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Original Research Article

Determination of Biochemical Parameters (AST, ALT, Total Protein, Albumin and ALP) in Corona (COVID-19) Patients

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Abstract:

Background: Present study was conducted to determine the biochemical parameters in Corona (COVID-19) patients and considering age and gender.

Objectives: To determine and compare the levels of AST, ALT, TOTAL PROTEIN, ALBUMIN and ALP in the corona patients and healthy controls.

Methods: Determination & comparison of serum (AST, ALT, TOTAL PROTEIN, ALBUMIN and ALP) was done between 50 Corona patients & 50 healthy controls. Biochemical parameter (AST, ALT, TOTAL PROTEIN, ALBUMIN and ALP) analysis was done using fully auto analyzer. Statistical comparison was done, results were expressed as Mean ± SD, $p < 0.05$ was considered to be statistically significant.

Results: All groups were statistically matched in age distribution analysed. Serum (AST) concentrations in cases & controls were (61.14 ± 41.34 IU/L) & (34.26 ± 16.67 IU/L) respectively ($p < 0.0001$). Serum (ALT) concentrations in cases & controls were (58.24 ± 45.60 IU/L) & (27.24 ± 14.63 IU/L) respectively ($p < 0.0001$). Serum (TP) concentrations in cases & controls were (6.72 ± 0.94 g/dl) & (6.55 ± 1.16 g/dl) respectively ($p = 0.424$). Serum (Alb.) concentrations in cases & controls were (3.85 ± 0.89 µg/dL) & (3.87 ± 1.11 µg/dL) respectively ($p = 0.890$). Serum (ALP) concentrations in cases & controls were (97.76 ± 44.99 IU/L) & (99.48 ± 57.52 IU/L) respectively ($p = 0.868$).

Interpretation and conclusion: Sreum (AST, ALT) showed significant increases in corona (covid-19) patients as compare to healthy controls, serum (TP, Albumin, ALP) were found insignificant.

Keywords: COVID-19, Biochemical parameter (AST, ALT, Total Protein (TP), Albumin (Alb), ALP, fully auto analyzer.

Introduction

Corona (Covid-19): COVID-19 is an infectious disease caused by the SARS-CoV-2 virus. COVID-19, a form of respiratory and systemic caused by a virus belonging to the Coronaviridae family, originated from the town of Wuhan in china, is still spreading around the world [1].

Corona viruses (CoVs) are the large (60-140 nm diameter), enveloped positive sensed RNA viruses group belonging to the Coronaviridae family [1-3]. The genome of CoVs is surrounded by a lipoprotein envelope containing several spicules of glycoprotein and helical capsid. Together it gives the virus a crown like appearance when observed under electron microscope and hence the word observed under electron microscope and hence the word "corona" comes which in Latin means crown [4]. In December 2019, the city of Wuhan in china became the epicenter of unexplainable cases of pneumonia, which in Jaunary 2020 were identify as a new corona virus, turning rapidly into a major problem of public health worldwide [5] .

The disease caused by the novel corona virus, Severe Acute Respiratory Syndrome Corona virus 2 (SARS-CoV-2) has been named "corona virus disease 2019" (COVID-19) by World Health Organization (WHO) and it has also been called once in a century pathogen. WHO declared COVID-19 as a pandemic on March 11, 2020 due to rapidly increasing number of cases across the globe [6].

Role of the laboratory in the determination of biochemical parameters in Corona (COVID-19) patients

Hepatic Markers

A panel of liver function tests constitutes liver enzyme, proteins and bilirubin which include biochemical parameters such as alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), lactate dehydrogenase (LDH), albumin, and total bilirubin. These liver biochemical markers reflect liver dysfunction and also been helpful as a screening tool for several medical conditions. Liver function tests have been analysed in several single and multicentred large scale studies which revealed rise in levels of liver enzymes (AST, ALT, ALP) in moderate to critically ill patients whereas rise in values in patients with mild infection was comparatively less [7-9].

Viral activity induces several inflammatory and haematological changes that lead to liver tissue damage, leading to increased levels of these enzymes [10,11].

