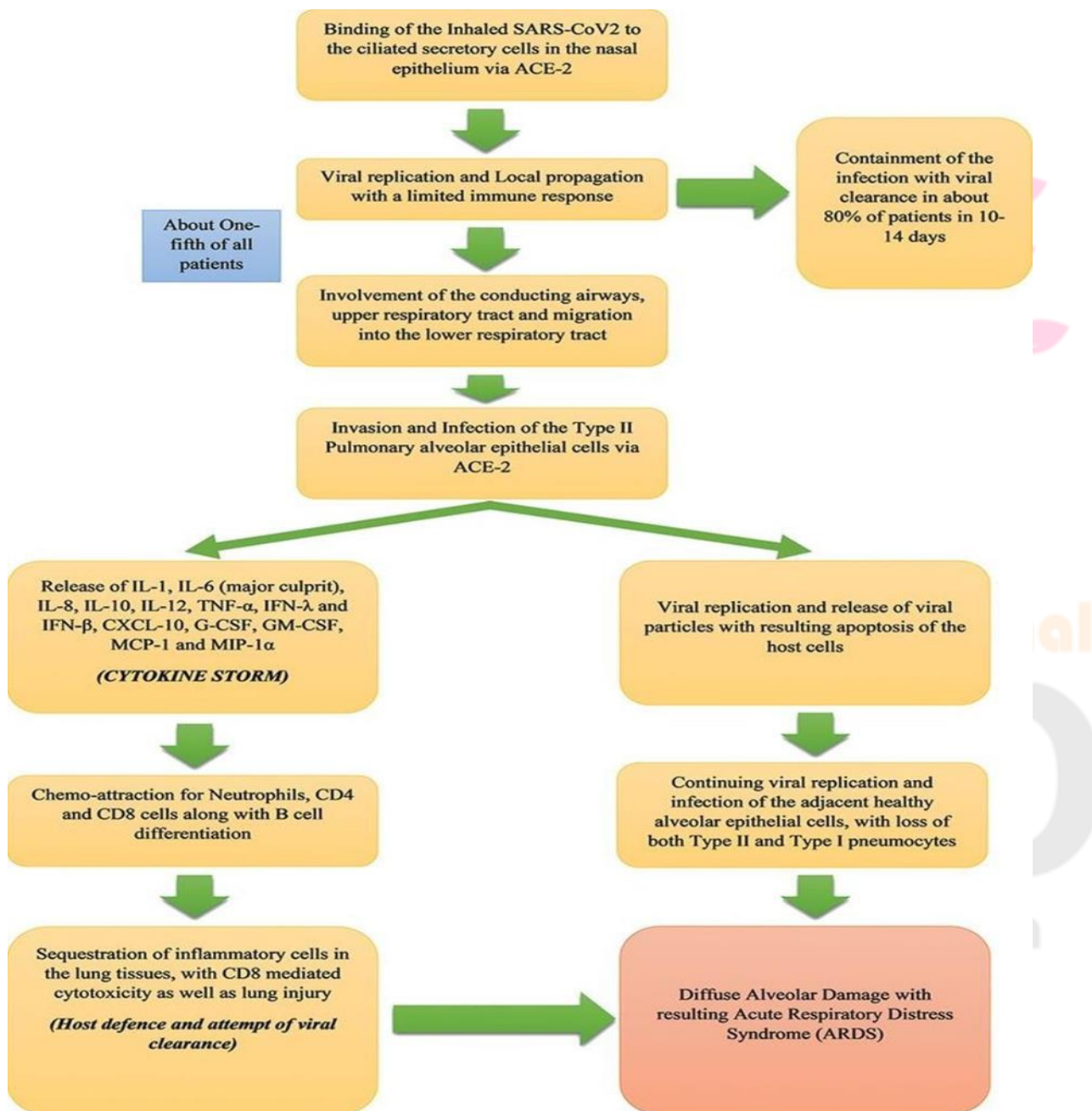


Figure 1 : Pathophysiology of COVID

## **RISK FACTORS**

People with risk factors requires hospitalizations and proper care .The risk factors are :

- Age: Elderly people are at higher risk of developing COVID-19.
- Gender: Males are more prone to get Covid-19 than females. Due to the high concentration of oestradiol in the women, there will be an increase in the expression and activity of ADAM-17, which ultimately increase the soluble ACE-2 leading to the reduced prevalence of COVID-19 in women compared to men.
- Diabetes: Many studies proved that diabetes increases the risk of COVID-19 by weakening the innate immunity.
- Hypertension: As the target site of the SARS-COV-2 is the ACE-2 receptors and the virus is also linked with Renin Angiotensin Aldosterone System (RAAS) via ACE-2.

