# COMPARATIVE STUDY OF COAGULATION PROFILE AND CRP IN COVI-19 INFECTED PATIENTS AND BACTERIAL PNEUMONIA PATIENTS

**BY**

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# "A COMPARATIVE STUDY OF COAGULATION PROFILE AND CRP IN COVID 19 INFECTED PATIENTS AND BACTERIAL PNEUMONIA PATIENTS"

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## List of abbreviations:

| | |
|---|---|
| INR | International Normalized Ratio |
| PT | Prothrombin |
| PTT | Partial Thromboplastin Time |
| PS | Peripheral smear |
| APTT | Activated Partial Thromboplastin Time |
| PAI | Plasminogen Activator Inhibitor |
| TF | Tissue Factor |
| ISI | International Sensitivity Index |
| WHO | World Health Organization |
| OTA | Oral Anticoagulant Therapy |
| SD | Standard Deviation |
| FDP | Fibrin Degradation products |

## INTRODUCTION:

In this outbreak of Covid-19, there are concerns about thrombosis due to Covid 19 infection, so D-dimer levels became an important marker. This study compares of coagulation profile and C.R.P. between Covid19 pneumonia and bacterial pneumonia patients. Also, we analyze the correlation between D-dimer and C.R.P.

## CASE DETAILS:

Patients diagnosed with Covid 19 infection and patients diagnosed with Bacterial pneumonia, 66 patients in each group were referred to the haematology and biochemistry laboratory of BLDE(DU) Shri B. M. Patil Medical College, Hospital and

Research Centre, Vijayapura.

## RESULTS AND DISCUSSION:

Patients with covid-19 pneumonia and bacterial pneumonia were compared. It was noted that D-dimer and C.R.P. were correlated in the majority of patients in both groups before treatment.

The D-dimer levels were directly proportional to the C.R.P. levels in all covid patients and all bacterial pneumonia patients. Followup after 14 days was available for about 44 covid patients out of which 19 had elevated D-dimer even after reduction in C.R.P. following treatment. Out of those 19 patients, 14 had elevated P.T., aPTT and PT-INR. D –dimer and C.R.P. was directly proportional in a follow-up of 30 patients with bacterial pneumonia.

**CONCLUSION** To conclude, D-dimer was directly proportional to C.R.P. in the majority of patients in both groups. Upon follow-up in 44 covid patients, there were 19 patients for whom d-dimer levels were high even after reduced C.R.P. following treatment, out of which 14 had prolonged P.T.,aPTT and PT-INR, so in these patients, anticoagulant therapy can be considered.

## NOVELTY

Anticoagulant therapy can be considered by correlating d-dimer and C.R.P. on follow-up.

KEYWORDS: Covid and bacterial pneumonia, d-dimer and CRP

INTRODUCTION:

Coronavirus disease 2019 was first discovered in Wuhan, China, in December 2019. Coronavirus disease 2019 is a single-stranded R.N.A. virus with a nuclear capsid and is spherical in shape. The Coronavirus 2019 mainly affects the lung by binding to the Angiotensin Converting enzyme 2 receptors. These Angiotensin Converting enzyme 2 receptors are mainly expressed in the apical part of the airway rather than the basolateral part, so the coronavirus mainly affects the apical part.

After binding to the receptor, the virus releases the R.N.A., and virus-specific translation starts the production of mRNA; this mRNA codes for a virus-specific protein, leading to its production and subsequent formation of new virions, which are released via cell secretory mechanisms.

A severe acute respiratory syndrome due to Coronavirus disease 2019 was termed a pandemic by WHO on March 11, 2020. In this outbreak, there are concerns of thrombosis due to Coronavirus disease 2019 infection when the disease progresses, so FDP levels became a marker for Coronavirus disease 2019 as it is an important and proven marker for thrombosis and mainly pulmonary embolism as a consequence of thrombosis. FDP and other acute-phase reactants, especially the C.R.P., are interlinked with each other in the progression of the disease, this correlation is also seen in the patients with community-acquired pneumonia, so in this study, we compare levels of FDP and other acute-phase reactants (such as C.R.P.) between two groups that are patients with Covid19 infection and bacterial pneumonia.

