Original Article

CLINICAL PRESENTATION OF COVID-19 DISEASE, ASSOCIATION BETWEEN SODIUM LEVELS AND PAO2/FIO2 RATIO, EFFECT OF STRESS ON MORTALITY RATE AND SMOKING PREVALENCE

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ABSTRACT:

Objective: To describe clinical parameters, risk factors, lab parameters, and association of these parameters with the severity of disease in admitted COVID-19 patients at Corona Unit Farooq Hospital Iqbal Town Branch Lahore.

Material and Methods: This was a retrospective study conducted on 43 admitted patients from 10th June 2020 to 14th July 2020. All the patients were presented with Acute Respiratory Distress Syndrome and were PCR positive for Corona Virus.

Results: Of All 43 patients, 16% of patients were presented with pulmonary symptoms & Encephalitis (responded to Acyclovir) and 84% with solely pulmonary symptoms (ARDS). The mean age among these patients was 59. About 23% of patients were presented with Moderate Acute Respiratory Distress Syndrome (ARDS), 28% Mild, and 49% Severe ARDS. According to HRCT Chest there was 30% involvement of lung tissue was seen in 6.96% patients, 40% in 30.23%, 50% in 4.65%, 60% in 11.63%, 70% in 27.91% and 80% in 18.60%. Among the Risk Factors Diabetes Mellitus was seen in 74.42% patients, pulmonary diseases 23.26%, Hypertension 41.86%, IHD 30.23%, cerebral palsy 4.65%, chronic kidney disease 6.98% and the smoker was only 11.63%. Among Lab Parameters Ferritin Levels were raised in all patients, D-Dimer 60.47%, Liver Function Tests (LFTs) 79.07%, RFTs (Renal Function Tests) 27.91%, CRP 97.67%, LDH (lactate dehydrogenase) 95.53%, Hemoglobin below normal was only in 6.98% and TLC was raised in 23.26 % patients. Plasma therapy was effective in 41.67%. Among the stressed patients at our Corona unit, 67% of patients were expired. Tocilizumab was seen effective in 61.54% of patients. CPAP was effective in 76.47% of patients. Decreased Levels of Sodium was Directly proportional to PaO2/FiO2. Among these patients only 18.60% of patients were expired, 9.30% were Discharged on request (clinically improved),72.0% of patients were recovered.

Conclusion: We feel that the findings described here, might be of interest to extensive further evaluation by the scientific community.

As smoking prevalence was least in our admitted COVID-19 patients, a significant correlation was seen among sodium level and PaO_2/FiO_2 Ratio and higher mortality rate among the stressed patients.

Key Words: COVID-19, Hypertension, PCR

INTRODUCTION:

Human coronaviruses (HCoV), in the 1960s, were first described by the discovery of HCoV-229E and HCoV-OC43, from the nasal cavities of human patients who were having a common cold, which caused respiratory and gastrointestinal infections.[1] SARS-CoV (2003), HCoV-NL63 (2004), HKU1 (2005), MERS-CoV (2012), and the latest one SARS-CoV-2 (2019) are the other human coronaviruses that caused serious respiratory tract infections, resulting in Corona Virus Disease (COVID-19).[2]

The morphology of coronavirus is large pleomorphic spherical particles with the bulbous surface so it named Corona comes from the Latin word "corona," meaning "crown." Human Corona Viruses vary significantly, as it causes the common cold the very harmless and MERS CoV the very lethal with more than 30% mortality rate.[3]

Major symptoms in CoVs was fever and sore throat with the less common pneumonia

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and bronchitis, and it spread in cold seasons.[4]

Still, there are no vaccines or antiviral drugs for the prevention or treatment of H CoV infection. The first coronavirus related outbreak of severe acute respiratory syndrome was described in November 2002 in Guangdong (China), and spread to 29 territories, during the 9 months including Hong Kong, Taiwan, Canada, Singapore, Vietnam, and the United State. Infected was 8098 people and 774 was killed worldwide.[5]