## **COVID 19 AND DIABETES MELLITUS**

People at higher risk of severe covid and death have higher several characteristics such as advanced age, male sex, health issues like DM, Obesity and CVD. Studies have shown that CVD and Diabetes mellitus patients are common among the patients with COVID-19 admitted to ICUs.

Potential pathogenic links between COVID-19 and diabetes mellitus includes effects on glucose homeostasis, inflammation, altered immune status and activation of RAAS (reninangiotensin-aldosterone system). During COVID-19 pandemic, tight control of glucose levels and prevention of diabetes complication might be crucial in patients with diabetes mellitus to keep susceptibility low and to prevent severe courses of COVID-19.

In human monocytes, elevated glucose levels directly increase SARS-COV-2 replication and glycolysis will sustain the replication by the production of mitochondrial reactive oxygen species and activation of hypoxia

inducible factor 1 alpha. So hyperglycemia supports viral proliferation. It is found that in covid patients with DM have dysregulated immune response Patients with diabetes mellitus fall into higher categories of SARS-COV 2 infection severity than without and poor glyceemic control predicts an increased need for medications and hospitalizations and increased mortality.

Infection with severe acute respiratory syndrome corona virus 2 (SARS-COV2) can lead to increased levels of inflammatory mediators in the blood including lipopolysaccharides, inflammatory cytokines and toxic metabolites.

Modulation of natural killer cell activity and IFN gamma can increase the interstitial and vascular permeability of proinflammatory products. SARS-COV 2 increases the ROS (reactive oxygen species) production leading to lung fibrosis, acute lung damage acute respiratory distress syndrome (ARDS). ROS production and viral activation of renin-aldosterone -angiotensin system (increased angiotensin 2 expression) can lead to insulin resistance, hyperglycaemia and vascular endothelial damage.

## **MATERIALS AND METHOD**

A retrospective cohort study was conducted over a period of six months in a tertiary care hospital. A total of 160 patient case records satisfying the inclusion criteria were analyzed to determine and categorise the severity of COVID-19 in diabetic and non-diabetic patients and to analyze the treatment and find the mortality. Case records were reviewed for demographic details, laboratory data, management and outcomes. Data analysis was conducted by using SPSS and Microsoft Excel.

## **STATICAL ANALYSIS**

A retrospective study was conducted among the in-patients admitted to hospital. The data of patients having covid-19 were collected. Statistical analysis was done using descriptive statistics, chi- square test. A p-value of <0.05 was considered as significant. Data analysis was conducted by using SPSS and Microsoft Excel.

