Review Article

Clinical Profile, Laboratory Parameters, Radiological Findings of COVID-19 Patients and its Association with Outcome — A Retrospective Observational Study

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Background : To study the clinical and epidemiological profile, laboratory parameters, radiological findings of patients admitted in Covid ICU of General Hospital, Thiruvananthapuram and its association with outcome.

Materials and Methods : The study was a hospital based retrospective study among patients admitted with COVID-19, in ICU of General Hospital, Thiruvananthapuram, Kerala which is a tertiary care centre, between 1st May and 31st of July, 2021. Diagnosis of COVID was confirmed either by Rapid Antigen test or RT-PCR. The features analyzed were demographic profile, co-morbidities, symptoms, clinical characteristics, laboratory parameters, radiological findings and outcome.

Results : Mean age of the population was 55.46 years, maximum patients were in 50-60-year age group. Highest mortality was seen in above 60 age group. (68.5%). Male gender were affected more (59%), but mortality was high in females (62.2%). Breathlessness was the commonest symptom and ARDS the commonest complication noted. Hypertension, Diabetes Mellitus, Chronic Kidney Disease, Cardiovascular, Cerebrovascular Diseases, Cancer were associated with significant mortality. Lymphocytopenia, raised blood Urea, SGOT, SGPT, CRP, D dimer was increased significantly in the non-survivor group.

Conclusion : Advanced age and presence of co morbidities were associated with increased mortality. Hypertension, Diabetes Mellitus, Chronic Kidney Disease was associated with increased mortality. These group of patients need early recognition and prompt intervention which will help in bringing down the mortality.

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***Key words* : Lymphocytopenia, ARDS.**

COVID-19 was declared as pandemic on 11th March, 2020. India has reported highest number of COVID cases second only to USA, but the case fatality rate was 1.2%. This was the lowest among the countries which had very high burden of Covid cases. The second wave in India was from April, 2021 and it spread across the country since the causative strain was highly transmissible. The number of cases started decreasing in other regions of India by May, 2021, but it took long for the cases to come down in Kerala, Maharashtra and North Eastern states[1]. In Kerala we had huge burden of COVID cases till end of July, 2021. Studies across the world proved that advanced age and co morbidities, certain specific clinical features, laboratory parameters, and radiological findings are associated with severe form of COVID-19 with adverse outcome. The present study was done to analyze these features and its association with outcome in our population[2]. The study was conducted at General Hospital Thiruvananthapuram which is a Tertiary Care Centre under Kerala State Health Services Department.

Editor's Comment :

- Early screening of COVID and appropriate management in elderly patients and in those with co morbidities help in better outcome.
- Proper control of Diabetes Mellitus, Hypertension, Chronic kidney disease help in reducing complications and mortality of COVID.

Materials and Methods

After getting institutional ethics committee approval, retrospectively collected data of patients admitted in ICU from 1st April to 31st July. All patients above 18 years of age and positive for either RT PCR or RAT were included. The decision for ICU admission and treatment protocols practiced were as per guidelines of Ministry of Health and Family Welfare Government of India. Severe category patients were admitted in ICU. Those with respiratory rate >30 per minute and /or oxygen saturation <90%.

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Details of age, gender, co-morbidities, symptoms and complications were collected. Co-morbidities included were Diabetes mellitus, Hypertension, Chronic Kidney Disease, Chronic Liver Disease, Cerebro Vascular Accident, Coronary Artery Disease, Chronic lung disease, Dyslipidemia, Malignancy and Hypothyroidism. Symptoms analyzed were fever, cough, breathlessness, sore throat, chest pain, hemoptysis, diarrhea, altered sensorium, anosmia, myalgia and fatigue. Complications considered were ARDS, Pneumonia, CAD, AKI, DKA, CHF, Transaminitis and outcome.

Statistical Analysis :

Data were entered in MS Excel and analyzed using SPSS software version 20

Results

The present study included 205 patients; mean age of the population was 55.46 years (55.459± 13.9840). Youngest patient was 24 years and oldest patient 85 years. Maximum patients were in the 50-60 years group (57 patients), followed by 60-70 years (44 patients) and 40-50 years (40 patient) respectively. (Figs 1&2).

Out of 205 patients 10 patients were referred to Government Medical College Hospital, Thiruvananthapuram. From the rest 195 patients 118 (57.6%) died and 77 (37.6%) patients survived the non-survivor group was divided into three (Fig 2).

