

## Original Article

# Deviations in the Basic Biochemical Parameters In COVID Patients : Our Experience in a COVID Hospital in Eastern India

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This descriptive, observational, cross-sectional study was performed to detect the deviations in common biochemical parameters in COVID patients. All the COVID patients whether symptomatic or not (admitted within 15<sup>th</sup> of September to 30<sup>th</sup> November) were enrolled in the study. A statistically significant rise in the serum transaminases, urea, creatinine, the serum electrolytes and a decrease in serum albumin from their respective reference intervals in the population was noted. These deviations indicate that, apart from the lung parenchyma, SARS COV-2 infection affects the liver and the kidney as well. These multisystem alterations in biochemical parameters are evident even if the patients are clinically asymptomatic.

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**Key words :** COVID-19, Deviations from reference intervals, Transaminitis, Multisystem alterations.

In the month of December, 2019, a cluster of cases of atypical pneumonia now known as novel coronavirus-infected pneumonia was reported from the Wuhan city in the Hubei province in China. In the following year in early January, the causative agent of the disease was identified by the Chinese Authorities as a strain of beta coronavirus which was named as 2019 novel coronavirus (SARS-COV2) and the disease as coronavirus disease 2019 or COVID-19. The disease eventually spread out across the globe and till February 21, 2021 around 111,821,203 cases of COVID-19 and 2,475,140 deaths have been reported to the WHO<sup>1</sup>. The magnitude of the global spread of the disease and the havoc it wrecked on the healthcare systems across the world compelled the WHO to declare COVID 19 a pandemic on 11<sup>TH</sup> March, 2020.

Early reports suggested that it caused a severe respiratory illness similar to that caused by severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV)<sup>2</sup>. Statistics associated with the disease are alarming. Almost 26 to 33 per cent of patients required admission in intensive care units and there is a high mortality of 4 to 15 percent<sup>3</sup>. But, the majority of the patients infected with the virus are either asymptomatic or present with fever, dry cough, difficulty in breathing and chest pain of varying proportions.

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### Editor's Comment :

- SARS-COV2 infection affects not only the lung parenchyma, but also other organ systems
- This multisystem involvement may be a result of hypoxia or a generalized hyperinflammatory reaction.
- Infection with SARS-COV2 causes gross biochemical derangements.
- These biochemical alterations are seen even in asymptomatic individuals infected with SARS-COV2.

In India, the first case of COVID-19 was reported on January 31, 2020 in Kerala, which increased to three cases by 3rd February; all were students returning from Wuhan. Gradually, the number of cases increased exponentially and at present, India is one of the worst affected countries inspite of a strict 21 day nationwide lockdown as a preventive measure against the pandemic which was imposed quite early in March. Till date, a total of 11,004,795 people have been affected in India and more than 149,218 people have lost their lives to the disease<sup>4</sup>.

As mentioned previously, the clinical presentation and profile of the patients vary widely. In a country like India with a vast population and an over burdened health care system, it is imperative that the suggestive clinical picture of the COVID patient be recognised early on to prevent further mortality. In this study, we have tried to assess the deviations in the common biochemical parameters in COVID positive patients so that it may help the clinician to predict the prognosis when dealing with suspected patients.

The aim of the study was to find out the deviations in the biochemical parameters from the established reference intervals in the COVID positive patients in a dedicated COVID Hospital in Eastern India. These reference intervals were originally developed in our

departmental laboratory to cater to the population served by this Tertiary Care Hospital. Prompt diagnosis of the alterations in laboratory parameters in association with the presenting signs and symptoms will assist will careful triage of the COVID patients during the pandemic.