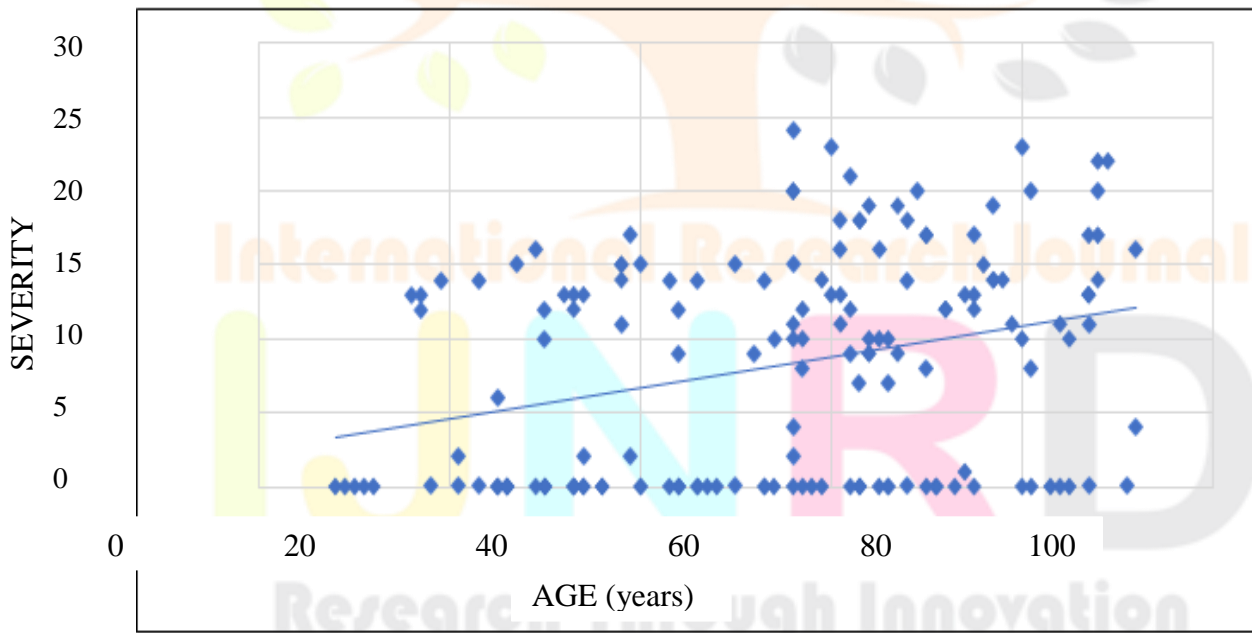
## **RESULT AND DISCUSSION**

### **PREDICTORS ASSOCIATED WITH SEVERITY OF COVID -19**

**Table 1: CORRELATION BETWEEN SEVERITY OF COVID-19 AND AGE**

VARIABLES	PEARSON CORRELATION	SIGNIFICANCE ( <i>p-value</i> )
Covid severity Age	0.303	$p < 0.001$

The correlation coefficient 0.303 is a positive correlation (same direction) and since the  $p\text{-value} < 0.001$ , the correlation is significant. A similar study conducted by Yauhen statsenko found that elderly patients are more prone to severe COVID-19. The following is the scatter diagram interpreting the positive correlation.

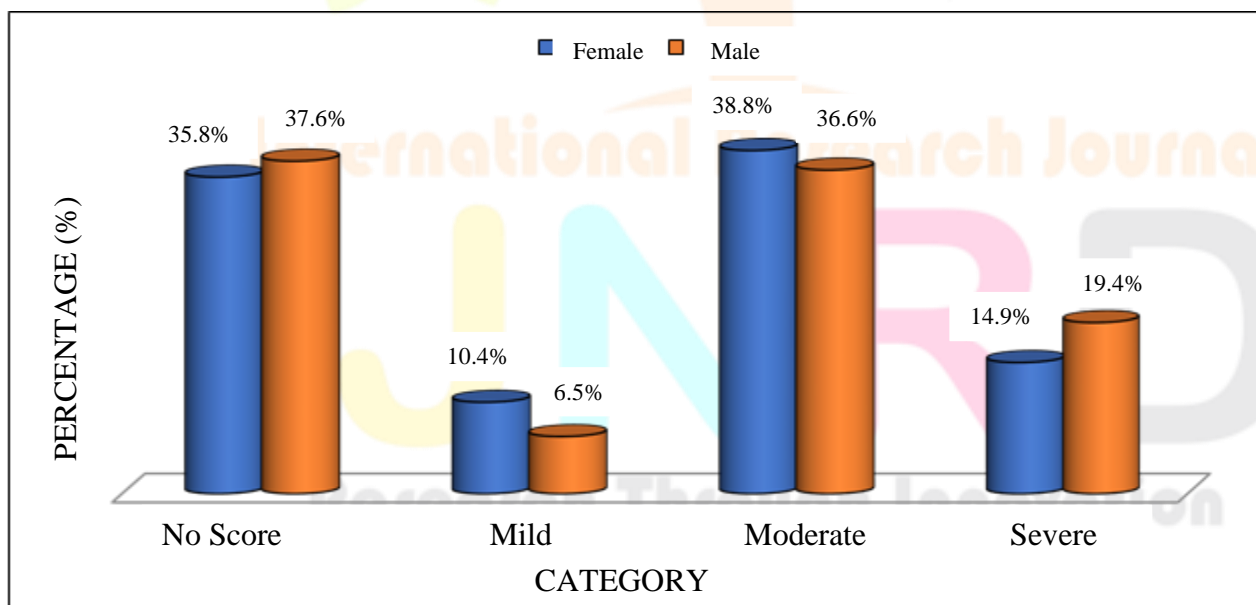
**FIGURE 2: CORRELATION BETWEEN SEVERITY OF COVID-19 AND AGE**