As age advances mortality increases, highest mortality was seen in age group above 60 years (68.5%) and association of age with mortality was statistically significant (p=0.0001). Mortality was lowest in less than 40 years age group (21.7%)(Fig 3).

Males were more affected in our study (59%) than females (40.9%) (Fig 3) mortality was higher among female patients (62.2%) than male patients (59.3%).

Breathlessness was the commonest symptom (69.3%), followed by cough in (60%). Saturation level at the time of admission was better in the survived group (mean SPO_2 88.234), than in non-survivor group (mean SPO_2 82.847). Fever was the next commonest symptom 38%, followed by myalgia (24.9%,) fatigue (23.9%), diarrhea (10.7%). chest pain (9.8%), sore throat (6.3%)(Table 1).

Among the total 195 patients, 172(88.2%) had co morbidities, mortality was 64.5% in this group, whereas in the group who did not have any co morbidities, mortality was 30.4% and this difference in mortality was statistically significant (p=0.002), (Table 2). Diabetes Mellitus was the commonest co morbidity with a prevalence of 59%. Mortality was

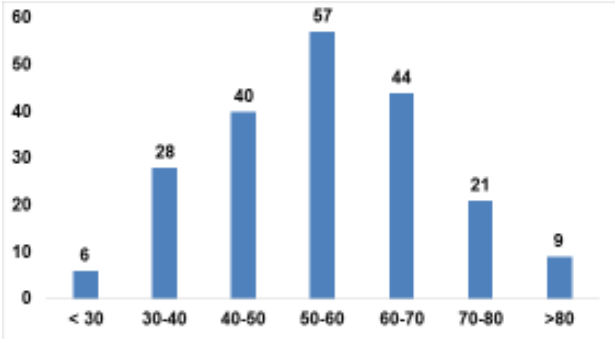

Fig 1 — Age Distribution of Study Population

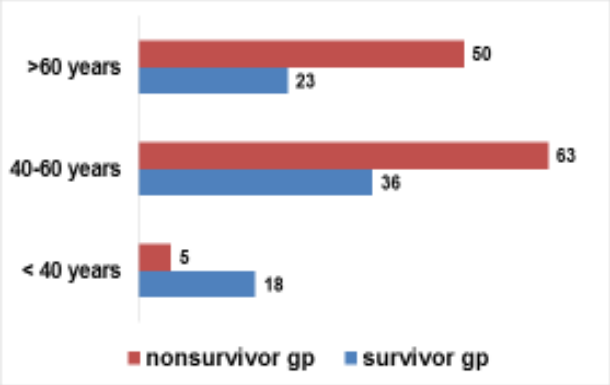

Fig 2 — Age Group Distribution in Survivor & Non-survivor Group

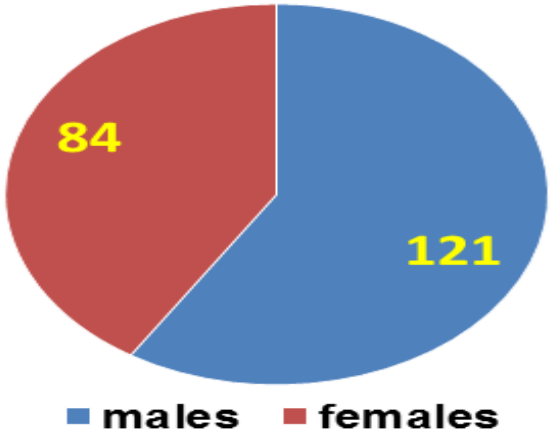

Fig 3 — Gender distribution

higher among the diabetic group (62.7%), compared to the non-diabetic group (57.1%). Hypertension was present in 50.2% of patients. Mortality among hypertensive group was 68% and in normotensive group 52.6%, this difference was statistically significant (p=0.028)[1]. Other co morbidities present were Dyslipidemia (20%), Hypothyroidism (17.43%), Chronic Kidney Disease (16.41%), Coronary Artery Disease (15.89%), Chronic Lung Disease (13.84%).