In the Middle East (April 2012), a second coronavirus related outbreak was described named the Middle East respiratory syndrome (MERS). First described in Saudi Arabia, and then, MERS spread to many other countries, Saudi Arabia, South Korea, the UAE, Jordan, Qatar, and Oman. Overall, it spread to 24 countries, with more than 1000 cases and more than 400 deaths.[1]

Again in South Korea, from a traveler from the Middle East, MERS was reported, during May and July 2015 total infected 186 persons, with a death rate of 36.[6]

Again the next MERS outbreak happened in countries of the Arabian Peninsula in August 2018 after 3 years, resulted in approx 147 infected and the death rate was 47. It affected Saudi Arabia, South Korea, and the United Kingdom too.[6]

On 31st December 2019, a pneumonia outbreak was reported in Wuhan, China, named as 2019 nCoV by the World Health Organization (WHO) and renamed by the International Committee on Taxonomy of Viruses that are SARS-CoV2. This was a new strain of HCoV.[7] To date, worldwide 14057897 confirmed cases, 594990 deaths, and 8359368 recoveries.

According to the government of Pakistan (ministry of health), a total of 260k confirmed cases with 5475 deaths has been reported till 17 July 2020. The highest number of cases has been reported in Punjab 89,023 followed by Sindh 110k, Khyber Pakhtunkhwa 31486, Islamabad 14454 and Baluchistan 11385 respectively.[8]

COVID-19 presentation varies from asymptomatic, mild symptoms to severe illness and mortality. Common symptoms are fever, cough, and dyspnea. Malaise and respiratory distress have also been reported.[1] the objective of this study was to describe clinical parameters, risk factors, lab parameters, and association of these parameters with the severity of disease in admitted COVID-19 patients at Corona Unit Farooq Hospital Iqbal Town Branch Lahore.

MATERIAL AND METHODS:

This was a retrospective study based on history, clinical records, laboratory records, and chest radiological features of admitted patients at the corona unit at Farooq hospital Iqbal town Lahore. The medical (laboratory) records were retrieved after taking permission from the head of the department Farooq hospital laboratory and informed consent was also taken from patients. The primary diagnostic method is reverse transcriptase-polymerase chain reaction (RT-PCR) assay of the nasopharyngeal swab. Only PCR positive patients were included. Children, PCR negative, and Acute Kidney Disease patients were excluded. All the data were analyzed using IBM SPSS statistical version 26.0.

RESULTS:

Of All 43 patients,16% of patients were presented with pulmonary symptoms & Encephalitis (responded to Acyclovir) and 84% of patients were presented with solely pulmonary symptoms (ARDS). (Figure-1)
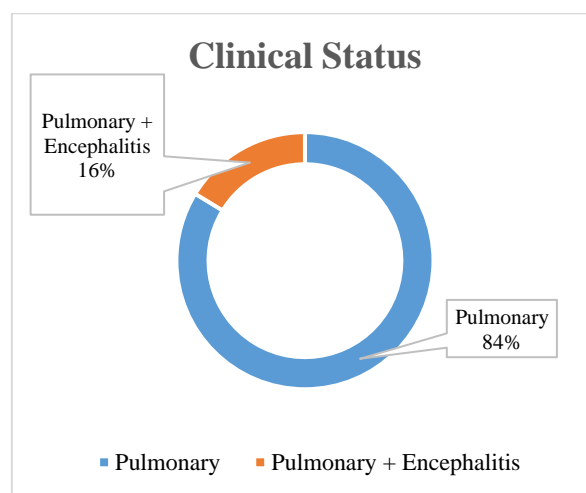