**MATERIALS AND METHODS**

The following study was carried out at the College of Medicine and Sagore Dutta Hospital, Kamarhati, in the outskirts of Kolkata. All the COVID positive patients admitted in this hospital from the 15<sup>th</sup> of September to 30<sup>th</sup> November were included in the study. The COVID positive patients were included in the study within 24 hours of admission. A confirmed case of COVID-19 was diagnosed by a TRUNAAT assay of the nasopharyngeal and oropharyngeal swabs. Fasting blood samples were drawn from the patients and analysed for urea, creatinine, liver enzymes, total protein, albumin, sodium and potassium. Since, on most of the occasions, glucose was estimated in the wards by a glucometer, we did not include glucose in our study. This biochemical analysis was carried out in the Biochemistry Department with an automated analyser namely XL 340. Other relevant clinical and demographic data was retrieved from the case history and the data recorded on admission.

The data thus obtained was compiled in the excel sheet and statistically analysed.

**ANALYSES AND RESULTS**

The biochemical parameters were tabulated in EXCEL sheet and the descriptive statistics were first calculated. Almost all the parameters were non-parametric in distribution as seen in the skewness and kurtosis. The statistical analyses is given below in Table 1, Fig 1.

**DISCUSSION**

A cursory glance at the table throws up some interesting data. Firstly, the tranaminases have increased considerably. 95% CI for AST and ALT are 47.55-55.5 U/l and 51.3-64.4 U/l and respectively while the reference intervals for the same are <45U/l and <35U/L .There are several theories regarding the elevation of liver enzymes. The liver damage may be caused directly by viral on slaught on the hepatic cells and some studies have demonstrated the presence of the virus in the liver cells though in the absence of viral inclusion bodies. Also gastrointestinal disturbances like diarrhoea have been reported quite frequently in these patients and the virus has been isolated in stool and blood samples<sup>2,3</sup>. It may also be noted here, that the Alkaline Phosphatase (ALP) has not increased correspondingly. Another plausible theory is that the hypoxia associated with the pneumonia in these patients contribute significantly to the liver injury. The ensuing cytokine storm and immune mediated inflammation in these patients may directly damage the liver. Again this hepatotoxicity has also been

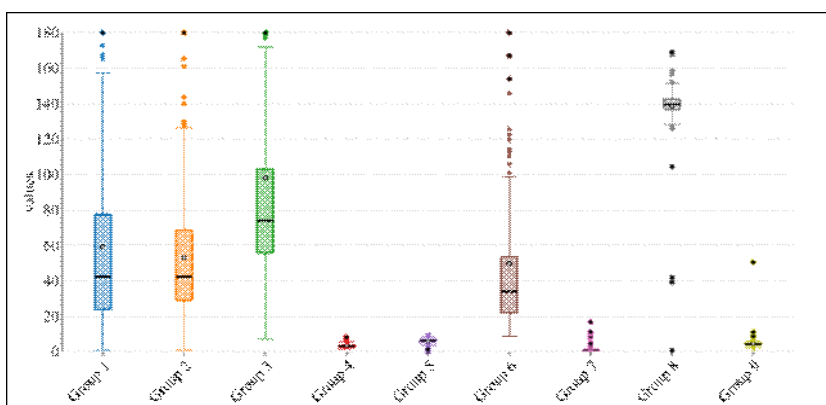


Fig 1 — Box and Whisker Plot showing the descriptive statistics of the above parameters (Groups are mentioned above in the table against the respective parameters)

Table 1 — Showing the descriptive statistics of the biochemical parameters in COVID patients and the figure below shows the box-whisker plot. (The corresponding groups are mentioned in this table itself)