OBJECTIVES:

1. To compare the changes in levels of D-dimer, C.R.P., and coagulation profile in Covid 19 infected patients and Bacterial pneumonia patients.

2. To study the correlation of D dimer with C.R.P.

**ANNEXURE-II**

## 6.2 Review of literature:

Coronavirus disease 2019 was a viral disease first discovered in Wuhan, China, in December 2019. Coronavirus disease 2019 is a single-stranded R.N.A. virus with a nuclear capsid and is spherical. The mechanism of affecting the human body is mainly through binding to the Angiotensin Converting Enzyme 2 receptors, and the most specific site to get affected is the lung. The Angiotensin Converting Enzyme 2 receptor is mainly located in the apical area, and thus covid, 19 infection most commonly affects the apical part of the airway.

Coronavirus disease 2019 is a condition caused by coronavirus disease 2019 . Coronavirus disease 2019 is caused by viral etiology and has a high affinity toward the respiratory mucosae. Coronavirus disease 2019 can cause similar effects like SARS-Cov. Coronavirus disease 2019 affected a large amount of the population, it was termed a global illness, and thus World Health Organization declared Coronavirus disease 2019 a pandemic. The infection is known to spread from one person to another person, and the leading causes are sputum droplets and contact with already affected patients. Dissemination through blood is expected, thus affecting the systemic organs other than the lungs, such as the liver and Kidney.(1)

The pathogenesis of Coronavirus disease 2019 mortality is acute respiratory distress syndrome caused by infection of the epithelial margin and activation of alveolar

macrophage in the lungs. The wide belief about the pathogenesis is that the virus uses the Angiotensin Converting Enzyme 2 receptors for its entry, mainly into the respiratory tract. Viral origins are said to be zoonotic with minimal evidence of genomic similarity to the bat coronaviruses but without an intermediate animal reservoir. There are currently minimal therapeutic options, and while many are being tested, none effectively curtails the death rates.

Two subsequent studies confirmed the pattern of signs and symptoms. It also found that the most common symptoms with which the patients presented were fever, fatigue, and dry cough, though there were a few patients who did not present with classic symptoms and still were positive for Coronavirus disease 2019. Other symptoms were gastrointestinal symptoms which include diarrhoea and nausea. [2]

Yu B Li X et *al* conducted a study in Wuhan, China in which case fatality rate due to Coronavirus disease 2019 was about 2.3% and this rate had greatly increased with age, the study tells that the case fatality rate increases to about 8% in cases in patients in between the age 70-80 years and further increases to 14.8% in patients above 80 years of age.

FDP is an important marker for pulmonary embolism and it was positive in about 50% of Coronavirus disease 2019 infected patients in this study.

To differentiate Coronavirus disease 2019 pneumonia and community-acquired pneumonia before RT PCR testing this study. In this study association between D dimer and CRP in both Coronavirus disease 2019 infected patients and community-acquired pneumonia patients were also seen.[3]

As part of this study, about 50% of patients with Coronavirus disease 2019 infection were positive for D Dimer, a very important marker of pulmonary embolism.

D – dimer is a fibrin degradation product (See fig .1)

FIBRINOGEN

THROMBIN

SOLUBLE FIBRIN MONOMERS

SOLUBLE FIBRIN POLYMERS

FACTOR VIII

INSOLUBLE FIBRIN CLOT

PLASMIN

D- DIMER AND OTHER FIBRIN DEGRADATION PRODUCTS

FIG 1: FORMATION OF D- DIMER

To differentiate Coronavirus disease 2019 pneumonia and community-acquired pneumonia before R.T. PCR testing this study. Patients infected with Covid 19 and

those with community-acquired pneumonia were also associated with D dimer and CRP.

In a combined analytic study conducted by Huang I, Pranata R, et al., in 13 studies, C.R.P. was seen to be associated with poor outcomes in Covid19 infected patients.