**Table no. 2 : ASSOCIATION OF SEVERITY OF COVID-19 AND GENDER**

[N=160]

CATEGORY	PATIENTS (%)		$\chi^2$	df	p-value
	FEMALE	MALE			
A(No score)	24 (35.8)	35 (37.6)	1.29	3	0.73
B(Mild)	7 (10.4)	6 (6.5)			
B(Moderate)	26 (38.8)	34 (36.6)			
C(Severe)	10 (14.9)	18 (19.4)			

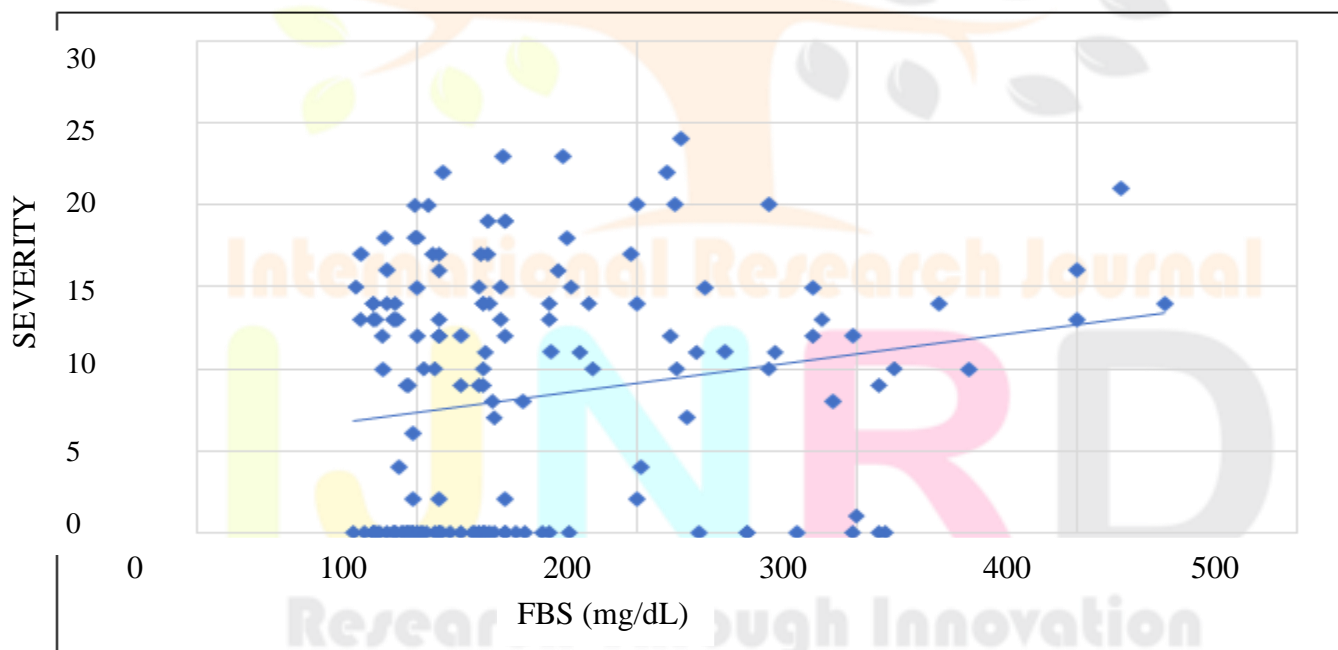
The above table interprets that there is no significant association between severity of covid-19 and gender. The chi-square value 1.29, gives a p-value > 0.05 which interprets that there is no significant association. A study conducted by Yauhen statsenko et al shows that men with covid-19 are at greater risk of severe covid-19.

