IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 22, Issue 3 Ser.5 (March. 2023), PP 64-68
www.iosrjournals.org

Outcome of Covid19 Pneumonia in Diabetes Mellitus Patients

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Abstract:
Background: *Covid 19 disease caused by SARS-CoV-2 has a highly variable clinical presentation ranging from asymptomatic to severe disease causing death. Diabetes mellitus significantly increases the severity, risk of hospitalization and mortality in covid 19 pneumonia.*
Methods: *A retrospective study conducted in 248 patients who tested positive for covid 19 by RTPCR admitted into Government Hospital for Chest and Communicable Diseases between April 2021 and June 2021 to know the severity assessed by oxygen requirement and outcome assessed by duration of hospitalization and death rates of covid 19 pneumonia in patients with diabetes mellitus.*
Results: *Out of 248 patients, 152 (61.2%) were non diabetic, 96 (38.7%) were diabetic, of which 74 (77%) being previously diagnosed, 22 (22.9%) diagnosed as de novo. Among 152 non-diabetics, 42 (27.6%) received two doses, 66 (43.4%) received first dose and 44 (28.9%) were not vaccinated; 28 (18.4%) required oxygen support with nasal cannula, 14 (9.2%) with face mask, 12 (7.8%) with non-rebreather mask (NRBM), 16 (10.5%) with high flow nasal cannula (HFNC) and 12 (7.8%) required non-invasive ventilation (NIV) support; 104 (68.4%) were discharged, of which* 84 (80.7%) discharged at room air and 20 (19.2%) required oxygen *and death occurred in 48 (31.5%), of which 18 (37.5%) were vaccinated with either dose and 30 (62.5%) were not vaccinated. Out of 96 diabetics, 24 (25%) were vaccinated with two doses, 20 (20.8%) with first dose and 52 (54.1%) not vaccinated; 14 (14.5%) required nasal cannula, 10 (10.4%) required face mask, 12 (12.5%) required NRBM, 22 (22.9%) required HFNC support, 19 (19.7%) required NIV support; 62 (64.5%) were discharged of which 26 (41.9%) required oxygen and death occurred in 34 (35.4%), of which 26 (76.4%) were not vaccinated and 8 (23.5%) were vaccinated.*
Conclusion: *Increased severity, mortality and length of hospital stay was observed in patients of covid 19 pneumonia with diabetes mellitus. However, in vaccinated, risk of mortality was observed to be significantly low compared to non-vaccinated patients.*
Keywords: *Outcome, Covid 19, Diabetes Mellitus.*

Date of Submission: 26-02-2023 Date of Acceptance: 10-03-2023

I. Introduction

A novel corona virus, known as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), emerged in Wuhan, China in December 2019. Since its emergence, it has rapidly spread all over the world. It was declared as global pandemic on March 11, 2020 by World health Organization (WHO) [1].

Covid 19 disease caused by SARS-CoV-2 has a highly variable clinical presentation ranging from asymptomatic to severe disease causing death. Presenting symptoms include cough, fever, shortness of breath, myalgias, headache, loss of smell and taste. Majority of the patients are asymptomatic and have mild symptoms while some develope serious complications like acute respiratory distress syndrome (ARDS), sepsis, multi organ dysfunction syndrome (MODS), hypercoagulation causing thrombo-embolism, eventually leading to death [2]. Previous studies have shown that older age and comorbidities like diabetes mellitus, hypertension, cardiovascular disease, chronic obstructive pulmonary disease, chronic kidney disease act as risk factors leading to severe disease and worse prognosis [3].

Diabetes mellitus (DM) being one such risk factor is a chronic metabolic disease characterized by increased blood glucose level. It leads to serious long-term sequelae like chronic kidney disease, cardiovascular disease and diabetic retinopathy [4]. DM is among the top 10 causes of adult deaths worldwide [5].

Several studies have shown that type 2 diabetes is associated with low-grade chronic inflammation that affects the homeostatic glucose regulation and insulin sensitivity [6]. Studies have indicated that hyperglycemia may be a major pushing factor for a poorer prognosis of COVID-19, and has been a suggested risk factor for predicting ICU admission and negative outcomes in patients. Hyperglycemia has been indicative of a poorer prognosis of COVID-19, regardless of diabetes status. Hyperglycemia in combination with chronic inflammation could contribute to an abnormal immune response by weakening T-cell function, in addition to an increased risk of hyperinflammation and cytokine storm [7,] which in turn can worsen the COVID-19 disease outcome.