Material and Methods

This study comprising of an observational case-controls study as well as an experimental study, conducted in the Department of Biochemistry, Jhalawar Medical College, Jhalawar (Rajasthan). The subjects in our study were selected from Hodoti region and Rajasthan. An estimation of Biochemical parameter AST, ALT, TP, Albumin and ALP were analyzed by fully automated analyzer in biochemistry laboratory, Jhalawar Medical College, Jhalawar (Rajasthan).

Inclusion criteria: Patients with history and physical findings of Corona disease are recruited as cases. Biochemical analysis suggestive of Corona disease (Covid-19) negative patients above the age of 25 years of age are recruited as controls.

Exclusion criteria: Patients with liver disease, lung disease (eg. Asthma, lung cancer). Patients with heart disease, Patients with history of anti-thyroid drugs, patients with chronic use of medicine (eg. steroids, anti-cancer drugs), any systemic disease (connective tissue disorders, chronic kidney disease and psychiatric disorders) are excluded from this study.

Statistical Analysis: The Statistical software SPSS 20.0 was used for the analysis of the data. Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements were presented on Mean ± SD and results on categorical measurements were presented in number (%). Unpaired – t test, Paired – t test, and Chi – square test were used in data analysis for this study. P value <0.05 was consider as significant.

Results

This case control study was conducted in Department of Biochemistry, Jhalawar Medical College and Hospita, Jhalawar from October 2021 to March 2022. A total of 50 patients of Corona (Covid-19) and 50 healthy controls were selected for study. The final observation and results are tabulated as below:

Comparison of age distribution between Group – I and Group – II is presented in Table – 1. The present observation shows that the mean age of Corona (Covid – 19) patients was (55.48 ± 15.02 years) and the mean age in healthy controls was (50.30 ± 11.60 years). Statistical analysis showed that p – value was 0.057, i.e. ($p > 0.05$) therefore the age difference in both groups was statistically insignificant.

Comparison of sex in cases and controls was statistically analyzed using chi – square test. The percentage of males in case group was 50%, whereas the percentage of females was 50%. The percentage of males in control group was 44%, whereas the percentage of females was 56%. Statistical analysis showed that p – value was 0.548, i.e. ($p > 0.05$) therefore the difference in sex distribution in both groups was statistically insignificant.

Comparison of serum AST concentration in cases and controls were statistically analyzed using unpaired t test. The mean of serum AST concentration in corona patients was found to be (61.14 ± 41.34 IU/L). The mean serum AST concentration in healthy controls was found to be (34.26 ± 16.67 IU/L). Statistical analysis showed that p – value was <0.0001 therefore the difference in serum AST concentration in both groups was statistically significant.

Comparison of serum ALT concentration in cases and controls was statistically analyzed using unpaired – t test. The mean serum ALT concentration in Corona (Covid-19) patients was found to be (58.24 ± 45.60 IU/L). The mean serum ALT concentration in healthy controls was found to be (27.24 ± 14.63 IU/L). Statistical analysis showed that p – value was <0.0001* therefore the difference in serum ALT concentration in both groups was statistically significant.

Comparison of serum total protein concentration in cases and controls was statistically analyzed using unpaired – t test. The mean serum total protein concentration in Corona (Covid-19) patients was found to be (6.72 ± 0.94 g/dl). The mean serum protein concentration in healthy controls was found to be (6.55 ± 1.16 g/dl). Statistical analysis showed that p – value was 0.424, i.e. ($p > 0.05$) therefore

the difference in serum total protein concentration in both statistically insignificant. Comparison of serum albumin concentration in cases and controls was statistically analyzed using unpaired – t test. The mean serum albumin concentration in Corona (Covid-19) patients was found to be (3.85 ± 0.89µg/dL). The mean serum albumin concentration in healthy controls was found to be (3.87 ± 1.11 µg/dL). Statistical analysis showed that p – value was 0.890, i.e. (p > 0.05) therefore the difference in serum albumin concentration in both groups was statistically insignificant. Comparison of serum ALP concentration in cases and controls was statistically analyzed using unpaired t test. The mean serum ALP concentration in Corona (Covid-19) patients was found to be (97.76 ± 44.99 IU/L). The mean serum ALP concentration in healthy controls was found to be (99.48 ± 57.52 IU/L). Statistical analysis showed that p – value was 0.868, i.e. (p > 0.05) therefore the difference in serum ALP concentration in both groups was statistically insignificant.