**Figure 3: ASSOCIATION OF SEVERITY OF COVID-19 AND GENDER**

**Table no.3 : CORRELATION BETWEEN SEVERITY OF COVID-19 AND FBS**

VARIABLES	PEARSON CORRELATION	SIGNIFICANCE ( <i>p-value</i> )
COVID SEVERITY FBS	0.189	$p < 0.05$

The correlation coefficient 0.189 is a positive correlation (same direction) and since the  $p$ -value  $< 0.05$ , the correlation is significant. Therefore there is a significant positive correlation between Covid severity and FBS. A study conducted by Juan chen et al and by Jiaoyue zhang et al noted significant elevation of blood glucose in patients with severe covid-19 and significant increase of D-dimer and FBS in diabetic than Non diabetic patients respectively. The following is the scatter diagram interpreting the relation.

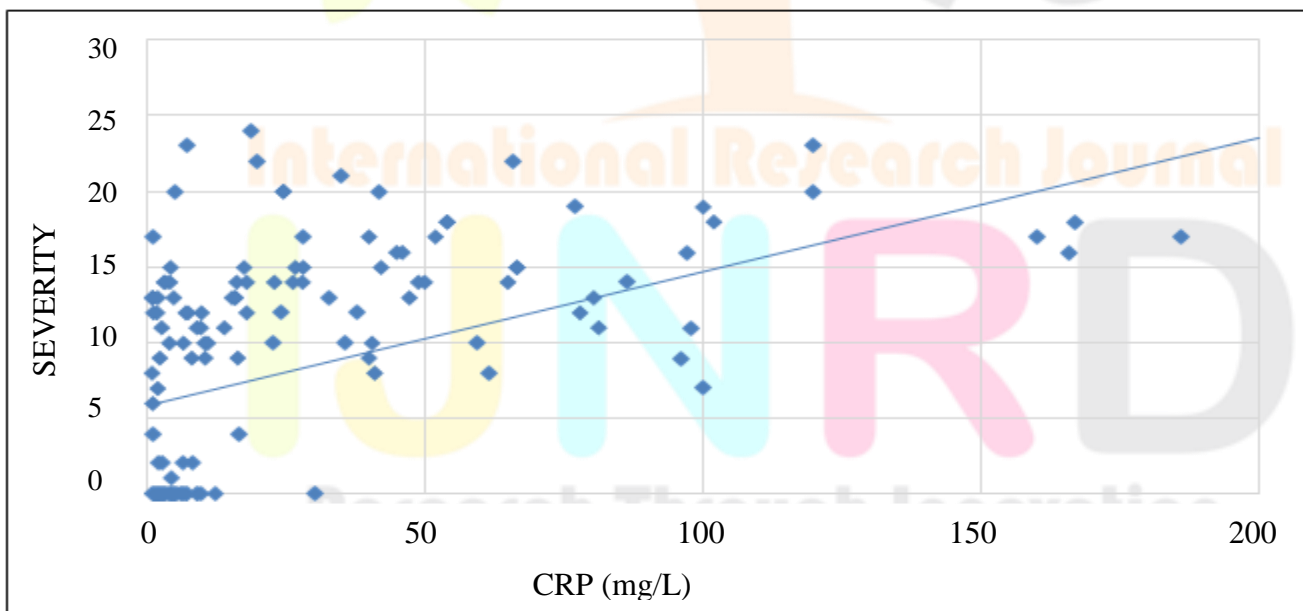
**Figure 4: CORRELATION BETWEEN SEVERITY OF COVID-19 AND FBS**



