



Study On Clinical and Laboratory Characteristics In COVID-19 Related Deaths -A Retrospective Study In A Tertiary Hospital Of Central India

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Abstract

Introduction: The coronavirus causes a cluster of severe respiratory illnesses. Covid-19 affects the lung primarily, and ARDS is the leading cause of death. Analyzing the clinical profile and laboratory characteristics of death cases can help to improve the outcome of infected patients.

Objectives- To study clinical and laboratory characteristics in COVID-19 related deaths.

Material and Methods- Design: retrospective observational study Duration: conducted in August 2020 to December 2020 Setting: Tertiary hospital. Study population: Sixty confirmed cases of COVID19 related deaths

Results-The mean age was 65 years. We found hypertension in 68.3% of cases which is the most common comorbidities. Hematological parameters showed raised white blood cells in 40%, increased neutrophils in 85%, and decreased lymphocytes in 83% of patients. D-dimer with median value 1454 ng/ml was raised in 89.2% patients, Lactic dehydrogenase median value of 436 U/L, was increased in 36.5% patients, Serum ferritin, median value 516.5 ng/ml was elevated in 74%, CRP was elevated in 100% patients with a median value of 48 U/L. Similarly, serum procalcitonin median value 0.13 ng/ml, IL6 with median 29.3 pg/ml was raised in 66.6% and 97.8% patients, respectively. On CT scans of the chest 38% had severe lung involvement. 73.3% of patients were in sepsis and septic shock.

Conclusion- Age, underlying diseases are important risk factors for death. The hematological and biochemical parameters help assess the severity. The raised inflammatory markers indicate the severity of the disease, and their progression in subsequent testing helps determine the prognosis of the disease

Keywords: COVID-19, comorbidity, D-Dimer, interleukins

Introduction

The first case of Coronavirus disease 2019 was reported in December 2019 in Wuhan, China; soon, it spread globally and became an international health emergency. World Health Organization (WHO) declared this outbreak a public health emergency of global concern in January 2020¹. As of January 2021, a total of 90335008 confirmed cases and 1954336 deaths have been reported to WHO so far¹. The

symptoms which occurred frequently are fever, dry cough, weakness, loss of taste sensation, loss of smell sensation, and fatigue². Symptoms of severe COVID-19 include shortness of breath and high temperature. The time from exposure to symptom onset, the incubation period can range from 1-14 days². The virus spreads from person to person through aerosols and droplets from the nose or mouth spread when

someone with COVID-19 coughs, sneezes, or speaks³. People age 60 years and above and people with underlying medical diseases are at a higher risk of developing a severe illness⁴. 80% of fatalities were reported in patients above age 60 years⁴. A study conducted on death cases in Wuhan suggested that age and underlying diseases are important risk factors for death⁵. The rising level of neutrophil, D-dimer, LDH, and decreasing trend of lymphocytes can indicate disease progression⁵. Multiorgan dysfunction, ARDS, acute renal injury, acute cardiac injury can occur in severe cases of COVID-19. We are presenting the study including analysis of sixty covid-19 related deaths, which will further strengthen our understanding of the disease and may help to improve the outcome of the patients with covid-19.

Methodology

A retrospective observational study was conducted on sixty patients who died of covid-19 at L.N. Medical College and J.K Hospital Bhopal, a tertiary care center. We had taken the Institutional ethical clearance before conducting the study. The Data was collected from the hospital's medical records department. According to the world health organization, all patients were diagnosed by RTPCR assay on the nasopharyngeal swab, which is confirmatory testing. All the patients received standard medical treatment as per the latest guidelines. We collected the data related to clinical features, co-morbid conditions, and laboratory parameters, Including complete blood count, liver function test, renal function test, electrolytes, coagulation function, and inflammatory markers like C- reactive protein, Interleukin-6, Serum ferritin, and LDH. Standard normal reference ranges were used for laboratory parameters. Blood culture, urine culture, endotracheal tube culture, Sputum culture were collected. Sepsis was assessed through the qSOFA score and systemic inflammatory response syndrome. When the patients were admitted to the hospital, their epidemiological and clinical data were directly collected from themselves or their family members. Data received was then analyzed using Excel Spreadsheets, Graphs, and Charts.