Figure-1 Clinical Status

Patients affected most at 40 years plus according to our study, the mean age was 59. Only 4 patients were below 40 years age. (Figure-2)
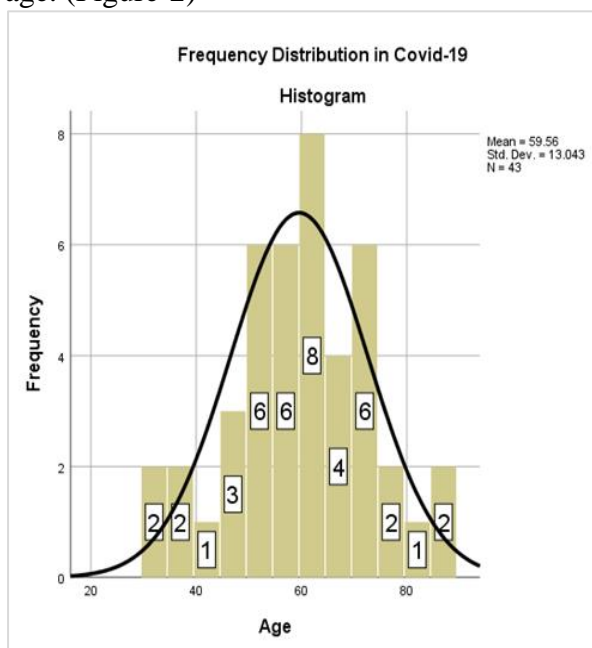

Figure-2 Age Frequency Distribution in SARS-CoV2

About 23% of patients were presented with Moderate ARDS (Acute Respiratory Distress Syndrome), 28% Mild and 49% patients were presented with Severe ARDS. (Figure-3)
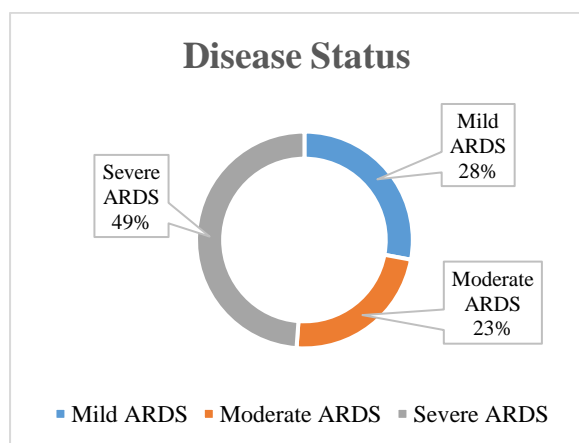

Figure-3 Disease Status

According to HRCT Chest there was 30% involvement of lung tissue was seen in 6.96% patients,40% in30.23% patients,50% in 4.65%, 60% in 11.63%, 70% in 27.91% and 80% in 18.60%. (Figure-4)
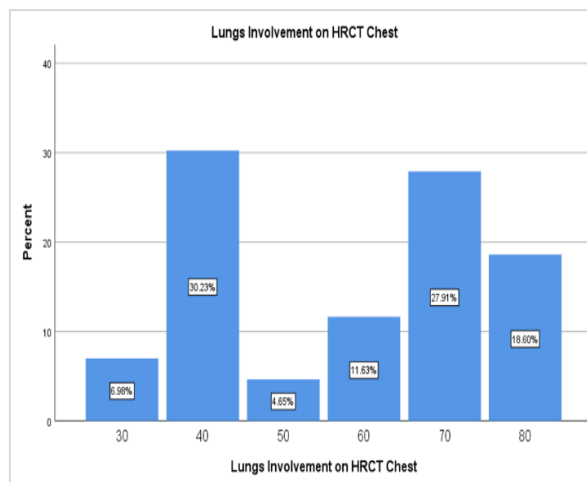

Figure-4 Lungs Involvement in HRCT Chest

Above 40% involvement of lung tissue was seen in 93.02% patients and below 40% involvement of lung tissue was seen only in 6.96% patients.

Overall critical patients were admitted to the Corona unit at Farooq Hospital Iqbal Town Lahore.