Table 1: Comparison of age between Cases and Controls

Group	Number	Mean	Std. Deviation	t-value	p-value
Cases	50	55.4800	15.02819	1.929	0.057
Controls	50	50.3000	11.60445		

Table 2: Comparison of sex distribution between Cases and Controls

Group	Males	Females	Total	Chi sq.	p-value
Group – I Cases	25 (50.0%)	25 (50.0%)	50 (100%)	0.361	0.548
Group – II Controls	22 (44.0%)	28 (56.0%)	50 (100%)		
Total	47 (47.0%)	53 (53.0%)	100 (100%)		

Table 3: Comparison of serum AST between Group – I and Group – II

Group	N	Mean (IU/L)	Std. Deviation	t -value	p-value
Group – I Cases	50	61.1400	41.34524	4.264	**<0.0001***
Group- II Controls	50	34.2600	1 16.67310		

Table 4: Comparison of serum ALT between Group – I and Group – II

Group	N	Mean (IU/L)	Std. Deviation	t-value	p-value
Group – I Cases	50	58.2400	45.60727	4.576	**<0.0001***
Group – II Controls	50	27.2400	14.63649		

Table 5: Comparison of serum total protein (TP) between Group – I and Group – II

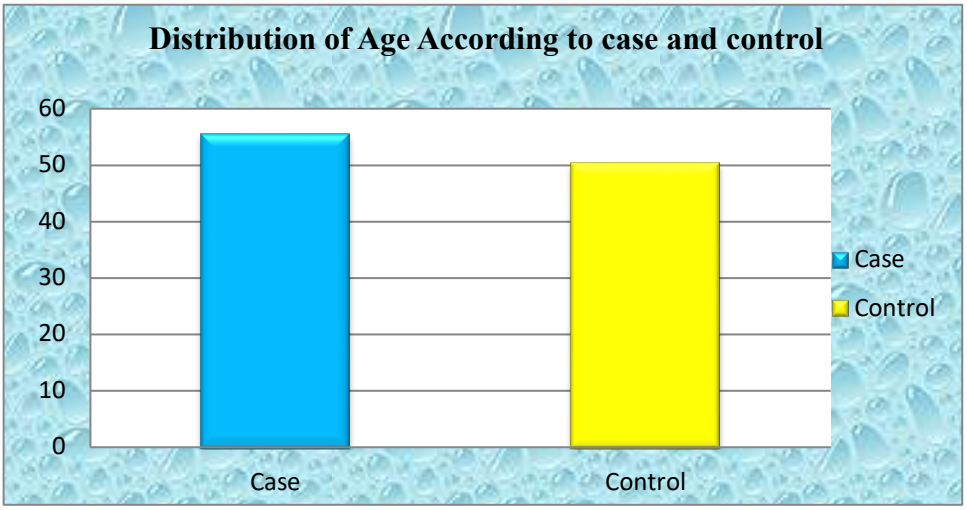
Group	N	Mean (g/dl)	Std. Deviation	t-value	p-value
Group – I Cases	50	6.7200	0 0.94567	0.802	0.424
Group –II Controls	50	6.5500	1.16238		