Parameters	Mean	Median	Mode	Reference intervals	SD	95% CI
Alanine transaminase (Group 1)	57.87	41.8	16.3	M: <35 U/L F: <31 U/L	57.63	51.3—64.4
Aspartate transaminase (Group 2)	51.57	41.7	29.8	M: <45 U/L F: <34 U/L	35.25	47.55—55.5
Alkaline phosphatase (Group 3)	91.99	73	52	M: 53-128 F: 42-98 U/L	68.23	84.21—99.76
Total protein (Group 4)	5.9	6.2	6.48	6.4-8.3 g/dl	1.33	5.7—6.098
Albumin (Group 5)	3.65	3.14	3.23	3.5-5.2 g/dl	1.50	3.4—3.8
Urea (Group 6)	49.46	34	21.1	19-45 mg/dl	58.42	42.8—56.12
Creatinine (Group 7)	1.42	0.835	0.81	F: 0.9-1.1 mg/dl M: 0.6-1.2 mg/dl	2.98	1.75—1.80
Sodium (Group 8)	139.1	139.7	137.4	136-145 meq/L	10.15	137.95—140.26
Potassium (Group 9)	4.56	4.39	4.2	3.5-5.1 meq/l	2.31	4.29—4.82

[Abbreviations: M-males, F-females; SD- standard deviation; 95%CI- 95 percent confidence intervals]

attributed to drugs by some authors though raised transaminases have been documented in drug naïve patients as well. But, this liver damage is transient and usually tends to reverse on its own. Nevertheless, this reversible rise in transaminases in COVID patients is almost universal and has been referred to as transaminitis by some authors<sup>5-7</sup>.

Secondly, the serum urea and creatinine along with sodium and potassium have also increased considerably. In this study, the 95% confidence interval for urea was 42.8-56.12mg/dl, creatinine was 1.08-1.75mg/dl, serum sodium was 137.95-140meq/L and serum potassium was 4.3-4.8meq/l respectively. The reference levels for the parameters are 19-45mg/dl, 0.6-1.2mg/dl, 136-145meq/dl and 3.5meq/dl-5.1meq/l respectively. All these suggest a possible renal injury by the SARS-COV2. Incidentally, the Angiotensin-converting Enzyme 2 Precursor (ACE2) receptor which is considered to be a functional receptor of SARS-COV 2 has also been detected in the proximal tubules, afferent arterioles, collecting ducts, and the thick ascending limb of Henle but not so in the distal tubules<sup>8,9</sup>. Studies have shown that SARS-COV2 can directly induce acute kidney injury by infecting the renal tubular epithelium and podocytes and causes acute tubular necrosis<sup>10,11</sup>. In COVID-19 subjects with renal function impairment, the NP antigen has been detected in the cytoplasm of kidney tubules instead of glomeruli. This acute kidney injury is actually a part of the multiple organ dysfunction syndrome caused by the activation of the immune system resulting in the release of large amount of proinflammatory cytokines TNF- $\alpha$ , IL-1, IL-6, interleukin (IL)-12, and interferon (IFN)- $\alpha$  as a part of the cytokine storm. Pathologically, inflammation and edema of the renal parenchyma has been demonstrated in patients with COVID-19<sup>12</sup>. Clinically the patients present with hypoperfusion, more fluid accumulation and lesser urine output<sup>13</sup>. The use of nephrotoxic drugs may also contribute to the scenario but the effect has not been studied in detail.

The deviations observed in these parameters indicate that the SARS COV 2 infection not only affects the lung parenchyma, it also wrecks havoc on the liver and the kidney as well. It remains to be seen however, whether this multisystem involvement is due to the hypoxia generated by the affected lung, or is a result of a generalised multisystem hyperinflammation. Whatever may be the cause, autopsy findings have demonstrated widespread micro-thromboses in large and small vessels, acute tubular injury in the kidneys, reactive lymph node changes, atypical changes in the liver histology, all supporting multisystem manifestations<sup>14,15</sup>.

## CONCLUSION

Thus it may be safely concluded that persons infected with SARS-COV2, show gross derangements in the biochemical parameters irrespective of the fact whether they exhibit signs and symptoms of the disease or not. In addition, it may also be concluded that there is a generalized multisystem involvement in COVID patients as evidenced by the alterations in the parameters included in the liver function tests and also the rise in urea, creatinine, sodium and potassium.

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**Conflict of Interest :** None

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