Study Design: A retrospective observational study

Duration: The study was conducted on those patients who got admitted from August 2020 to December 2020.

Case definition of COVID-19 death- A COVID-19 death is defined, for surveillance purposes, resulting from a clinically compatible illness in a probable or a confirmed COVID-19 case, unless there is a clear alternative cause of death cannot be related to COVID-19 disease. There should be no period of complete recovery between illness and death.⁷

Statistical Analysis-

Descriptive analysis was used to describe the patient's clinical features. Continuous variables were expressed as median and interquartile range (IQR) values. Categorical variables were expressed as numbers (%).

Results-

Sixty patient data were included in this study. Out of these, 43 were male, and 17 were females. The mean age was 65 years with an age range from 26-90 years. The maximum number of patients that is 22 was seen in the age group of 60-69 years. [Figure 1]

The history for underlying diseases showed 41 (68.3%) patients with a history of hypertension, 30 patients with diabetes, 9 had coronary artery disease, 7 had Chronic kidney disease, followed by liver disease, hypothyroidism, ischemic heart disease, COPD, Asthma, CVD. Other causes included a history of a solitary kidney, post-renal transplant, portal hypertension, seizure disorder, meningitis, schizophrenia, BPH, cellulitis, and tibia fracture. [Figure 2]

Analysis of laboratory test results:

The hemoglobin was low in 28 (46.6%) patients, including both genders, lymphocytes with a median value of 10% were deficient in 50 (83%) patients, and platelets were low in 12 (20%) patients. The parameters raised than usual were white blood cells in 24 (40%) patients, neutrophils in 51(85%) patients. Kidney damage was indicated by raised urea in 33 (55%) patients, increased creatinine in 31(51.6%). Raised SGOT indicated liver damage in 35 (58.3%), elevated SGPT in 4(6.6%), low serum bilirubin in 12 (20%), and low albumin in 44 (73.3%) patients. Serum electrolytes sodium with a median of 137 mmol/L was low in 14 (23.7%) patients, and potassium with a median of 4.1 mmol/L was low in 6 (10.1%) patients. Coagulation profile was also seen;

prothrombin time and INR were raised in 20 (6.9%) and 18 (69.2%) patients. [Table 1]

Analysis Of Inflammatory Markers:

D-dimer with a median value of 1454 ng/ml was raised in 50 (89.2%) patients, Lactic dehydrogenase (LDH) had a median value of 436 U/L and was raised in 19 (36.5%) patients. Serum ferritin with a median value of 516.5 ng/ml was raised in 40 (74%), including both males and females. CRP has risen in 51 (100%) patients with a median value of 48 mg/L. Similarly, serum procalcitonin median value of 0.13 ng/ml, IL6 with median 29.3 pg/ml, was raised in 12 (66.6%) and 46 (97.8%) patients. [Table 2]

Analysis Of Severity:

We analyzed biomarkers to assess poor prognosis. Repeat samples were taken and compared with the first test. It was seen that the levels of the last tests of neutrophils (81.1%), CRP (56%), D-Dimer (70.2%), and lactic dehydrogenase (67.6%) were increased as compared to the first test. On the other hand, lymphocytes (75.4%) were decreased. The serum procalcitonin showed an equal number of comparisons. [Table 3]

C.T. Severity Index:

Based on the C.T. scan done on 42 patients, we graded the severity of patients. The mild patients (CT lung involvement <25%) were 4(9.5%), moderate patients (CT lung involvement 25-75%) were 22 (52.3%), and severe category patients (CT lung involvement 75-100%) were 16 (38%). [Figure 3]

Culture Growth:

Blood and urine cultures were sent in 35 patients. Blood culture showed Acinetobacter (5.7%), MRSA (5.7%), Staphylococcus aureus (2.8%), and Candida non-albicans (2.8%). In urine culture, there was the growth of Enterococcus (5.7%), Candida non-albicans (11.4%), Acinetobacter (2.8%), E Coli (5.7%), Pseudomonas (2.8%), MRSA (2.8%). Endotracheal tube culture done in 2 patients showed MRSA (50%), E.coli (50%). Sputum culture sent in 3 patients showed Pseudomonas (33.3%) and gram-positive cocci (33.3%).