Table 6: Comparison of serum albumin between Group - I and Group – II

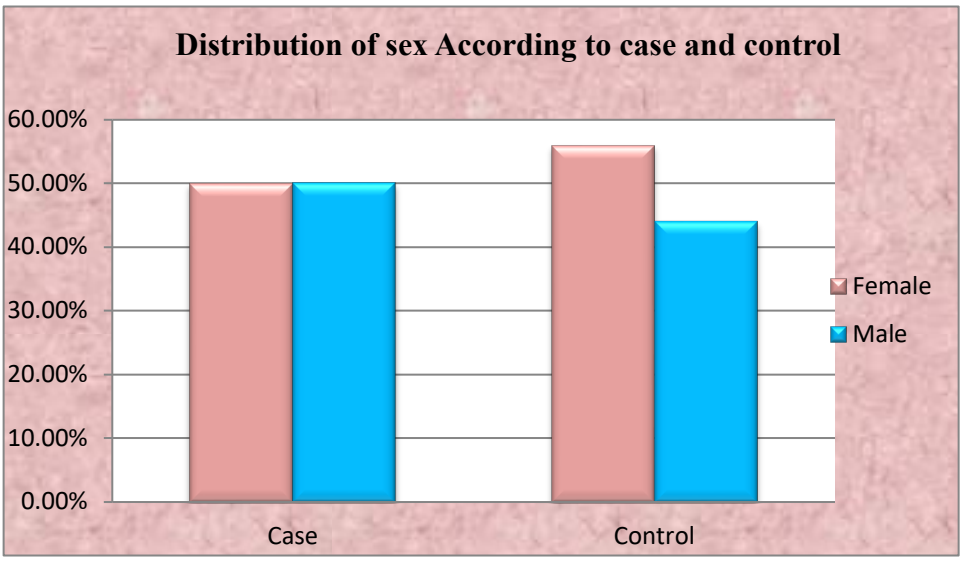
Group	N	Mean (g/dl)	Std. Deviation	t-value	p-value
Group – I Cases	50	3. 3.8500	0.89334	0.138	0.890
Group – II Controls	50	3. 3.8780	1.11653		

Table 7: Comparison of serum ALP between Group-I and Group-II

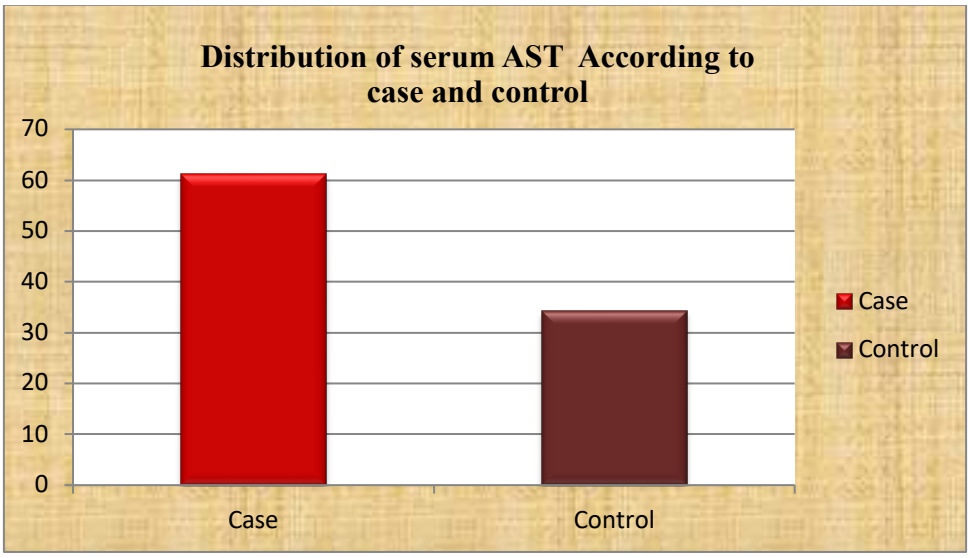
Group	N	Mean (IU/L)	Std. Deviation	t-value	p-value
Group – I Cases	50	97.7600	44.99050	0.167	0.868
Group –II Controls	50	99.4800	57.52346		



