# Analysis of PCT and ferritin in patients of covid-19, tuberculosis and COVID-TB coinfection

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## ABSTRACT

**Objective:** The outbreak of SARS-CoV-2 virus affected and economy on a global scale. The sudden outbreak also mounted the need for through research for cure, prevention and diagnosis of SARS-CoV-2 infection.

The objective of this study is to determine the role and significance of testing PCT and Ferritin in patients of COVID-19, Tuberculosis and COVID-TB coinfection.

The populations suffering from other chronic respiratory health infection are more so at risk in light of this outbreak.

**Material and methods:** This is case-control study was conducted on a total of 164 patients divided into three group COVID-19(57), TB(54) and COVID-TB(53) .Their biochemical markers PCT and Ferritin were was statistically analysed using One-way ANOVA.

**Results:** It was found that in patients suffering form COVID-TB coinfection the levels of PCT and Ferritin were markedly higher as compared to COVID-19 and TB patients. Additionally, the levels of PCT and Ferritin were highly increased in patients of TB as compared to COVID-19 patients.

**Conclusion:** Through this study it is concluded that the addition of biochemical markers testing intuberculosis patients and diagnostic protocols may prove to be of significant assistance in earlydiagnosis of tuberculosis and also to estimate the severity of infection in patients of activetuberculosis.

**Keyword:** COVID-19, SARS-CoV-2, Tuberculosis, COVID-TB coinfection , PCT, Ferritin

## INTRODUCTION

The Corona virus disease commonly known as Covid-19 originated in the seafood market of Wuhan, China in December 2019. On 30th January, 2020, the first case of Covid-19 was reported in India in the town of Thrissur, Alappuzha and Kasargod in the state of Kerela, among which three of them were students who had recently returned from Wuhan, China. Till date more than 29 lakh people have tested positive for (Covid-19) in India including 4 lakh deaths.[1]

Tuberculosis is a bacterial infectious disease caused by Mycobacterium tuberculosis has been a serious issue, causing major morbidity and mortality over the past century. The target of this bacterium is majorly the lungs but it can also infect tissue on other body parts like kidney, spine, brain. Such condition is referred as extra-pulmonary TB.[2]

Ferritin is known to cause immune dysregulation. It has been reported that fatal outcomes by Covid-19 are accompanied by Cytokine storm syndrome, thereby it has been observed that disease severity is correlated by Cytokine Storm Syndrome.[3]

Mounting evidence has been found that in critically ill patients, there are characteristics of hyperinflammation, consisting of elevated serum Procalcitonin (PCT) and hyperferritinemia. These findings suggest a possibly crucial role of a cytokine storm in Covid-19 patho-physiology [4].

Ferritin, an acute phase protein from the iron pathway serves as a potent indicator of degree of inflammation. The serum level of ferritin is elevated in infections, different malignancies and autoimmune diseases. TB being a bacterial infection, shows increased serum levels of ferritin and can be used as a TB biomarker. Assessment of PCT and Ferritin can be utilized for treatment of TB.[5]The levels of Procalcitonin has also been investigated to assess bacterial infection. PCT is more affective in terms of accuracy to detect various bacterial infections. [6]

Till date a very few data is available so we planned this study.

Aim of the study to analysis of PCT and ferritin in patients of COVID-19, Tuberculosis and COVID- TB coinfection.

## MATERIALS AND METHODS

This study was conducted on a total of 164 patients who were attending the OPD or IPD ofGeetanjali Medical College and Hospital as well as Chest and Tuberculosis department of RNTMedical College and MB hospital, Udaipur. This study was conducted in the span of 2020-2021.The patients were divided into three categories based on their disease and their biochemicalmarkers data was statistically analyzed using One-Way ANOVA (Analysis of variance).And anUnpaired t-test between TB and COVID-TB coinfection patient groups.

A total of 164 patients aged between 18 years to 85 years were included in this study. Totalpatients (164) were then divided into three groups on the basis of their disease diagnosis. Thepatient groups are as follow. 57 COVID-19 positive patients. 53 COVID-TB Coinfectionpositive patients and 54 TB positive patients.

## INCLUSION CRITERIA
- Positive for COVID-19
- Diagnosed with tuberculosis
- Diagnosed with COVID-TB Coinfection.

## EXCLUSION CRITERIA
- Below 18 years of age.
- Above 85 years of age.
- Any other inflammatory or infectious condition.
- Major surgery.