**Table 4: CORRELATION BETWEEN SEVERITY OF COVID-19 AND CRP**

VARIABLES	PEARSON CORRELATION	SIGNIFICANCE ( <i>p-value</i> )
Covid severity CRP	0.509	<i>p</i> < 0.001
VARIABLES	PEARSON CORRELATION	SIGNIFICANCE ( <i>p-value</i> )

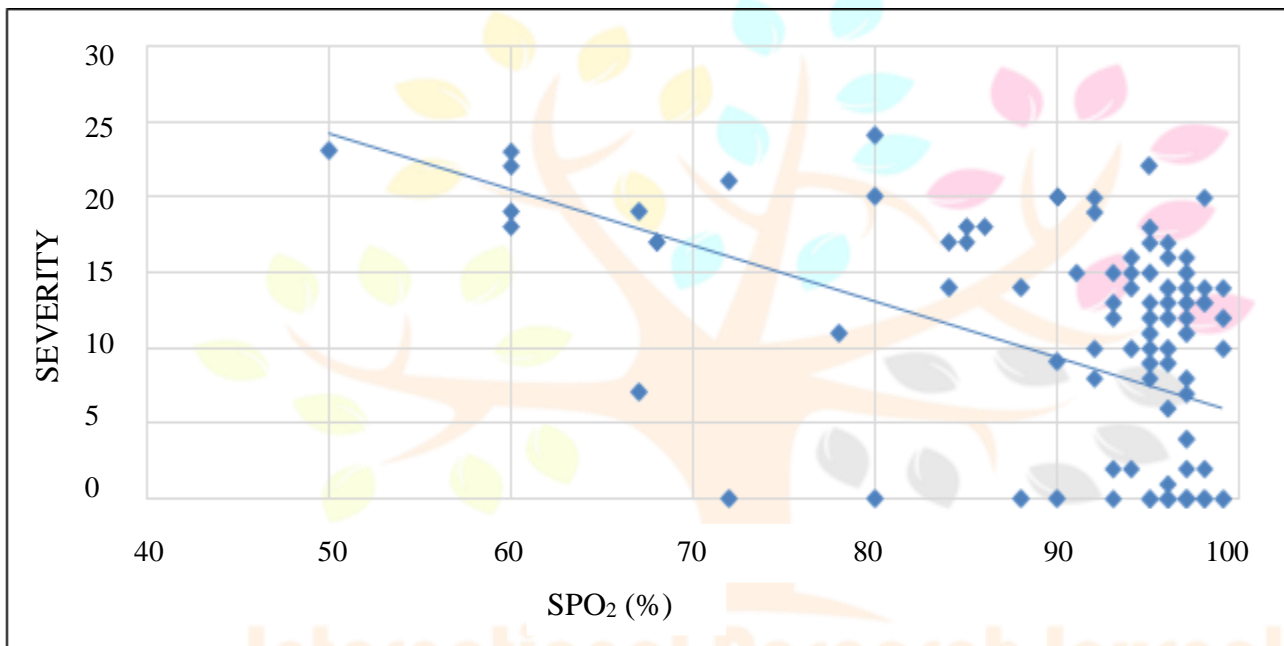
The correlation coefficient 0.509 is a positive correlation (same direction) and since the  $p$ -value < 0.001, the correlation is significant. Therefore there is a significant positive correlation between Covid severity and CRP. A study conducted by Maryame Achnach et al showed that CRP value is significantly higher in patients with severe covid-19. The following is the scatter diagram interpreting the relation.

**Figure 5: CORRELATION BETWEEN SEVERITY OF COVID-19 AND CRP****Table 5: CORRELATION BETWEEN SEVERITY OF COVID-19 AND SPO2patients**

The	Covid severity	- 0.443	$p < 0.001$
	SPO <sub>2</sub>		

correlation coefficient - 0.443 is a negative correlation (opposite direction) and since the p-value < 0.001, the correlation is significant. Therefore there is a significant negative correlation between Covid-19 severity and SPO<sub>2</sub>. The following is the scatter diagram interpreting the relation.