Table 1 — *Symptoms and Association with Outcome*

Symptoms	Number of patients	Survived	Died	P value
Breathlessness :				
Present	136	57(41.9%)	79(58.1%)	0.293
Absent	59	20(33.9%)	39(66.1%)	
Myalgia :				
Present	49	19(38.8%)	30(61.2%)	0.96
Absent	146	58(39.7%)	88(60.3%)	
Fatigue :				
Present	47	21(44.7%)	26(55.3%)	0.699
Absent	148	56(37.8%)	92(62.2%)	
Chest pain :				
Present	18	7(38.9%)	11(61.1%)	0.957
Absent	177	70(39.5%)	107(60.5%)	
Sore throat :				
Present	11	7(63.6%)	4(36.45)	0.09
Absent	184	70(38%)	114(62%)	
Hemoptysis :				
Present	6	6(100%)	0(0)	0.044
Absent	189	112(59.3%)	70 (39.5%)	
Cough :				
Present	118	70(59.3%)	48(40.7%)	0.674
Absent	77	48(62.35)	39(37.7%)	
Fever :				
Present	74	46(62.2%)	78(37.8%)	0.713
Absent	121	72(59.55)	49(40.5%)	

Coronary Artery Disease was present in 31 patients. Mortality was higher in patients with CAD (71%) than in the group who did not have CAD (29%). CKD was present in 32 patients and mortality was higher in patients with CKD (68.8%) than in those patients in whom CKD was absent (58.9%), but it was not statistically significant (p=0.297). Patients with hypothyroidism had higher mortality (67.6%). Malignancy was present in 10 patients, out of them 9 died (mortality 90%) and among patients without malignancy only 58.9% had mortality and the difference was significant statistically (p=0.05). Stroke was present in 7 patients (3.4%) with a mortality of 60.1%. Chronic Lung Disease was present in 27 patients, the mortality (51.9%), when compared with patients who did not have Chronic Lung Disease (48.1%) (Tables 2&3).

ARDS was the commonest complication present in (46.3%) patients. Mortality in the group whom developed ARDS was higher 75.8% compared to group who did not develop ARDS (47.1%) the difference was statistically significant (p=0.0001)(Table 3). Pneumonia was the next commonest complication (35.6%.). Mortality was more among with pneumonia (74.6%) compared to without pneumonia (52.4%) which was statistically significant (p-0.002). Acute kidney injury developed in 32 patients; among them the mortality (75.9%) was higher than those who did not develop AKI (57.8%). This association was not significant statistically (p=0.067). Transaminitis was present in 15 patients, mortality was higher in these patients 73.3% whereas in patients without transaminitis mortality was 59.4%. Coronary artery disease developed in 22 (11.7%) patients while in ICU, which included STEMI,

Table 2 — *Co-morbidity and its association with outcome*

Comorbidity	Number of Patients	Outcome No(%) Survived	Died	p value
Diabetes Mellitus :				
Present	118	44 (37.3%)	74(62.7%)	0.605
Absent	77	33 (42.9%)	44 (57.1%)	
Hypertension :				
Present	100	32(32%)	68(68%)	0.028
Absent	95	45(47.4%)	50 (52.6%)	
Chronic Lung Disease :				
Present	27	13(48.1%)	14(51.9%)	0.321
Absent	168	68(38.1%)	104 (61.9%)	
Dyslipidemia :				
Present	39	18(46.2%)	21(53.8%)	0.34
Absent	156	59(37.8%)	97(62.2%)	
Coronary Artery Disease :				
Present	31	9(29%)	22(71%)	0.194
Absent	164	68(41.5%)	96(58.5%)	
Cerebrovascular Accident :				
Present	7	2(28.6%)	5(71.4%)	0.547
Absent	188	75(39.9%)	113(60.1%)	
Chronic Kidney Disease :				
Present	32	10(31.3%)	22(688.8%)	0.297
Absent	163	67(41.1%)	96(58.9%)	
Hypothyroidism :				
Present	34	11(32.4%)	23(67.6%)	0.349
Absent	161	66(41.1%)	23(67.6%)	
Malignancy :				
Present	10	1(10%)	9(90%)	0.05
Absent	185	76(41.1%)	109(58.9%)	

Table 3 — *Clinical findings/Complications and association with Outcome*

Complication	Number of patients	Mortality Survived	Died	p value
ARDS :				
Present	91	22(24.2%)	69 (75.8%)	0.0001
Absent	104	55(52.9%)	49(47.1%)	
Pneumonia :				
Present	71	18(25.4%)	53(74.6%)	0.002
Absent	124	59(47.6%)	65(52.4%)	
CAD :				
Present	22	5(22.7%)	17 (77.3%)	0.088
Absent	173	72(41.6%)	101 (58.4%)	
CHF :				
Present	4	1(25%)	3(75%)	0.549
Absent	191	76(39.8%)	115(60.2%)	
DKA :				
Present	13	5(38.5%)	8(61.5%)	0.938
Absent	182	72(39.6%)	110(60.4%)	
AKI :				
Present	29	7(24.1%)	22(75.9%)	0.067
Absent	166	70(42.2%)	96(57.8%)	
CVA :				
Present	3	0(0%)	3(100%)	0.159
Absent	192	77(39.6%)	115(59.9%)	