Understanding the pathogenesis of both DM and COVID-19 can help in providing better management of the disease and improving the outcomes. In this study, comprehensive clinical analysis of COVID-19 patients with and without type 2 diabetes was performed. We assessed the severity of disease by oxygen requirement and outcome by duration of hospital stay and death rates.

II. Materials And Methods:

This is a retrospective observational study conducted in COVID-19 patients who are hospitalized in Department of pulmonary Medicine, Government Hospital for Chest and Communicable Diseases (GHCCD), Andhra Medical College, Visakhapatnam during second wave of COVID-19 between April 2021 and June 2021. A total of 248 patients were included in the study.

Study design: Hospital-based retrospective observational study

Study location: Department of pulmonary Medicine, Government Hospital for Chest and Communicable Diseases (GHCCD), Andhra Medical College, Visakhapatnam

Study duration: April 2021 and June 2021

Sample size: A total of 248 patients tested positive for COVID-19 by RTPCR and are hospitalized.

III. Methodology:

Demographic data like age and gender, presenting symptoms like fever, shortness of breath, cough, headache, loss of smell and taste, vaccination status, comorbidities, vital data like pulse rate, respiratory rate, blood pressure, oxygen saturation, laboratory investigations like complete blood picture, C-reactive protein (CRP), serum lactate dehydrogenase (LDH), serum ferritin, D-dimer, chest X-ray and HRCT chest if available were collected. Diagnosis of diabetes was based on medical history either on or not on treatment. De novo diabetes was diagnosed with fasting blood glucose > 126mg/dl (7mmol/L) and HbA1C > 6.5%. Severity of the disease was assessed by requirement of oxygen and number of pts who were on and outcome was assessed by duration of hospitalization, number of discharges and deaths.

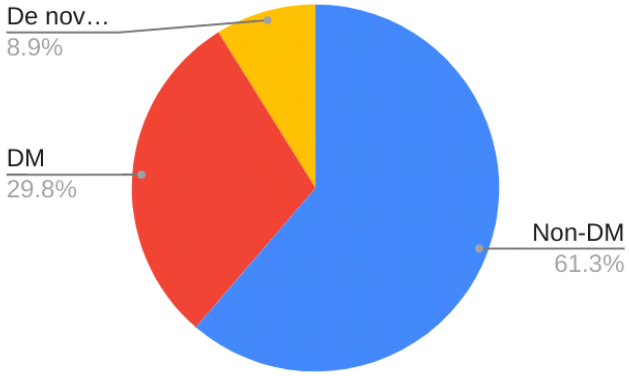
IV. Results

Present study included 248 patients, of which 184 (74.1%) were males and 64 (45.8%) were females. Mean age of the study population was 52.5 years. Of 248 patients, 96 (38.7%) were diabetics and 152 (61.2%) were non-diabetics. Among 152 non-diabetics, 116 (76.3%) were males and 36 (23.6%) were females. Among 96 diabetics, 68 (70.8%) were males and 28 (29.1%) were females. Mean age of non-diabetics and diabetics was 50 years and 56.6 years respectively.

Table no.1: Demographic distribution

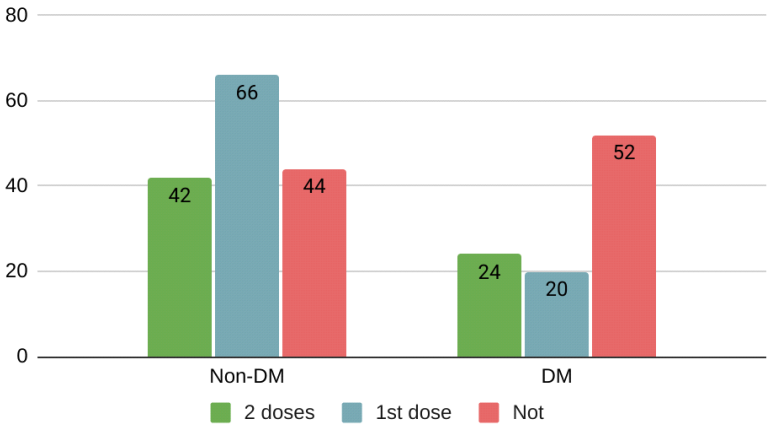
	Total (n= 248)	Non-diabetic (n=152)	Diabetic (n=96)
Male (%)	184 (74.1%)	116 (76.3%)	68 (70.8%)
Female (%)	64 (45.8%)	36 (23.6%)	28 (29.1%)
Mean age (years)	52.5	50	56.6

Figure no.1: Distribution of diabetics and non-diabetics



Among 248 patients, 152 (61.3%) were non-diabetic, 74 (29.8%) were diabetic and 22 (8.9%) diagnosed as de novo diabetes.