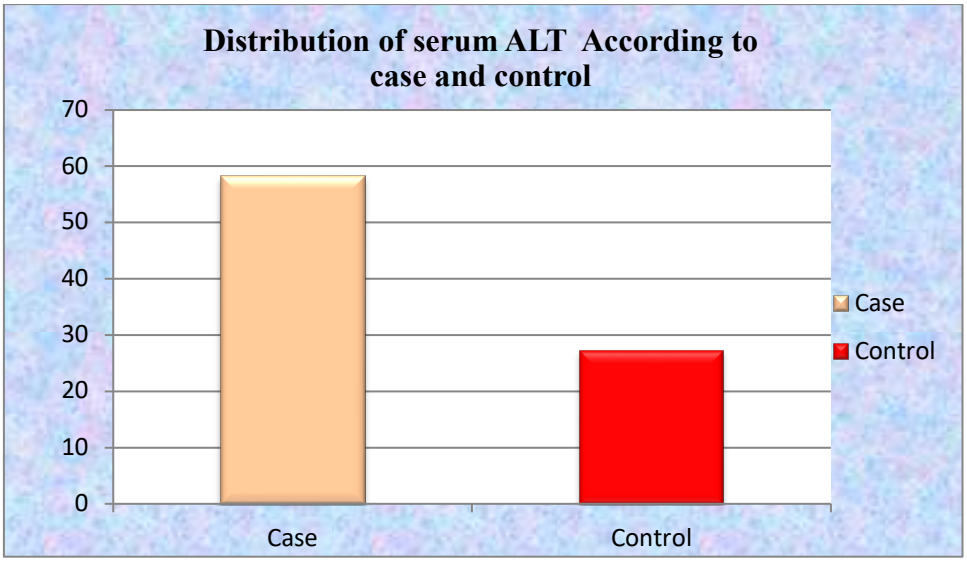
Graph 1: Comparison of age between Group – I and Group – II



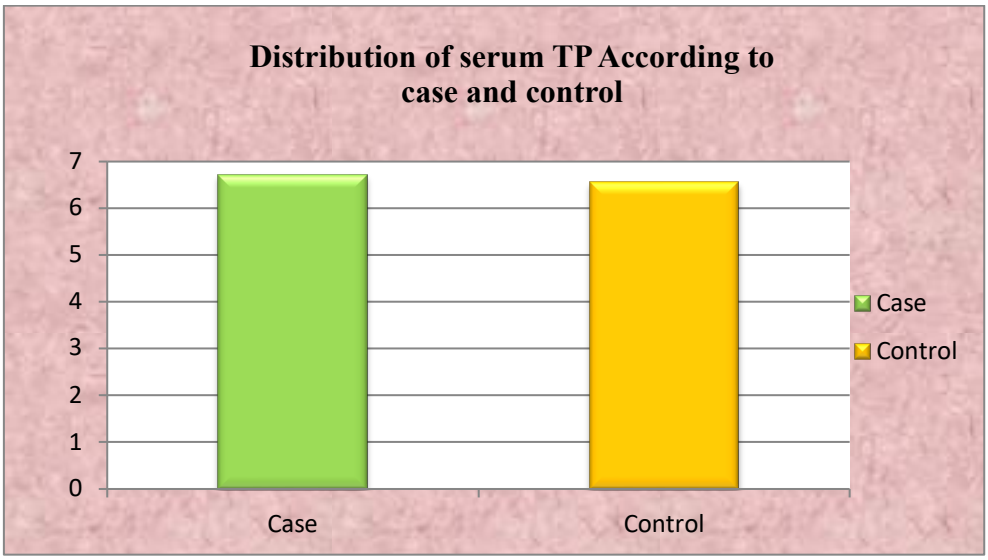
Graph 2: Comparison of sex between Group – I and Group – II