NSTEMI, LBBB with a mortality of (77.3%) and Cardiac failure developed in 4 (2.0%) patients, three of them succumbed. Cerebrovascular accident developed in 3 (1.5%) while in ICU. All of them died. Diabetic keto acidosis developed in 13 patients (7.3%) and the mortality was higher in patients with DKA (61.5%)(Table 4).

X-ray was taken in 114 patients. Consolidation was the most common finding seen in 71 patients with a mortality of 70.6%, followed by ground glass opacities in 44 patients with a mortality of (61.9%). Six patients had pneumothorax and all of them succumbed, one patient developed pneumomediastinum.

CT chest taken in 37 patients, out of them 25 had a score more than 15. While the group with CT score more than 15 had mortality of 50% the group with a CT severity score of less than 15 had mortality of 40%. Out of ECG taken in 195 patients 72 (35.1%) were abnormal. Among the laboratory parameters lymphocytopenia, hyperbilirubinemia and increased blood urea, was high in non-survivor group. Increased level of random blood sugar, serum creatinine, SGOT/SGPT and low platelet count was present in non-survivor group.

Table 4 — *Showing Laboratory Parameters*

Laboratory parameters	No of patients	Mortality number	Mortality %	P value
Random Blood Sugar :				
<200	102	58	56.9	0.275
>200	93	60	64.5	
B Urea :				
Normal	77	38	49.4	0.036
Raised	115	78	67.8	
S Bilirubin :				
Normal	149	84	56.4	0.033
Raised	46	34	73.9	
S Creatinine :				
Normal	148	89	60.1	0.947
Raised	40	25	62.5	
Lymphocyte :				
Normal	50	29	58.0	0.899
Decreased	142	87	61.3	
Platelet :				
Normal	94	51	54.3	0.158
Decreased	95	64	67.4	
SGOT :				
Normal	84	45	53.6	0.176
Raised	110	72	65.5	
SGPT :				
Normal	97	60	61.9	0.654
Raised	97	57	58.8	
D Dimer :				
Normal	20	7	35	0.014
Raised	175	111	63.4	
CRP :				
Normal	75	39	52.0	0.05
Raised	120	79	65.8	
Troponin :				
Normal	24	11	45.8	0.008
Raised	16	14	87.5	

Lymphocytopenia a characteristic feature in Covid 19 was present in 142 patients out of which 87 died (61.3 %) this is high when compared with normal lymphocyte group of 50 patients with a mortality of 58%. Raised values CRP, D dimer, were associated with high mortality.

Troponin T was done in 43 patients and was high in non-survivor group (87.5%).

All patients were given O_2 support, among them 104 patients received Noninvasive Ventilation. Five patients received invasive mechanical ventilation, others received O_2 support through simple face mask and non rebreathable mask.

Out of 205 patients 10 patients were referred to Medical College Hospital (4.9%),118 patients died (57.6%), 58 patients shifted to ward (28.3%),19 patients discharged from ICU (9.3%).

Discussion

In the present study of 195 patients 57.6% died and 37.6% survived. This observation of mortality is different from the studies conducted in other states of India[3,4.]

Mean age of the present study population was 55.46 years with highest mortality in age group above 60 years (68.5%). The association of age with mortality has statistical significance (p=0.0001)[4,6].

This is comparable with studies across Globe which shows increased mortality as age advances.

Most studies showed that male patients are affected more with increased mortality. In the present study also, male patients were more affected than female patients. But mortality was higher in female group (62.25%) when compared with male group (59.3%)[3]. However, this association was statistically insignificant. Increased prevalence of co-morbidities like Diabetes Mellitus, Hypertension obesity and Social factors could be the reason for this observation of high mortality in female group.

In the present study mortality was higher (64.5%) in patients who had co morbidities and among the co-morbidities Diabetes Mellitus was the commonest. This could be attributed to the high prevalence of Diabetes Mellitus in Kerala. Studies across Globe showed association of Diabetes Mellitus and Covid having a poor outcome[4,5,12]. Diabetic patients have defective phagocytic and immune mechanism, there is increased chance of secondary infections, hyper glycemia due to drugs used in treatment of COVID like steroids all play a role. Our study showed increased mortality in patients with Diabetes Mellitus

(62.7%), but without any statistical significance. Along with poor glycemic control.