Figure no.2: Vaccination status



Among 152 non-diabetics, 42 (27.6%) received two doses, 66 (43.4%) received first dose and 44 (28.9%) were not vaccinated. Among 96 diabetics, 24 (25%) received two doses, 20 (20.8%) received first dose and 52 (54.1%) were not vaccinated.

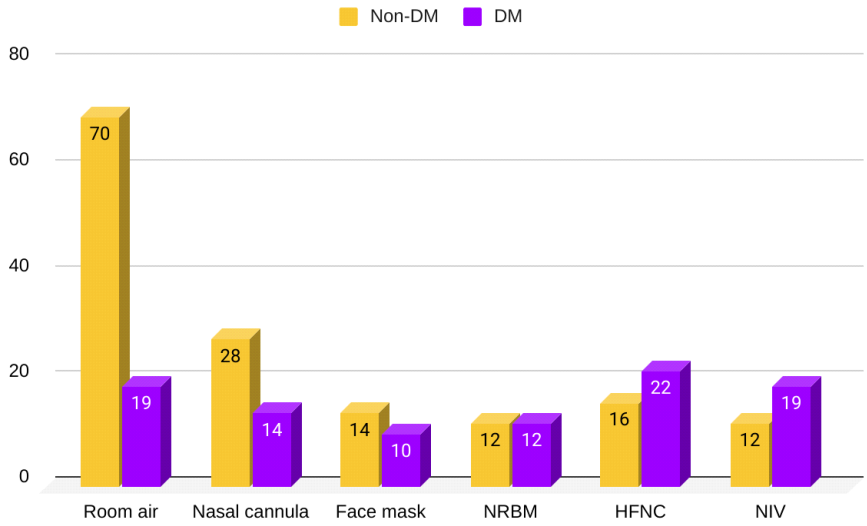
Table no.2: Symptomatology

SYMPTOM	Total (248) N (%)	Non-diabetic (152) N (%)	Diabetic (96) N (%)
SOB	208 (83.8%)	124 (81.5%)	84 (87.5%)
Fever	187 (75.4%)	145 (95.3%)	42 (43.7%)
Cough	185 (74.5%)	112 (73.6%)	73 (76%)
Myalgias	143 (57.6%)	88 (57.8%)	55 (57.2%)
Headache	138 (55.6%)	83 (54.6%)	55 (57.2%)
Sore Throat	110 (44.3%)	74 (48.6%)	36 (37.5%)
Diarrhea	85 (34.2%)	42 (27.6%)	43 (44.7%)
Vomiting	76 (30.6%)	38 (25%)	38 (39.5%)
Loss of taste	106 (42.7%)	67 (44%)	39 (40.6%)
Loss of smell	134 (54%)	85 (55.9%)	49 (51%)

Among 248 patients, SOB is the predominant symptom seen in 208 (83.8%) followed by fever 187(74.5%), 143 (57.6%) had myalgias, 138 (55.6%) had sore throat, 85 (34.2%) had diarrhea, 76 (30.6%) had vomiting, 106 (42.7%) had loss of taste and 134 (54%) had loss of smell.

Of 152 non-diabetics, 124 (81.5%) had SOB, 145 (95.3%) had fever, 112 (73.6%) had cough, 88 (57.8%) had myalgias, 83 (54.6%) had headache, 74 (48.6%) had sore throat, 42 (27.6%) had diarrhea, 38 (25%) had vomiting, 67 (44%) had loss of taste and 85 (55.9%) had loss of smell.
Of 96 diabetics, 84 (87.5%) had SOB, 42 (43.7%) had fever, 73 (76%) had cough, 55 (57.2%) had myalgias, 55 (57.2%) had headache, 43 (44.7%) had diarrhea, 38 (39.5%) had vomiting, 39 (40.6%) had loss of taste and 49 (51%) had loss of smell.