Sepsis:

In our study, 44 (73.3%) patients were in sepsis and septic shock.

Discussion:

In this study, we reported 60 death cases with COVID-19. The clinical characteristics showed that age and underlying diseases were the most critical risk factors for death. The majority of our patients lied in the higher age group of 60-69 years. Similar results were seen in the study conducted on 25 death cases in Wuhan, China⁵. Most of our patients' underlying disease was found, with the most common being hypertension followed by diabetes, heart, and kidney disease. According to WHO, people aged 60 years and above and with underlying medical problems like high blood pressure, heart and lung problems, diabetes, obesity, cancer are at higher risk of developing a severe illness⁸. Among hematologic parameters, it is seen that there is an increase in white blood cells neutrophils and there is a decrease in lymphocytes, hemoglobin, and platelet counts. Comparing the last test from the first test, the neutrophil count increased while lymphocytes decreased, indicating the severity of disease and poor prognosis. It suggests that bacterial infections play an essential role in disease severity, and lymphocytes eliminate virally infected cells. Ability to replenish lymphocytes may help control COVID-19⁹. Several studies have shown electrolyte abnormalities affect disease prognosis. Hyponatremia was found to be independently associated with COVID-19 death¹⁰.

In our study, hyponatremia was seen in 23.7% and hypokalemia in 10.1% of patients. There was an increase in SGOT, SGPT in 58.3% and 6.6% of patients, whereas a decrease in serum bilirubin and albumin levels was seen in 20% and 73.3% of patients, respectively. Urea creatinine was raised in 55% and 51.6% patients, respectively. Prothrombin time and INR were both elevated. Elevation in liver enzymes, renal biomarkers, and coagulation profile indicates multiorgan failure, seen in severe disease⁹. D-dimer is an index for identifying patients at high risk for venous thromboembolism. Various studies have shown that raised D-dimer levels have a higher incidence of mortality, and those levels were more in patients who died of COVID-19 than in the survivors¹¹. In our study, D-dimer was elevated in 89.2% of patients.

Lactic dehydrogenase was raised in 36.5% of patients. CRP, a marker of inflammation, was raised in 100% of patients. There was an increase in D-

dimer, CRP, and lactic dehydrogenase values in the last test compared with the first test indicating a poor prognosis. Higher serum ferritin and IL6 leads to an increased risk of death. High serum Procalcitonin has a poor prognosis¹². We recorded a raised serum Ferritin in 74% of patients, raised Procalcitonin in 66.6%, and raised IL6 in 97.8% of patients. Comparing the last test with the first test, CRP and Procalcitonin increased, indicating a poor prognosis.

C.T. scan is a rapid method to diagnose COVID-19 disease. Apart from this, the scoring helps assess the severity of the disease¹³. We found that 52.3% of patients had moderate lung involvement while 38% had severe lung involvement. C.T. chest could not be done in few patients on admission, and repeat C.T. in other patients due to the patient being on ventilator support. Endothelial dysfunction has a pathological role in the development of sepsis leading to mortality¹⁴. In our study, 73.3% of patients were in sepsis and septic shock. This is one of the most common causes of mortality among these patients. Hence, timely intervention to prevent bacterial infection could also help reduce the occurrence of sepsis and mortality.

Conclusion-

Age, underlying diseases, and sepsis are important risk factors for death among patients with COVID-19. The hematological and biochemical parameters help to assess the severity. Multisystem involvement is seen in COVID-19 deaths. The raised inflammatory markers indicate the severity of the disease, and their progression in subsequent testing helps determine the prognosis of the disease.