Diabetic Keto Acidosis also had adverse outcome with a mortality of (61.5%).

Second commonest co-morbidity was hypertension with 68% mortality (p=0.028)[4,5,8]. The mortality among hypertensive patients was higher than in patients with Diabetes Mellitus[5].

Chronic Kidney Disease patients are at increased risk of mortality which is evident from previous studies[1] in the present study CKD patients had 68.8% mortality[14,15]. Already existing renal dysfunction and electrolyte abnormalities added to the Mortality. The CKD patients definitely need early recognition of illness and appropriate treatment. In patients who developed Acute Kidney Injury mortality was 75.9%. Patients admitted in ICU are more to develop AKI. Various mechanisms like Direct Renal Injury, Acute Tubular Necrosis, Hypotension, Electrolyte Imbalance, Tissue Hypoxia, Nephrotoxicity of drugs play a role in development of AKI[13].

A mortality of 77.3% was seen with Coronary Artery Disease and 75% mortality for those who developed cardiac failure[16]. Affinity of SARS-Cov-2 virus for ACE-2 receptors which are present in both heart and brain could be the reason. Vasculitis, hypoxic injury, microvascular dysfunction also plays a role in increased cardiovascular and cerebrovascular mortality. All three patients who developed stroke succumbed. All of them had ischemic stroke. Chronic Lung Disease is considered as risk factor for disease severity and mortality in COVID-19. But our study group did not show high mortality, Low prevalence of Chronic Lung Disease in the study population could be the reason.

Breathlessness was the most frequently reported symptom because study population included patients of Cat B and Cat C (ref). Decreased oxygen saturation level at the time of admission was associated with poor outcome indicating severe lung involvement. All 6 patients presented with hemoptysis died which could be due to the severe ARDS present in them. ARDS was the most frequent complication in our study, with mortality of 75.8% All patients in ICU were given O_2 support 5 patients required mechanical ventilation, Other advanced modes of oxygen support used were noninvasive ventilation, high flow nasal oxygen, Bains circuit, non-rebreathable mask. Patients in non-survivor group required advanced modes of oxygen support, whereas majority patients in survivor group received simple face mask and non rebreathable mask. Non-invasive mechanical ventilation was commonest mode of support which was well accepted world over as the treatment of ARDS due to COVID-19. In our study those patients received NIV had a better outcome.

Among the co-morbidities malignancy had a significant impact (90% mortality)[5]. Immuno-suppression defective phagocytosis, prothrombotic effect due to primary malignancy or treatment related might be the cause for high mortality. Patients with cancer have an increased risk of acquiring infection and rapid deterioration. So, early identification of illness in these patients and active intervention warranted.

Lymphocytopenia which is a characteristic feature of COVID-19 was present in 142 patients out of which 87 died (61.3%) p=0.899. In our study raised S bilirubin, raised B. Urea, Lymphocytopenia was observed in non-survivor group. Raised levels of blood sugar, S Creatinine, SGOT/SGPT, and Thrombocytopenia were also observed in non-survivor group (Table 4).

Acute phase reactant CRP was associated with disease severity and was raised in non-survivor group with a mortality of 65.8%. Elevated Troponin levels has a strong association with disease severity, it indicates both ischemic and non-ischemic myocardial injury[16]. Present study showed high Troponin levels in non-survivor group. High D dimer levels are associated with increased risk of thrombotic complications and poor outcome. In our study the mortality of group with raised D dimer was 63.4%[17,18].

CT scan of Chest was taken in 37 patients only, since most of the patients were admitted with respiratory failure, they could not be mobilized for CT scan and radiological findings did not correlate with outcome.

Conclusion

Highest mortality was seen in age group above 60 years. Presence Co-morbidities like Hypertension, Diabetes Mellitus, Chronic Kidney Disease, Cardiovascular and Cerebro Vascular Diseases, Cancer had increased Mortality. Complications like Acute Kidney Injury, ARDS, raised levels of CRP, D Dimer, Lymphocytopenia, Transaminitis were observed in non-survivor group.

Limitations :

Since most patients were in respiratory failure, weight could not be recorded. CT scan of Chest could not be done in all patients.

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