Figure no.3: Oxygen requirement during hospitalization



Among 152 diabetics, 70 (46%) were maintained with room air, 28 (18.4%) required oxygen support with nasal cannula, 14 (9.2%) with face mask, 12 (7.8%) with non-rebreather mask (NRBM), 16 (10.5%) with high flow nasal cannula (HFNC) and 12 (7.8%) required non-invasive ventilation (NIV) support.
Among 96 diabetics, 19 (19.7%) were maintained with room air, 14 (14.5%) required nasal cannula, 10 (10.4%) with face mask, 12 (12.5%) with NRBM, 22 (22.9%) with HFNC and 19 (19.7%) required NIV support.

Table no.3: Outcome

Outcome	Discharge		Total	Death		Total
	Room air	With oxygen		Vaccinated	Non vaccinated	
Non-DM	84 (80.7%)	20 (19.2%)	104 (68.4%)	18 (37.5%)	30 (62.5%)	48 (31.5%)
DM	36 (58%)	26 (41.9%)	62 (64.5%)	8 (23.5%)	26 (76.4%)	34 (35.4%)
Total	120 (72.2%)	46 (27.7%)	166 (66.9%)	26 (31.7%)	56 (68.2%)	82 (33%)

Of 248 patients, 166 (66.9%) discharged and death occurred in 82 (33%). Of 166 discharged, 120 (72.2%) discharged with room air and 46 (27.7%) required oxygen at discharge. Of 82 deaths, 26 (31.7%) were vaccinated with either dose and 56 (68.2%) were not vaccinated.
In 152 non diabetics, 104 (68.4%) were discharged and death occurred in 48 (31.5%). Out of 104 discharged, 84 (80.7%) discharged at room air and 20 (19.2%) required oxygen support at discharge. Out of 48 deaths, 18 (37.5%) were vaccinated with either dose and 30 (62.5%) were not vaccinated.
In 96 diabetics, 62 (64.5%) were discharged and death occurred in 34 (35.4%). Of 62 discharged, 36 (58%) discharged at room air and 26 (41.9%) discharged with oxygen. Of 34 deaths, 8 (23.5%) were vaccinated with either dose and 26 (76.4%) were not vaccinated.

IV. DISCUSSION

COVID-19 has varying symptoms ranging from asymptomatic to severe disease causing increased morbidity and mortality. Outcome of the disease depends on many factors like age of the individual affected, gender, associated comorbidities like diabetes, hypertension, cardiovascular and respiratory diseases. The present study has shown the clinical features, outcome in diabetics and role of vaccination in reducing mortality.

In the present study, we found that patients with diabetes had severe disease compared to non-diabetics indicated by severe hypoxia requiring oxygen support with HFNC and NIV and higher number of deaths.

Similar results were obtained in a study conducted by Alshukry et al in Kuwait [2]. A Chinese study has shown that diabetics had 7.3% increased risk of mortality compared to general population [8].

The presence of hyperglycemia independent of diabetic status appears to have poor outcome in patients with COVID-19. Studies showed that hyperglycemia increases the production of inflammatory markers like interleukin-6 (IL-6) which is associated with increased lung infiltration and severity of disease [9]. Hypertension is seen as frequent comorbidity along with diabetes. Usage of ACE inhibitors in the treatment of HTN may allow SARS-CoV-2 to enter into cells by binding with ACE-2 [10].

Diabetes is a state of low-grade chronic inflammation. Inflammation induces cytokine storm and increases the risk of vascular permeability, multi organ failure and death. DM causes an increase in risk of thromboembolic events due to imbalance between clotting factors and fibrinolysis. Infection with COVID-19 further increases the risk of thromboembolism leading to increased mortality [11].

Vaccination has significantly reduced the severity of disease and mortality in both diabetics and non-diabetics. In the present study, individuals vaccinated with either dose has a smaller number of symptoms, less requirement of oxygen, reduced length of hospital stay and reduced mortality when compared to unvaccinated individuals in both non-diabetics and diabetics. Several studies have shown that vaccination significantly reduced the infectivity, severity of disease, complications and death in patients infected with COVID-19.

V. CONCLUSION

There is increased severity, mortality and length of hospital stay in patients of COVID-19 pneumonia with diabetes mellitus when compared with non-diabetics. However, in vaccinated, risk of mortality is significantly low compared to non-vaccinated patients.

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