**Figure 6: CORRELATION BETWEEN SEVERITY OF COVID-19 AND SPO<sub>2</sub>patients**

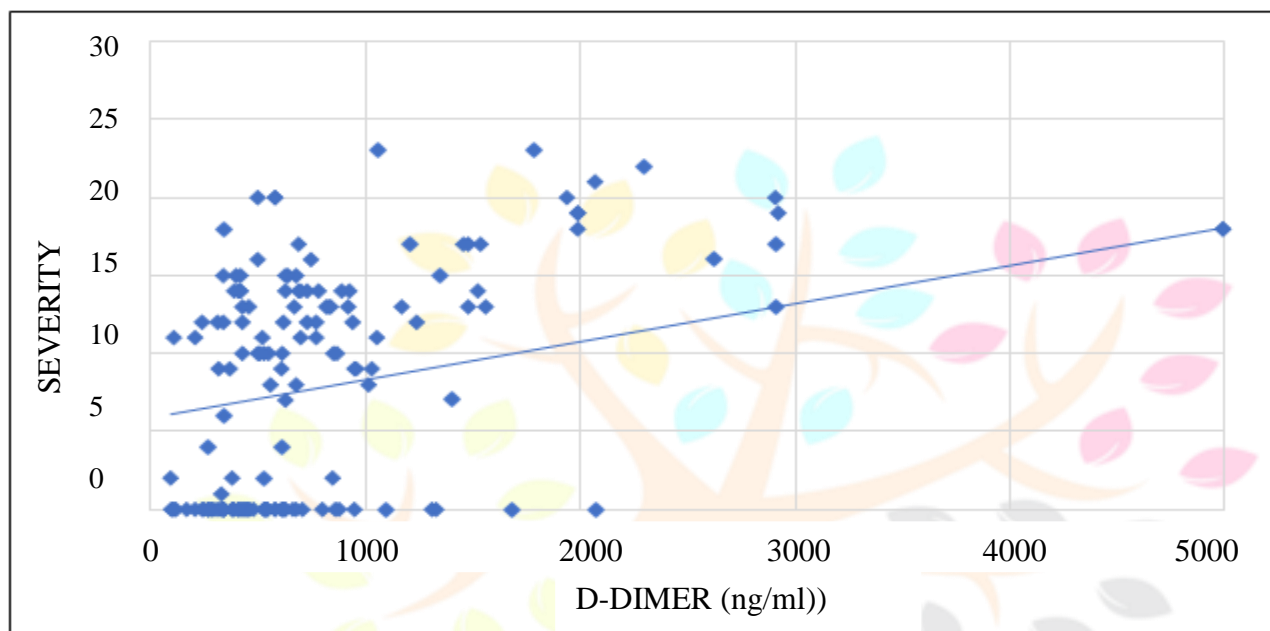


**Table 6 : CORRELATION BETWEEN SEVERITY OF COVID-19 AND D-DIMER**

VARIABLES	PEARSON CORRELATION	SIGNIFICANCE ( <i>p-value</i> )
Covid severity D-Dimer	0.418	$p < 0.001$

The correlation coefficient 0.418 is a positive correlation (same direction) and since the p-value < 0.001, the correlation is significant. Therefore there is a significant positive correlation between Covid severity and D-Dimer. A study conducted by Ayusha poudel et al noted that D-dimer value is highly elevated in covid-19 patients. The following is the scatter diagram interpreting the relation.