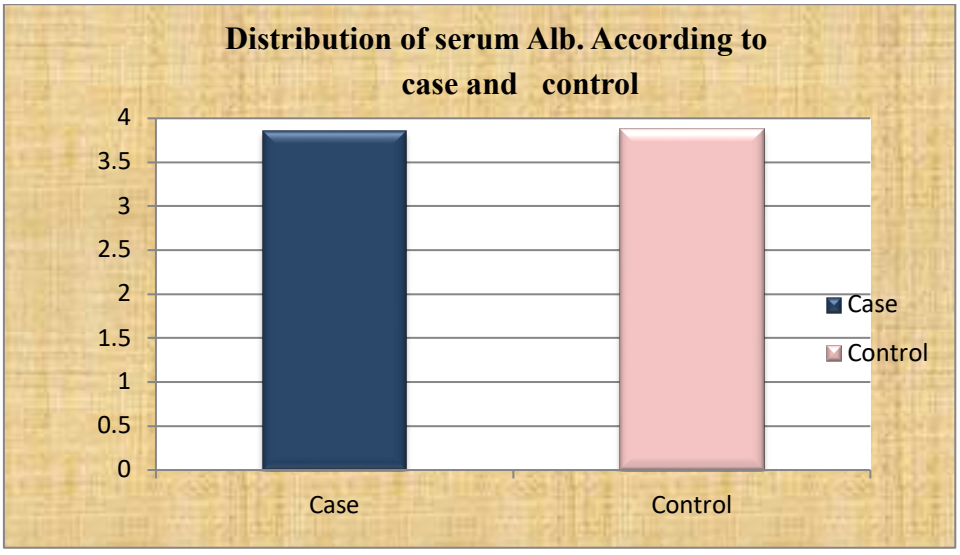
Graph 3: Comparison of serum AST between Group – I and Group – II



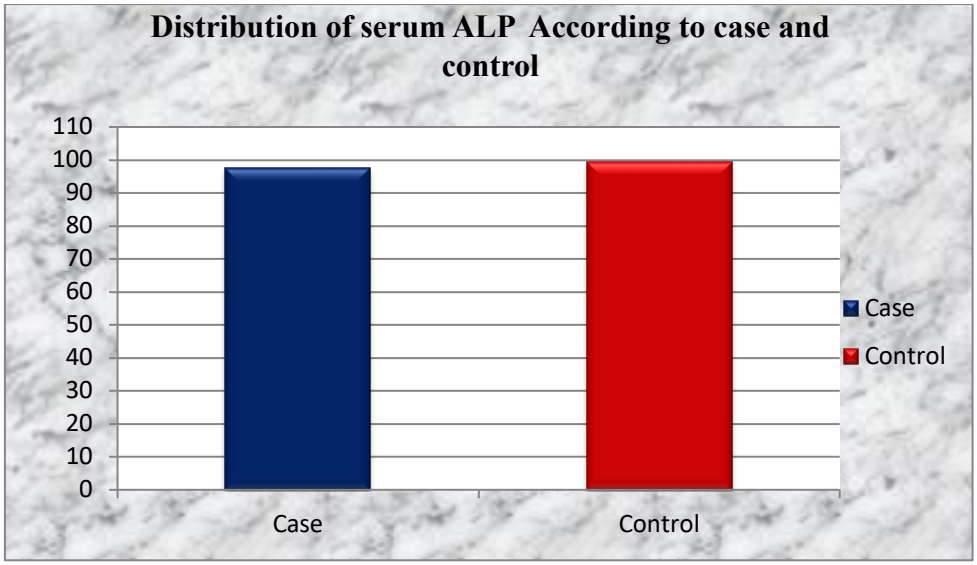
Graph 4: Comparison of serum ALT between Group – I and Group – II



Graph 5: Comparison of serum total protein between Group – I and Group – II



Graph 6: Comparison of serum albumin between Group – I and Group – II



Graph 7: Comparison of serum ALP between Group – I and Group – II

Discussion

The present study was conducted on a total number of 100 subjects, which were divided into two categories of groups. For the study, Group – I was comprised of 50 Corona (COVID-19) patients in the Hadoti region and Rajasthan, whereas Group – II was comprised of 50 healthy controls. Age distribution in both groups was statistically compared using unpaired – t test. Concentrations of biochemical parameter AST, ALT, TP, Albumin, ALP, were measured in both groups using fully automated analyzer in Biochemistry Laboratory, Department of Biochemistry, Jhalawar Medical College, Jhalawar (Rajasthan).

