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Comparison of Clinical Profile of Survive and Non-Survive ICU Admitted Critically Ill COVID-19 Patients at Tertiary Hospital of Central India

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Abstract: ***This is a retrospective case series to determine the clinical characteristics of ICU admitted COVID-19 patients conducted in tertiary care Hospital of Aurangabad, Maharashtra. We included all confirmed patients of COVID 19 admitted in ICU between a three months period. We focused on demographic data, clinical presentation, comorbidities, vitals, complications and management of all patients. Of the 200 Critically ill COVID-19 patients, majority of individuals in our study were males [146 (73%)]. Mean age of non-survived patients was 61.31yrs which was significant (p <0.0001). Majority of patients are residents of urban area [169 (84.5%)]. Fatigue [23 (23%)] was observed more in survived patients and dry cough [73 (73%)] was more prominent in non-survived patients. Dyspnoea [93 (93%)] was the most common clinical feature followed by fever [81 (81%)] in non survivors. Presence of pre-existing comorbidities [77 (77%)] in non-survived patients is significant; most common being hypertension [52 (52%)] and diabetes [52 (52%)] followed by Ischaemic heart diseases [13 (13%)] and asthma [13 (13%)]. Heart rate is significantly higher [94.69 bpm] in non-survived compared to survived [89.77 bpm]. Less number of survived patients required invasive mechanical ventilation [13 (13%)], maximum survived patients were on supplemental oxygen through mask or nasal cannula [66 (66%)]. Maximum of non-survived patients required invasive ventilation [81 (81%)] followed by non-invasive ventilation [56 (56%)]. Survivors had least number of complications and Acute respiratory distress syndrome [83 (83%)] is one of the main complications presented in non survivors followed by septic shock [58 (58%)]. SARS CoV-2 causes systemic inflammation which results in both systemic and pulmonary complications which is most fatal in high risk groups of elderly males with pre-existing comorbidities. Appropriate attention towards monitoring and preventing transmission of disease to such groups is necessary, but vigorous treatment of infected individuals should be the utmost priority. Chances of survival of patients on mechanical ventilations are less comparatively less than those who are not on mechanical ventilation.***

Keyword: SARS CoV-2, Clinical profile, Critically ill

1. Introduction

Coronaviruses are a group of spherical enveloped single stranded RNA viruses that causes mild to fatal respiratory illness in mammals & birds. Of the known four genera only Alphacoronaviruses&Betacoronaviruses are known to infect mammals [1]. Frequently seen four strains of human coronaviruses HCoV-OC43, HCoV-229E, HCoV-HKU1 and HCoV-NL63 produces 15% of the common cold in adults and children worldwide [2, 3], while 40 to 50% of colds are due to rhinoviruses [4]. After 2003, three strains of coronavirus SARS-CoV-1, MERS-CoV& SARS-CoV-2 causing life threatening symptoms emerged.

In January 2020, Chinese Center for Disease Control and Preventionfirst isolated a newstrain of coronavirus from three patients with pneumonia of unknown aetiology in China [5, 6]. A novel coronavirus, 2019-nCoV as abbreviated by WHO was later renamed by Coronavirus Study Group of International Committee on Taxonomy of Viruses as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) and the disease was called coronavirus disease 2019 (COVID-19). COVID-19 infection which shows person to person transmission of the SARS-CoV-2 in family and hospital settings [7, 8] has classic symptoms of fever, dry cough and tiredness; infrequent symptoms are myalgia, sore throat, headache, conjunctivitis, anorexia, diarrhoea, loss of taste or smell and rash on skin; fatal symptoms include breathlessness, chest pain and loss of speech or movement which may require intensive care admission [3]. The incubation period of SARS-CoV-2 is 14 days with most of the cases occurring within 4-5 days after exposure [8]. Data from Wuhan from where first cases of COVID-19 were reported in China shows that 23-32% of hospitalized patients required intensive care unit (ICU) admission [9].

In India first case of COVID-19 was reported on January 30th, 2020 in Kerala and till 21stMarch 2021, there have been 11, 599, 130 confirmed cases of COVID-19 with 159, 755 deaths, reported to WHO [10]. Although a total of 34, 859, 345 vaccine doses have been administered in India till 15 March 2021 [10], measures to limit the spread of virus, alleviate patient mortality and refine prognosis of severe infection is the question accosting the current pandemic.

2. Materials and Methods

Aim: To compare the Clinical Profile of Survived & Non-survived Critically Ill COVID-19 patients admitted at Tertiary Hospital of Central India.

Objectives: Comparison of clinical profile of Survived & Non Survived Critically ill COVID-19 patients.