**Figure 7: CORRELATION BETWEEN SEVERITY OF COVID-19 AND D-DIMER**

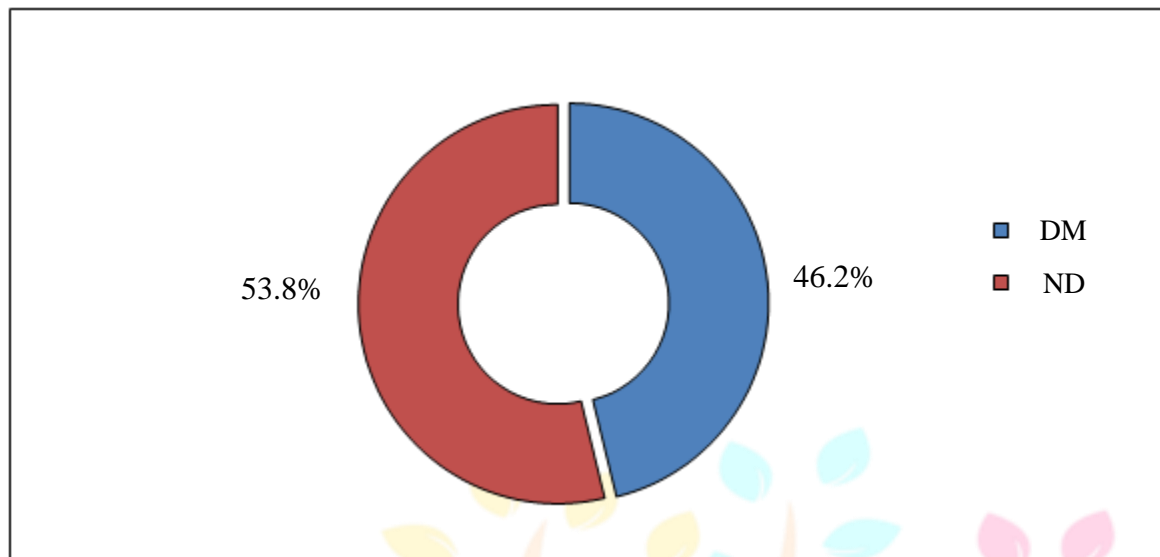


**Table 7: PREVALENCE OF DIABETES MELLITUS IN COVID -19 PATIENTS**

N=160

PARAMETER	FREQUENCY	PERCENTAGE (%)
DIABETES MELLITUS	74	46.2
NON DIABETIC	86	53.8
<b>Total</b>	<b>160</b>	<b>100.0</b>

Out of 160 COVID-19 patients, 74 were diabetic patients was in accordance with a study conducted by Du M et al noted that there was higher prevalence of diabetes in COVID-19 patients.

**Figure 8: PREVALENCE OF DIABETES MELLITUS IN COVID -19 PATIENTS**

## CONCLUSION

This Covid-19 infection became a global pandemic, first starting out of Wuhan, China spreading out to entire parts of the world, causing millions of deaths in its wake and is still an ongoing pandemic. The study on Diabetes and COVID-19 is important as management of covid-19 can only be done successfully once diabetes is brought under control. Management and treatment of Covid-19 is done symptomatically. Mortality is frequently seen in patients suffering from Covid-19 and uncontrolled Diabetes. The above aspect of diabetes and Covid-19, as they affect overall treatment outcome in patients. So adequate management of diabetes is must in Covid-19 patients.

Assessing and monitoring the laboratory parameters especially fasting blood glucose levels, Random blood glucose levels must be done, to avoid case of Covid-19 patients with uncontrollable diabetes mellitus. Managing diabetes in early stages of Covid-19 infection, is important to reduce risks of mortality and to prevent disease progression from going out of hand.

The study deals to determine and categorise the severity of Covid in diabetes and non-diabetes patients. 160 cases of Covid patients were collected and among this 74 patients were diabetic and 86 patients were non-diabetic. Most of the diabetic Covid patients belong to category B and category C. SPO<sub>2</sub> is significantly decreased in diabetic patients. TLC, CRP, FBS, N/L, CT score were significantly increased in diabetic Covid patients. On analysing the treatment pattern, anticoagulants and steroids were more prescribed in

diabetes patients indicating the risk of more complication in diabetic patients. On interpreting mortality, it is more in diabetic patients. It is found that diabetes was associated with alterations in different parameters of Covid severity indicating the need for more care in diabetic patients. The severity of covid-19 is found to be more in diabetic patients.

Thus in this study we were able to demonstrate that diabetes is associated with increased risk of greater disease severity and poor short term outcome, which includes death. We concluded that management of diabetes is a must to lower complications associated with Covid-19. Thus intense scrutiny and intensive care must be given to the patients suffering from both diabetes and Covid-19, particularly in geriatrics patients.

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Miss Adithya Prasad

Mr. Allen Joseph

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