There was an association between elevated FDP and poor composite outcomes in a meta-analysis of 11 studies.[4]

According to Soraya GV et al., who performed two meta-analyses, 26 studies were analyzed in their second analysis, and FDP was a factor that lead to worse outcomes in severe Coronavirus disease 2019. [5]

In a meta-analytic study conducted by Ponti G, Maccaferri M et al., it was stated that FDP and C.R.P. were directly proportional to the poor outcome in Covid 19 patients[6]

In another study conducted by Pan F Yang L et al., out of 124 patients, 89 patients were dead, and 35 patients got discharged. Out of these two groups, patients who were dead had higher FDP and C.R.P. compared to survivors.[7]

Zhang JJ, Cao YY et al. conducted a study on 289 patients in which 240 patients got discharged, and 49 patients died; out of the 49 patients who died, most of them had elevated D dimer and C.R.P. levels, and it was directly proportional to in-hospital deaths.[8]

Luo X, Zhou W et al. conducted a study on 298 patients, of which 84 died and 214

recovered. Out of these 84 patients who died, there was an association between elevated D dimer and C.R.P. levels.[9]

Rostami M Mansouri et al. stated that Fibrin degradation products are good prognostic indicator for coronavirus disease 2019 patients as it is an good indicator for a patient to be labelled as thrombosis. In Coronavirus disease 2019 patients, if FDP is increased 3 to 4 folds, it signifies poor prognosis. In case the patient has comorbidities such as diabetes, stroke and asthma, it leads to increased levels of FDP and ultimately leads to a poor prognosis.[10]

According to Terpos E et al., coagulation abnormalities such as aPTT and P.T. prolongation, D dimer, and severe thrombocytopenia lead to life-threatening conditions such as disseminated intravascular coagulation (D.I.C.), which needs immediate intervention.[11]

Long X et al. stated that Covid-19-related coagulopathy occurred in many cases where patients go for critical illness. When the Coagulation profile consisting of FDP, P.T., A.P.T.T. and T.T. were measured, it showed prolongation compared to survivors. D.I.C. was seen in non-survivors. C.R.P. was increased in all patients as it is an acute phase reactant. D-dimer was correlated with C.R.P. and serum ferritin.[12]

Iftikhar R et al. confirmed that patients with severe and critical diseases were included in the study, and it was found that absolute lymphocyte count (A.L.C.) and platelets were lower while higher CBC parameters especially the neutrophils and lymphocytes along with acute phase reactants. The authors obtained a result which showed a survival of about 83.2%. Median haemoglobin and platelet count were found to be low, while WBC, A.N.C., NLR, prothrombin time (P.T.), and activated partial thromboplastin time (A.P.T.T.) was found to be higher for patients who died. [13]

According to Long H et al., Coagulation disorder started at early stage of Coronavirus disease 2019 infection had FDP increased. The levels of FDP were in correlation with clinical classification. Among 23 patients who died,18 had elevated FDP during the initial lab test, and 22 had decreased D-dimer during the subsequent lab test. [14]

Zhang y et al. stated that Compared with healthy controls, patients with COVID-19 had significant coagulation dysfunction, including increased values of FIB, P.T., A.P.T.T., INR, F.D.P., but markedly decreased AT value. An increased coagulation profile was directly propotional to increased hospital stay and higher morbidity, and a lower coagulation profile was inversely proportional to hospital stay and lesser morbidity.[15]

Five hundred thirty-eight probable Coronavirus disease 2019 patients were tested, and 217 were found to be positive, with 52.11±13.12 years being the average age, out of which 38 died. Complete blood count parameters which included neutrophils and lymphocyte along with acute phase reactants showed elevated results in patients with higher mortality . Coagulation parameters, including FDP, C.R.P., P.T., and activated Partial Thromboplastin Time, showed significantly higher values among the patients who died. The univariate analysis concluded that comorbidities which includes long standing kidney disease(chronic) , diabetes mellitus, and coronary heart disease, along with lab tests such as WBC, NLR, and PPT counts, can predict mortality.[16]

As Pepys MB et al. stated, C.R.P. above the median value of 108mg/dl was associated with Vascular Thromboembolism, Acute Kidney, critical illness, and mortality as compared to C.R.P. in patients below the median of 108mg/dl. A relationship between C.R.P. and Coronavirus disease 2019 with bad outcome was observed. The associations between C.R.P. were directly proportional even when D- dimer was not correlating. Nevertheless, patients with high D-dimer and high C.R.P. were correlating towards mortality and adverse outcomes. (17)