Study Design: This is a retrospective observational case study of 200 critically ill COVID-19 patients conducted in MGM Medical College & Hospital, Aurangabad, Maharashtra; during 1st May 2020 to 31st July 2020. We selected cases using purposive sampling and included only

diagnosed cases of COVID-19 who were critically ill & required ICU admission at MGM tertiary care hospital of Aurangabad, Maharashtra. ICU COVID-19 patients who were less than 18 years of age at the time of admission, pregnant COVID-19 patients and the patients who stayed for less than 24 hours in the ICU were excluded.

Approval for the study was obtained from the Institutional Ethical Committee of MGM Medical College and Hospital, Aurangabad, Maharashtra. Written informed consent was taken from the patients or their next to kin at the time of admission to the hospital.

Data Collection: We reviewed the medical records of all patients with diagnosed COVID-19 infection. The admission data of these patients were collected and evaluated. Data regarding age, sex (male, female), area of living (urban, rural), chief complains of patients at the time of admission (fever, anorexia, fatigue, dry cough, diarrhoea, dyspnoea) were collected. Pre-existing comorbidities (hypertension, diabetes mellitus, IHD, asthma, COPD, chronic kidney disease, CCF, hypothyroidism), need for respiratory support (supplemental oxygen, HFO2, non-invasive ventilation, invasive ventilation), complications (ARDS, septic shock, AKI, multi organ failure, DIC, myocardial damage, liver injury, rhabdomyolosis), as well as survived status were ascertained from physician documentation & electronic medical reports.

Statistical Analysis: The data was compiled in master chart i. e. in MS-EXCEL Sheet and for analysis of this data; SPSS (Statistical package for social sciences) Version 20th was used. Continuous variables with normal distribution were presented as mean (Standard Deviation [SD]) and compared between survived &non survived groups by using Student's t –tests. A two sided p value of less than 0.05 was considered to be statistically significant. Categorical Variables were presented as frequency (percentage [%]) & assessed using Pearson $\chi^{2.}$

3. Observations & Results:

Table 1: Demographic profile of COVID-19 ICU patients

Group	Category	Survived [n=100]		Non Survived [n=100]		Total [n=200]		P-value
		No.	%	No.	%	No.	%	
Gender	Male	67	67	79	79	146	73	0.056
	Female	33	33	21	21	54	27	
Age-Group	≤30 years	3	3	2	2	5	2.5	<0.0001
	31-40	13	13	3	3	16	8	
	41-50	26	26	17	17	43	21.5	
	51-60	36	36	24	24	60	30	
	61-70	16	16	28	28	44	22	
	>70	6	6	26	26	32	16	
AGE	Mean ± Standard Deviation	52.52 ± 11.71		61.31 ± 11.56		56.91 ± 11.63		<0.0001
Duration of Hospital Stay	Mean ± Standard Deviation	7.56 ± 6.09		8.93 ± 5.97		8.24 ± 6.03		0.110
Area of Living	Rural	13	13	18	18	31	15.5	0.329
	Urban	87	87	82	82	169	84.5	

Of the 200 critically ill COVID-19 patients, majority of individuals were males [146 (73%)]. Minimum patients [5 (2.5%)] belongs to age group ≤30 years whereas maximum patients [60 (60%)] are in age group 51-60 years. Mean age of non-survived patients was 61.31yrs which was significant (p <0.0001). Majority of COVID-19 ICU patients are residents of urban area [169 (84.5%)].

Table 2: Chief Complains in COVID-19 ICU patients

Symptoms	Survived [n=100]		Non Survived [n=100]		Total [n=200]		P-value
	No.	%	No.	%	No.	%	
Anorexia	4	4	7	7	11	5.5	0.352
Fatigue	23	23	12	12	35	17.5	0.041
Dyspnoea	85	85	93	93	178	89	0.052
Dry Cough	54	54	73	73	127	63.5	0.005
Diarrhoea	9	9	8	8	17	8.5	0.8
Fever	72	72	81	81	153	76.5	0.104
Other	8	8	9	9	17	8.5	0.785

In our study, dry cough and fatigue were statistically significant, with fatigue [23 (23%)] being observed more in survived patients and dry cough [73 (73%)] was more prominent in non-survived patients. Dyspnoea [93 (93%)] was the most common clinical feature followed by fever [81 (81%)] in non survivors.