Among the Risk Factors Diabetes Mellitus was seen in 74.42% patients, pulmonary diseases like COPD, Asthma, Tuberculosis was seen in 23.26% patients, Hypertension was seen in 41.86% patients and IHD (Ischemic Heart Disease) was seen in 30.23% patients, Cerebral palsy was seen in 4.65% patients, Chronic kidney disease was seen in 6.98% patients and only 11.63% of patients were smokers. (Table-1)

Table-1: Risk Factors

Diabetes Mellitus	Yes	74.42%
	No	25.58%
Pulmonary Disease	Yes	23.26%
	No	76.74%
Hypertension	Yes	41.86%
	No	58.14%
Ischemic Heart Disease (IHD)	Yes	30.23%
	No	69.77%
Hepatitis	Yes	9.30%
	No	90.70%
Cerebral Palsy	Yes	4.65%
	No	95.35%
Smoker	Yes	11.63%
	No	88.37%
Chronic Kidney Disease (CKD)	Yes	6.98%
	No	93.02%
Typhoid	Yes	2.33%
	No	97.67%

Lab parameters played a very important role in diagnosis like Ferritin, D Dimer C-reactive protein, and LDH was raised in the maximum number of patients. According to our survey on admitted Covid-19 patients, Ferritin Levels were raised in all patients.

D-Dimer was raised in 60.47% patients, LFTs (Liver Function Tests) were raised in 79.07% patients, RFTs (Renal Function Tests) were raised in 27.91% patients, CRP was raised in 97.67% patients, LDH (lactate dehydrogenase) was raised in 95.53% patients, Hemoglobin below normal was only in 6.98% patients and TLC was raised in 23.26 % patients. (Table-2)

Table-2 Comparison of Lab Results

Ferritin Level	below 500	30.23%
	500-1000	32.56%
	1000-2000	27.91%
	2000-3000	4.65%
	above 3000	4.65%
D Dimer	Normal	39.53%
	Raised	60.47%
LFTs	Normal	20.93%
	Raised	79.07%
RFTs	Normal	72.09%
	Raised	27.91%
CRP	Normal	2.33%
	Raised	97.67%
LDH	Normal	4.65%
	Raised	95.35%
HB	Low	6.98%
	Normal	93.02%
TLC	Normal	76.74%
	Raised	23.26%

Plasma therapy was effective in 41.67% and was not effective in 58.33% of patients. (Figure-5)
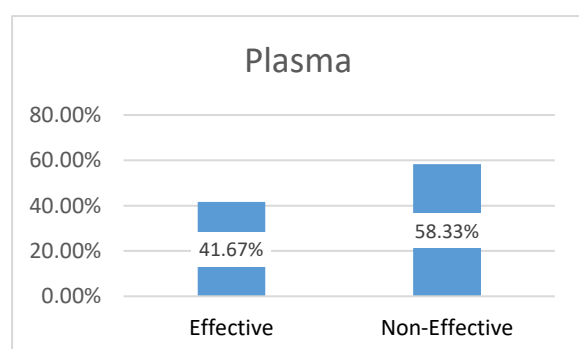

Figure-5 Plasma Effectiveness

Among the stressed patients at our Corona unit, 67% of patients expired, 22% of patients were discharged on request and only 11% of patients recovered. (Figure-6)
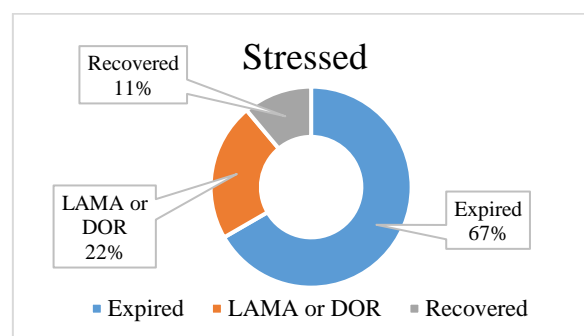