In Coronavirus disease 2019, coinfection of viral and bacterial agents has been described in patients especially with increased hospital stay. Bacterial pneumonia can

occur following the early phase of viral infection of respiratory mucosa or occur during the recovery phase. There is no specific pattern present for viral coinfection or bacterial pneumonia which occurs following primary viral disease in Coronavirus disease 2019. Accroding to clinical data present previously and the handling of previous viral epidemics such as Severe acute respiratory syndrome coronavirus disease along with influenza Coronavirus disease 2019 should be treated based on clinical symptoms and results accordingly.(18).

During the period of study, the number of patients admitted to the ICU were 101 for severe Coronavirus Disease-2019 associated pneumonia. Patients were mostly on intubation and were mechanically ventilated during I.C.U. stay. Out of these patients, Twenty respiratory tract specimens were obtained within the first 2 days. Staph. aureus was the pathogen found in about fifty percent of patients , who had rapid onset bacterial pneumonia secondary to coronavirus 2019 pneumonia. The authors found a high percentage of early-onset bacterial coinfection during severe COVID-19 pneumonia, with a high percentage of patients showing staphylococcus aureus positivity. The results correlate with the World health organization guidelines of prescribing antibiotic therapy in patients with coronavirus disease 2019. (19)

Study  on sepsis and coagulation gives us essential guidelines for further studies in

patients infected with Coronavirus disease 2019 pneumonia to see if giving anticoagulant therapy could decrease systemic inflammatory response along with V.T.E. and microembolism that can modify the life expectancy of patients. A high pool of very good agents are present, and randomized clinical trials were the need of the hour to look into extensive range of drugs that inbit coagulation to tell the proper mode of treatment .(20)

Of 54 Coronavirus disease-2019 patients who were placed in I.C.U. Mechanical ventilation was done forty nine of the patients . In univariate analysis, patients with V.A.P. had higher chances of getting ARDS, acute kidney injury and were mechanically ventilated longer, and had a longer I.C.U stay (21)

Anticoagulation therapy should be started following the diagnosis of D.I.C. in Coronavirus disease 2019 diagnosed patients, even when there are risks of bleeding. In addition, the current evidence does show that routine use of anticoagulation, particularly in patients having higher FDP levels. There are requirements for more studies on Coronavirus disease 2019 as a systemic disease and its treatment using anticoagulants. Anticoagulation is a subject to be studied, but D-dimer rise and disease severity are the indication factor for starting anticoagulation treatment as early as possible (22)

The rate at which pulmonary embolism occurs among Coronavirus disease-2019

patients was increased in the I.C.U admitted patients, followed by general wards and is mostly present in peripheral pulmonary arteries when compared to centrally present arteries, suggesting that thrombosis of small arteries to play a role of more significance. FDP evaluation can be useful to select patients with Coronavirus Disease-2019 to undergo C.T.P.A., using D-dimer cutoff levels of more than1000 μg/L.(23)

A metaanalysis including several papers showed that the FDP concentration was elevated among patients who had severe Coronavirus disease-2019 infection than those with less severe Coronavirus disease 2019 infection. The heterogeneity was moderate . (24)

Patients with Coronavirus Disease-2019 patients having increased chances for thrombosis can be prescribed with prophylactic anticoagulant therapy, and increased coagulation parameters is not an contraindication for the traetment. (25)

Each and every patient that is one ninety seven of them had infections with bacteria, and fungus coinfection was one thirty four of them. The commonly isolated bacteria was Klebsiella pneumonia which is found in forty percent patients, the second most common was multi-drug resistant (M.D.R.) . (26)

Hemostasis is an event by which the clotting process gets activated following a b.reach of vascular integrity. This process includes the formation of a thrombus, vasoconstriction, platelet aggregation, recanalization, and healing. Conventionally, secondary hemostasis was described as intrinsic and extrinsic pathways merging at a common pathway.

The coagulation process will be started by platelets plug formation over the wound within a few seconds of loss of vascular maintainace. This is the hemostasis which occurs primarily. Hemostasis which occurs after intial platelet plug formation is a many-sided interaction within plasma coagulation factors, which leads to the production of fibrin strands giving strength to the platelet plugs.