Table 3: Co-morbidities inCOVID-19 ICU patients

Group	Category	Survived [n=100]		Non Survived [n=100]		Total [n=200]		P-value
		No.	%	No.	%	No.	%	
CO-MORBIDITIES	Absent	46	46	23	23	69	34.5	0.002
	Present	54	54	77	77	131	65.5	
PRESENT CO-MORBIDITIES	Hypertension	34	34	52	52	86	43	0.025
	Diabetic Mellitus	34	34	52	52	86	43	0.018
	IHD	1	1	13	13	14	7	0.001
	Asthma	1	1	13	13	14	7	0.003
	COPD	0	0	2	2	2	1	0.155
	Chronic Kidney Disease	5	5	4	4	9	4.5	0.733
	CCF	0	0	3	3	3	1.5	0.081
	Hypothyroidism	4	4	1	1	5	2.5	0.174
	Other	3	3	14	14	17	8.5	0.005

Statistically significant difference was observed in presence of pre-existing comorbidities [77 (77%)] in non-survived patients is significant (p value 0.002). Most common comorbidities observed in non-survived are hypertension [52 (52%)] and diabetes [52 (52%)] followed by Ischaemic heart diseases [13 (13%)] and asthma [13 (13%)].

Table 4: Vitals at the time of admission in ICU of COVID-19 patients

Vitals At The Time of ICU Admission	Survived [n=100] Mean ± SD	Non Survived [n=100] Mean ± SD	Total [n=200] Mean ± SD	P-value
Heart Rate (beats per minute)	89.77 ± 13.730	94.69 ± 15.071	92.23 ± 14.401	0.017
Respiratory Rate (cycles /min)	28.80 ± 7.652	30.32 ± 8.382	29.56 ± 8.017	0.131
Systolic Blood Pressure (mmHg)	138.21 ± 99.336	130.03 ± 19.774	134.12 ± 59.555	0.420
Diastolic Blood Pressure (mmHg)	78.52 ± 8.983	79.91 ± 11.443	79.215 ± 10.213	0.341
Mean Arterial Pressure (mmHg)	107.12 ± 12.004	110.23 ± 15.022	108.675 ± 13.513	0.107
SPO2 (%)	86.53 ± 9.985	85.19 ± 12.845	85.86 ± 11.415	0.411
Blood Sugar Level (mg/dL)	160.74 ± 74.384	169.54 ± 71.065	165.14 ± 72.725	0.393

HR is significantly (p value 0.017) higher [94.69 bpm] in non-survived compared to survived [89.77 bpm]. There is no significance observed in Respiratory Rate, Mean Arterial Pressure&SPO_2.

Table 5: Respiratory Support in COVID-19 ICU patients

Respiratory Support	Survived [n=100]		Non Survived [n=100]		Total [n=200]		P-value
	No.	%	No.	%	No.	%	
Supplemental Oxygen	66	66	20	20	86	43	<0.0001
HFO2	38	38	27	27	65	32.5	0.97
Non Invasive Ventilator	23	23	56	56	79	39.5	<0.0001
Invasive Ventilation	13	13	81	81	94	47	<0.0001

In our study, less number of survived patients required invasive mechanical ventilation [13 (13%)], maximum survived patients were on supplemental oxygen through mask or nasal cannula [66 (66%)]. Maximum of non-survived patients significantly required (p value <0.0001) required invasive ventilation [81 (81%)] followed by non-invasive ventilation [56 (56%)].

Table 6: Complications in COVID-19 ICU patients

Complications	Survived [N=100]		Non Survived [N=100]		Total [N=200]		P-value
	No.	%	No.	%	No.	%	
ARDS	6	6	83	83	89	44.5	<0.0001
Septic Shock	2	2	58	58	60	30	<0.0001
AKI	1	1	36	36	37	18.5	<0.0001
Multi organ failure	0	0	23	23	23	11.5	<0.0001
Myocardial Damage	0	0	2	2	2	1	0.155
Other	1	1	9	9	10	5	0.009

In our study, survivors had least number of complications and the presence of complications like ARDS, septic shock, AKI and multi organ failure were statistically significant (p value <0.0001) in non survivors. Acute respiratory distress syndrome [83 (83%)] is one of the main complications presented in non survivors followed by septic shock [58 (58%)].

4. Discussion

In present study comparing between survived and non-survived ICU admitted COVID-19 patients, there was no significant relation found between gender, duration of stay and area of living, but majority of individuals in our study were males [146 (73%)]. Study by Chen N et al. and Nahum J et al. also evidenced that majority of patients affected were males [11, 12]

Majority of patients in our study were the resident of urban area [169 (84.5%)]. In a retrospective study conducted by Zhang et al. in Wuhan, 100% of their subjects were resident from urban area of Wuhan [13]. Althougharea of residence is not contemplated much when it comes to the transmission of infection, the city areas are more crowded having population density more compared to rural areas. Many people commute

to cities for various reasons, increasing the chance infection introduction in rural areas. All these makes area of residence an important risk factor regarding transmission of COVID 19, which should be further researched.