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Figure 1: Age distribution

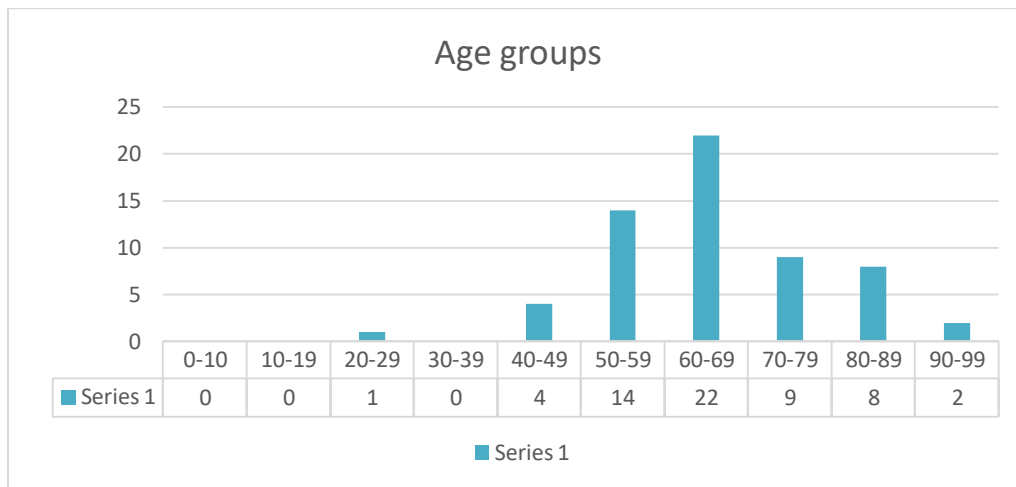


Figure 2: Comorbidities

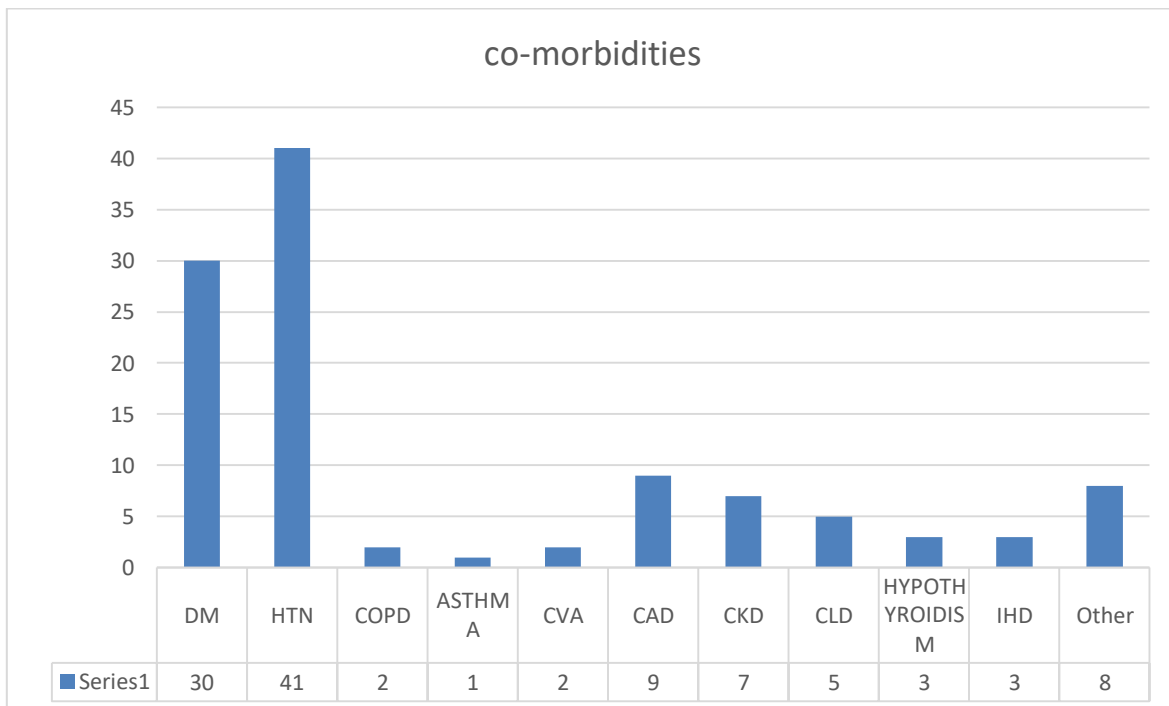


Table 1: Laboratory test analysis

Laboratory finding	Test result (Median, IQR)	Normal Range	Total (n)	Below the Lower (n, %)	Above the Upper (n, %)
Hemoglobin (g %)	12.95 (11.6-14.3)	13-17 (M) 12-15 (F)	60	28 (46.6)	1(1.6)
White blood cells(/cumm)	9450(5575-14125)	4000-11000	60	3 (5)	24 (40)
Neutrophils (%)	84.5(80-88)	40-75	60	0 (0)	51 (85)
Lymphocytes (%)	10(9-16)	20-45	60	50 (83)	0(0)
Platelets(lac/cumm)	2.03(1.70-2.56)	1.5-4	60	12 (20)	2 (3.3)
Urea (mg/dl)	42.5(28-56.2)	15-39	60	1(1.6)	33 (55)
Creatinine (mg/dl)	1.34(1.08-1.81)	0.55-1.30	60	2 (3.3)	31 (51.6)
S.Bilirubin (mg/dl)	0.6 (0.4-0.9)	0.2-1	60	12 (20)	9 (15)
SGOT(U/L)	43.5(29.7-65)	15-37	60	0(0)	35 (58.3)
SGPT(U/L)	41.5(29.7-52)	12-78	60	0(0)	4 (6.6)
Albumin(g/dl)	2.7(2.4-3.1)	3.1-5	60	44(73.3)	0(0)
Sodium (mmol/L)	137 (134.5-140.5)	135-145	59	14 (23.7)	6 (10.1)
Potassium (mmol/L)	4.1 (3.7-4.5)	3.5-5	59	6 (10.1)	3 (5)
Prothrombin time (sec)	14.5 (12.8-15.9)	11-12.5	26	0(0)	20 (76.9)