The results were compared statistically using unpaired – t test. Statistical analysis for all types of comparisons was done using SPSS software (version 20.0). The data in this study was expressed in terms of mean ± SD, and $p < 0.05$ was considered to be statistically significant.

Comparison of age distribution between Group – I and Group – II is presented in Table – 1 and Graph –1. The present observation shows that the mean age of Corona (COVID-19) patients was (55.48 ± 15.02 years) and the mean age in healthy controls was (50.30 ± 11.60 years). Statistical analysis showed that p – value between the two groups was 0.057, i.e. ($p > 0.05$) therefore the age difference in both groups was statistically insignificant.

Comparison of sex distribution between Group – I and Group – II is presented in Table – 2 and Graph – 2. The present observation shows that the percentage of males in case group was 50%, whereas the percentage of females was 50%. The percentage of males in control group was 44%, whereas the percentage of females was 56%. Statistical analysis showed that p – value between the two groups was 0.548, i.e. ($p > 0.05$) therefore the difference in sex distribution in both groups was statistically insignificant. Thus, both cases and controls were statistically matched in age and sex distribution.

Thus, it was concluded that Corona (COVID-19) patients have higher serum AST concentration than healthy controls, but the difference was statistically significant.

Similar results were observed in 2020, researchers Lin Ye, Bin Chen and associates conducted a study in china and also found that serum AST levels in Corona (COVID-19) patients were significantly higher than healthy controls. [12]

AST needs pyridoxal phosphate (vitamin B_6) as coenzyme. It is a maker of liver injury and show moderate to drastic increase in parenchymal liver diseases like hepatitis and malignancies of liver. AST was used as a marker of myocardial ischemia in old day. The level is significantly elevated in myocardial infarction. As AST is raised in various other conditions, the troponins have replaced AST as a diagnostic marker in ischemic heart disease. AST is now used as a marker for hepatic injury. [13] Comparison of serum ALT concentration between corona patients and healthy patients were done. Thus it was concluded that Corona (covid-19) patients have higher ALT concentration than healthy controls, and the difference was statistically significant.

In 2021 similar finding to our Study reported in literature by Wei Xu, Chenlu Huang et al in china, and also found that serum AST level in severe Corona (COVID-19) patients were significantly higher than non – severe patients. Their results also showed that serum AST in Corona (COVID-19) patients was below the higher limit of reference interval, whereas in healthy controls it was within the limits of reference interval for serum AST.[14]

Comparison of serum total protein concentration between corona patients and healthy patients was made. Thus, it was concluded that Corona (covid-19) patients have slightly higher total protein concentration than healthy controls, and the difference was statistically insignificant.

Most common test of synthetic function of liver is the estimation of total protein and albumin in serum and calculation of A/G ratio. [15]. Thus, it was concluded that Corona (COVID-19) patients have slightly lower albumin concentration than healthy controls, and the difference was statistically insignificant.

Similar results were observed in 2020, Anita et al India and also demonstrate that serum albumin level lower in Corona (COVID-19) patients were significantly lower than healthy controls.[16]. Level of Albumin is reported significantly lower in serious COVID-19 patients. Underlying causes leading to hypoalbuminemia may include decreased biosynthesis due to insufficient protein intake and increased loss of albumin.[17]

Comparison of serum ALP concentration between corona patients and healthy patients are done. It was concluded that Corona (COVID-19) patients have slightly lower ALP concentration than healthy controls, and the difference was statistically insignificant. Results similar to our study were observed in study conducted by a researchers Anita Chalak and associates in 2020 in India and also found that serum APL level higher in Corona (COVID-19) patients were significantly higher than healthy controls.[16]

Conclusion

Based on the findings of the present study we conclude that the sever acute respiratory syndrome – CoV-2 (SARS-Co-2) infection results in a respiratory disease and causes several biochemical alteration, therefore biochemical parameters (AST, ALT, Total protein, Albumin and ALP) may also be considered as important predictors for assessing severity in Covid-19 patients.

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