Figure-6 Relation between Stress and Outcome

Tocilizumab was seen effective in 61.54% of patients, showed an adverse reaction in 7.69% patients, and 30.77% this Drug was not effective. (Figure-7)
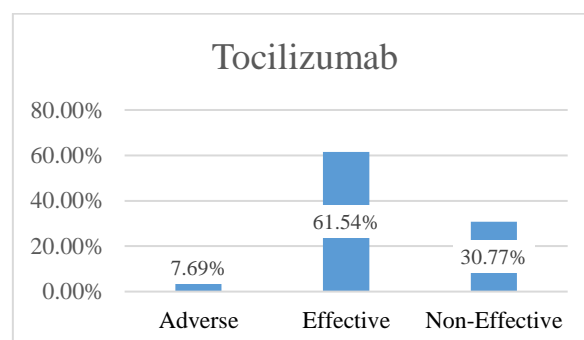

Figure-7 Effects of Tocilizumab

Invasive Ventilation was given only to 2 patients and it does not show any positive response in patients as lung compliance was severely affected but noninvasive ventilation especially Continuous Positive Airway Pressure (CPAP) was effective in 76.47% patients. (Figure-8)
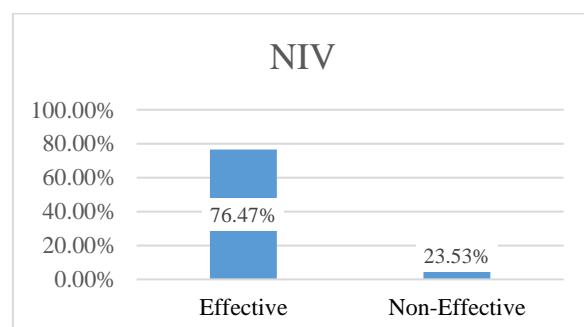

Figure-8 Effectiveness of Non-Invasive Ventilation

According to our survey on admitted Covid-19 patients, Levels of Sodium was Directly proportional to the PaO2/FiO2 Ratio, as Pearson Correlation between these two variables was significant at 0.01 level. (Figure-9)
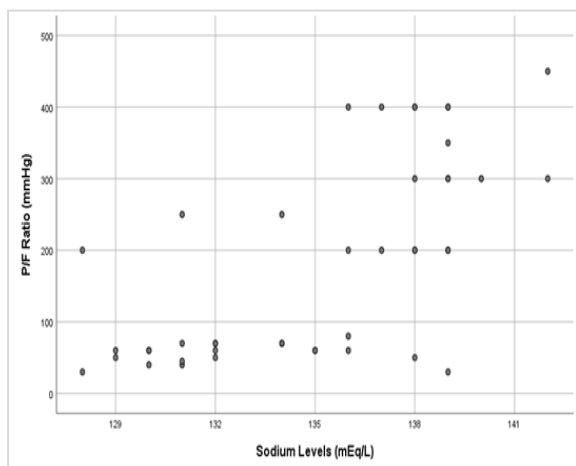

Figure-9 Sodium Levels v/s PIF Ratio

As the Sodium level goes down in blood thus the P/F ratio goes down. (Table-3)

Table-3 Correlation of P/F Ratio and Sodium Levels

Correlations		P/F Ratio (mmHg)	Sodium Levels (mEq/L)
P/F Ratio (mmHg)	Pearson Correlation	1	.664**
	Sig. (2-tailed)		.000
	N	43	43
Sodium Levels (mEq/L)	Pearson Correlation	.664**	1
	Sig. (2-tailed)	.000	
	N	43	43