INR	1.23(1.07-1.37)	0.8-1.1	26	0(0)	18 (69.2)

Table 2: Inflammatory markers analysis

Marker	Test result (Median, IQR)	Normal Range	Total (n)	Below the lower (n, %)	Above the upper (n, %)
D- Dimer (ng/ml)	1454 (820.5-3675.5)	0-500	56	0(0)	50 (89.2)
Lactic dehydrogenase (U/L)	436 (282.5-630.7)	240-480	52	6 (11.5)	19 (36.5)
Serum Ferritin (ng/ml)	516.5 (277.5-989.7)	30-400 M	54	1 (1.8)	40 (74)

		15-150 F			
CRP (mg/L)	48 (24-48)	0-10	51	0(0)	51(100)
Serum Procalcitonin (ng/ml)	0.13 (0.07-0.50)	<0.1	18	0(0)	12(66.6)
IL6 (pg/ml)	29.3 (13.6-45.3)	<4.40	47	0(0)	46 (97.8)

Table 3: Biomarkers indicating poor prognosis

Laboratory finding	The first test (Median, IQR)	Last test (Median, IQR)	n	Increased (n, %)	Decreased (n, %)
Neutrophils (%)	84 (80-88)	91 (88-93)	53	43 (81.1)	9 (16.9)
Lymphocytes (%)	12 (9-16)	7 (4-9)	53	9 (16.9)	40 (75.4)
Procalcitonin (ng/ml)	0.38 (0.13-1.69)	0.71 (0.26-1.62)	4	2 (50)	2 (50)
CRP (mg/L)	48 (24-48)	92.9 (48-192)	25	14 (56)	6 (24)
D- Dimer (ng/ml)	1178 (786-2819)	5768 (1398-10000)	37	26 (70.2)	11(29.7)
Lactic dehydrogenase (U/L)	402.5 (269.5-565.5)	529.5 (417.5-719.5)	34	23 (67.6)	11 (32.3)

Figure 3: Lung involvement on Ct scan