Mean age of non-survived patients was 61.31 years with SD of ±11.56 showing that significantly most of the non-survived were older patients. Higher risk of mortality in COVID-19 for elderly patients was also shown in previous studies [14, 15, 16]. In non-survived group, maximum patients were of age ranging 61-71 and minimal mortality was seen in ≤30 years old, concluding that elderly males possess greater risk of mortality [11].

In our study, dry cough and fatigue were statistically significant, with fatigue [23 (23%)] being observed more in survived patients and dry cough [73 (73%)] was more prominent in non-survived patients. Wedid not find any difference between survived and non-survived patients regarding presentation of dyspnoea and fever. Out of 200 critically ill COVID-19 patients, 178 (89%) experienced dyspnoea followed by fever [153 (76.6%)]. In our study, dyspnoea was the most common clinical feature followed by fever prominently in non survivors. In studies conducted by Yang et al. in China, fever [51 (98%)] was the most common clinical feature followed by dyspnoea [33 (63.5%)] [17], similar results were also found in other studies [15, 18].
Older people are more prone to have original essential organ comorbidities, which can affect the mortality of patient with COVID-19. A study conducted by Yang et al. concluded that 'Male, older, co-existing of heart, liver, and kidney comorbidities, especially those with severe Grade organ injuries, had a poor prognosis after SARS-CoV-2 infection' [19]. Original comorbidities decreases the chances of survival in COVID-19whichwas statistically proven (p value 0.002) by our study wherein77 (77%) of non-survived patients had pre-existing comorbidities; this conclusion is also supported byprevious study [17]. Prevention of COVID-19 is necessary, however if infected more attention and vigorous treatment is needed in older individuals with comorbidities. Most common comorbidities observed in non-survived were hypertension [52 (52%)] and diabetes [52 (52%)] followed by Ischaemic heart diseases [13 (13%)] and asthma [13 (13%)]. Tao et al. conducted a study in China among 2877 hospitalized patients, 29.5% (850/2877) had a history of hypertension which after adjustment for confounders showed that COVID-19 patients with hypertension had a two-fold increase in the relative risk of mortality compared toCOVID-19 patients without hypertension [20].

Respiratory support in critically ill patients is the vital component of prognosis and treatment. Statistically significant difference was observed in the requirement of supports like supplemental oxygen, non-invasive ventilation and mechanical ventilation in non-survived individuals. High mortality rate is observed in mechanically ventilated patients. In complicating hypoxemia, end-organ failure, or in patients with contraindications such as delirium, invasive mechanical ventilation is required. In our study, less number of survived patients required invasive mechanical ventilation [13 (13%)], maximum survived patients were on supplemental oxygen through mask or nasal cannula [66 (66%)]. The viral infection may lead to sub pleural inflammation, increase in vascular permeability and interstitial oedema further complicating to hypoxia [21]. Chen et al. conducted a study on 113 non-survivors, wherealmost all the patients [113 (100%)] received oxygen therapy, in which [77 (68%)] patients used high flow nasal oxygen, [76 (67%)] non-invasive ventilator mechanical ventilation and [17 (15%)] patients used an invasiveventilation, there was no use of invasive ventilation shown in recovered patients [22]

In our study, survivors had least number of complications and the presence of complications like ARDS, septic shock, AKI and multi organ failure were statistically significant (p value <0.0001). Acute respiratory distress syndrome [83 (83%)] is one of the main complications presented in non survivors followed by septic shock [58 (58%)] contrary to a study in which most of the deaths in critically ill COVID-19 patients caused by sepsis [23]. A study at Shijiazhuang conducted by Chen et al. showed extra pulmonary complications of cardiac injury [10 (19.6%)], acute kidney injury [5 (9.8%)] which were statistically significant in critically ill patients [18]. Another study at Wuhan conducted by Chen et al. where ARDS presented in 83 (53%) survived individuals [22], unlike our study where only [6 (6%)] survivors presented with ARDS.

5. Conclusion

Adult males with pre-existing comorbidities most commonly like hypertension and diabetes mellitus falls under high risk categories. Prevention of COVID-19 is necessary, however if infected more attention and vigorous treatment is needed for high risk categories to reduce mortality. SARS-CoV-2 causes systemic inflammation which results in both systemic and pulmonary complications. Chances of survival of patients on mechanical ventilations are less comparatively less than those who are not on mechanical ventilation.

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