Among these patients only 18.60% of patients expired, 9.30% were Discharged on request (clinically improved), percentage advised to stay in isolation until PCR for Covid-19 turns out negative, 72.0% patients were recovered. (Figure-10)
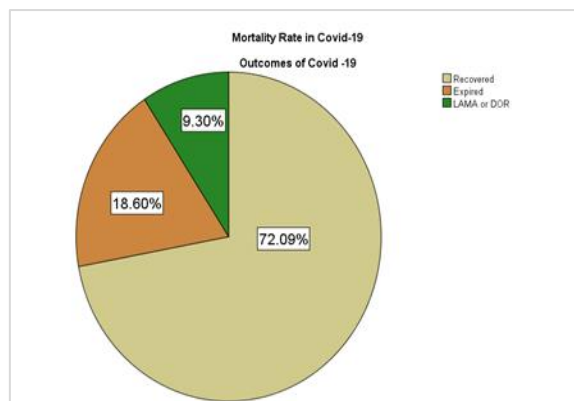

Figure-10 Mortality Rate in SARS-CoV2

DISCUSSION:

According to our knowledge, this study is the first one in Pakistan in which the association between hyponatremia and PaO2/FiO2 Ratio has been showing as well as the effect of Stress on Mortality Rate. The mean age showed in this study is 59 years, while Bhatraju et al showed that the mean age was around 64 years.[9]

Stress causes an increase in cortisol levels, activating adaptive changes in metabolism, cardiovascular functions, and immune system. This study showed that in COVID-19 admitted patient's mortality rate was 67% among the stressed patients. Dhillo et al reported mortality rate was increased by 42% due to stress-induced higher cortisol concentration.[10]

This study showed that hyponatremia is associated with advanced COVID-19 disease as this is correlated with decreased PaO_2/FiO_2 Ratio.

In COVID-19 infections, Respiratory failure from acute respiratory distress syndrome (ARDS) is the common cause of mortality, but a secondary hyper inflammation syndrome that is the release of cytokines may coming up with fatal outcome, causing multiple organ failure. In COVI-19 induced pathology, IL-6 is the important cytokines. So Tocilizumab, a humanized monoclonal antibody against the IL-6 receptor, has proved clinical efficacy in the treatment of seriously ill patients. Interleukin-6 plays a pathogenic role in these severe inflammatory conditions released by macrophages and monocytes causing

electrolyte imbalance by inducing the non-osmotic release of vasopressin so the SAID (syndrome of inappropriate antidiuresis) and thus ending up in Hyponatremia. So in our study in severe ARDS with Hyponatremia Tocilizumab was effective in 61.54% patients.[10]

Diuretics like furosemide was used to maintain fluid balance, to get rid of free water thus correct Hyponatremia and it played an important role in recovery.

In this study female patients (25.58%) were less affected than males (74.42%) and this is in accordance to another study carried by Wang et al., 2020.[11]

In this study, not a single patient was having mild or moderate symptoms as all admitted patients were having ARDS (Acute Respiratory Distress Syndrome). The case fatality rate was 18.60% and it's in accordance with Huang et al.[12]

Among these patients, 74.42% patients were having Diabetes Mellitus (uncontrolled) and so were critical as in another study showed that the Diabetes Mellitus is associated with mortality, severe COVID-19 disease, ARDS, and disease progression.[13]

In this study, 30.23% of the patients had IHD, Pulmonary Diseases, and Hypertension were seen in 23.26% and 41.86% respectively. So Diabetes Mellitus, Hypertension, Pulmonary Diseases, and Ischemic Heart Disease were among the most prevalent underlying diseases in COVID-19 admitted patients.[14]

An unexpectedly low prevalence of Smoking (11.63%)was seen in COVID-19 admitted patients at Farooq Hospital Iqbal Town Branch Lahore, as also seen in this study.[15] In another study, the meta-analysis based on Chinese patients suggest that active smoking does not apparently seem to be significantly associated with enhanced risk of progressing towards severe disease in COVID-19.[16]

CONFLICT OF INTEREST:

We declared that there is no conflict of interest.

CONCLUSION:

According to these findings, it is concluded that there is a significant correlation between sodium level and PaO_2/FiO_2 Ratio and higher mortality rate among the stressed patients.

AUTHOR'S CONTRIBUTION:

FR: Planing and collection of data
RA: Statistical analysis and drafting of article

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