## STUDY DESIGN
Case-control study

## COLLECTION AND ANALYSIS OF SAMPLE
5 ml blood was collected using aseptic technique from antecubital vein and was collected in plain vial. Serum was separated by centrifugation of blood sample. After incubation at 37° C for15 minutes in incubator and centrifuged for 10 mins at approximately 3000 rpm (revolutions perminute). Serum so obtained was used for estimation of the below 5 test parameters mentioned.

*Eur. Chem. Bull.* **2023**,12( issue 8), 8066-8070

8067

## STATISTICAL ANALYSIS

The result data was analyzed using one-way ANOVA and Unpaired t-test between TB and COVID-TB coinfection patient groups

Where p-value of less than 0.05 was considered significant. P-value more than 0.05 was considered non-significant.

Data was entered and analyzed in Microsoft-excel software (Windows 10).

## PARAMETERS

The tests were run on COBAS-6000. 2 test parameters (PCT, Ferritin) were analyzed in all three patient groups.

1) Procalcitonin (PCT)

Method- The electrochemiluminescence immunoassay "ECLIA" is intended for use on Cobas 6000.

2) Ferritin

Method- Particle enhanced immunoturbidimetric assay is intended for use on cobas-6000.

## OBSERVATION AND RESULT

**Table 1: shows comparison of mean values of ferritin across the three patient groups that are, COVID-19, Tuberculosis and Covid-TB Coinfection.**

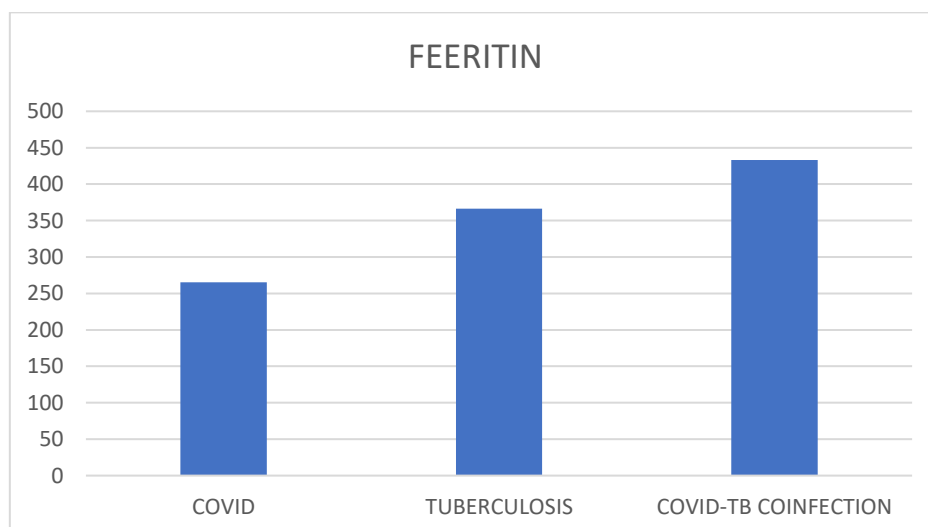| FERRITIN (ng/dl) | |
|---|---|
| **GROUP** | **MEAN** |
| COVID | 265.15 |
| TUBERCULOSIS | 366.40 |
| COVID-TB COINFECTION | 433.02 |



**Fig 1: depicts comparison of mean values of Ferritin across the three patient groups that are, COVID-19, Tuberculosis and Covid-TB Coinfection.**

**Table 2: shows comparison of mean of PCT across the three patient groups that are, COVID-19, Tuberculosis and Covid-TB Coinfection.**

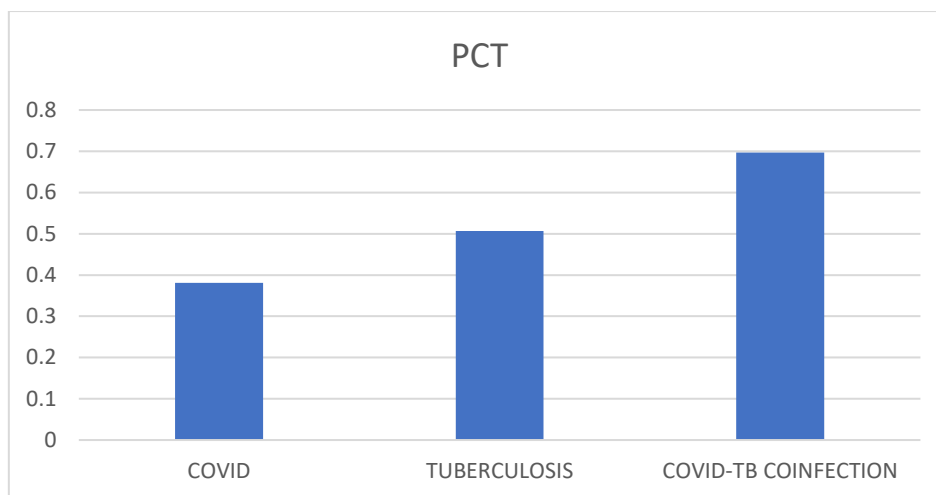| PCT(ng/ml) | |
|---|---|
| **GROUP** | **MEAN** |
| COVID | 0.38 |
| TUBERCULOSIS | 0.50 |
| COVID-TB COINFECTION | 0.69 |

**Fig 2: depicts comparison of mean of PCT across the three patient groups that are, COVID-19, Tuberculosis and Covid-TB Coinfection.**

**Table 3: shows comparison between the t-test results and mean values of Tuberculosis and COVID-TBCoinfection patient groups.**

| PARAMETER | TUBERCULOSIS (MEAN±SD) | COVID-TB COINFECTION (MEAN±SD) | P VALUE |
|---|---|---|---|
| FERRITIN | 366.40±174.59 | 433.02±124.32 | <0.05 |
| PCT | 0.50±0.39 | 0.69±0.53 | <0.05 |

**Table 4: shows comparison of mean values and One-Way ANOVA of all test parameters (PCT, FERRITIN) across the three patient groups that are, COVID-19,Tuberculosisand Covid-TBCoinfection.**

| PARAMETER | COVID-19 (MEAN±SD) | TUBERCULOSIS (MEAN±SD) | COVID-TB COINFECTION (MEAN±SD) | P VALUE |
|---|---|---|---|---|
| FERRITIN | 265.15±231.46 | 366.40±174.59 | 433.02±124.32 | <0.05 |
| PCT | 0.38±0.37 | 0.50±0.39 | 0.69±0.53 | <0.05 |

- The levels of PCT were the most increased in COVID-TB Coinfection patients followed by Tuberculosis and a mild increase in COVID-19 patients.
- Ferritin levels were highest in COVID-TB Coinfection patients followed by tuberculosis and lastly COVID-19.

**DISCUSSION**

The sudden outbreak of covid-19 had numerous adverse effects on public health. Patients suffering from other co-morbidities such as CAD, diabetes, hypertension weremore vulnerable toa more severe infection as opposed to persons having covid-19 infection but were otherwisehealthy. The patients suffering from tuberculosis were most vulnerable to extremely severeinfection along with poor prognosis. These observations were also made by a study from Saunders MJ, et.al.2020.[7]

The present study showed that the levels of ferritin showed highest rise in COVID-TBcoinfection patients with a mean value of 433.02 ±124.32 followed by TB patients wheremeanvalue of 366.40± 174.59 was found. The least rise of ferritin among the three patients group wasfound covid-19 patients with a mean value of 265.15 ± 231.46 was observed and the analysis ofvariance showed a highly significant p value 0.0002 across are three patient groups. Also, the t-test results between COVID-TB and TB patient showed a

significant p value of 0.0252. Thesefindings can also be found in a similar study conducted by (Henry B.M et, al 2020) which started that ferritin is much more specific biochemical markers useful for diagnosis of severity ofinfection which can be especially beneficial for patients of COVID-TB and Tuberculosis.[8]

Another study conducted by (Huang C et.al 2020) discusses the importance of testing for levelsof PCT on patients of COVID and COVID-TB matches the result of our study which found thatthe mean value of PCT was highest in patients of COVID-TB coinfection with a mean value of $0.69 \pm 0.53$ followed by TB patient group where the mean value is $0.50 \pm 0.39$ and a mildincrease in covid-19 patient group with a mean value of $0.38 \pm 0.37$. The analysis of varianceresults of the same came out to be significant with p-value of 0.00098. The t-test results alsoshowed significant p-value of 0.0374.[9]

## CONCLUSION

Through this study it is concluded that the addition of biochemical markers testing intuberculosis patients and diagnostic protocols may prove to be of significant assistance in earlydiagnosis of tuberculosis and also to estimate the severity of infection in patients of activetuberculosis.

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