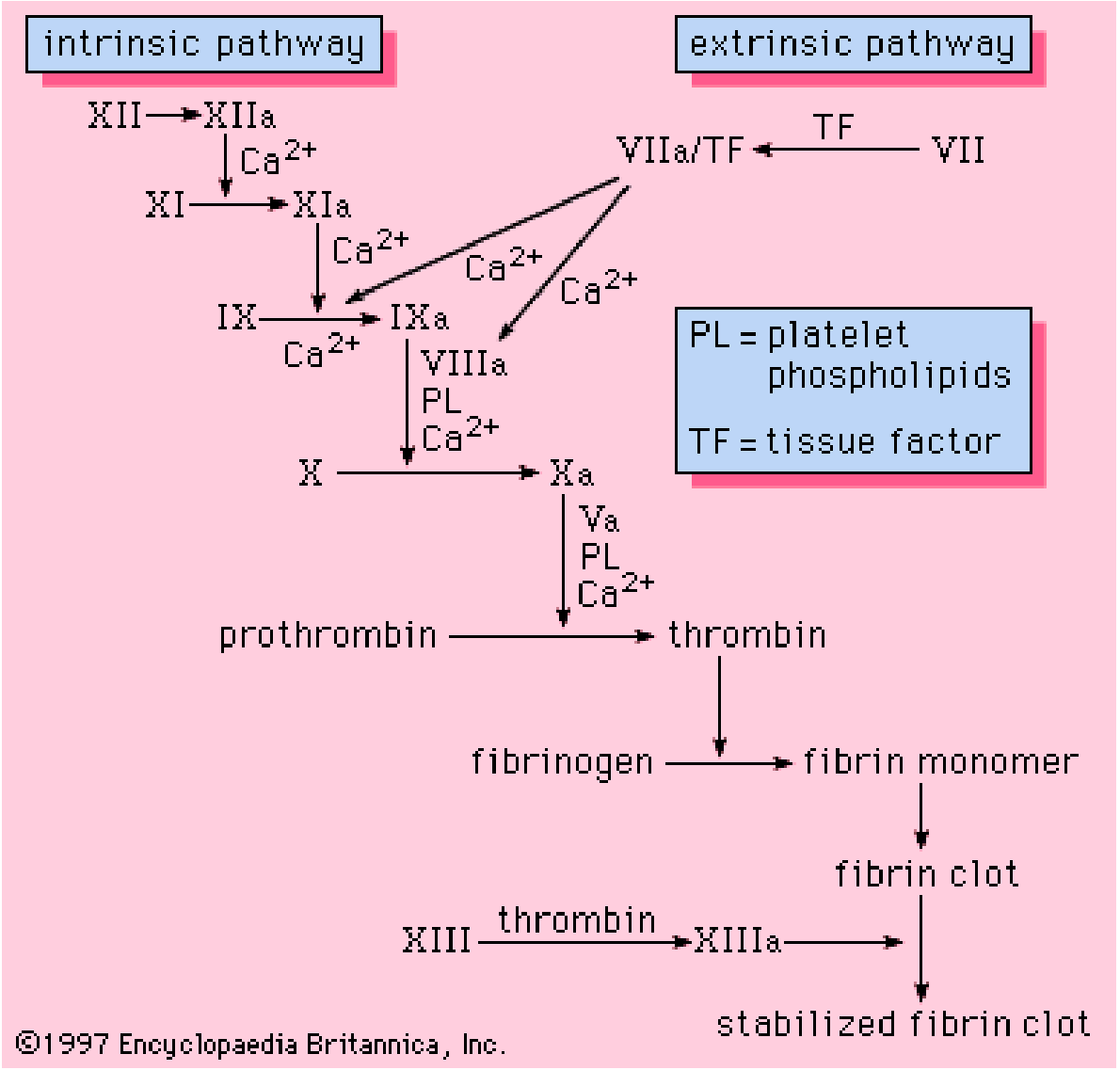
International Normalized Ratio is the test of high significance in patients peri-operatively and also to evaluate the coagulation system of patients. The INR is obtained from prothrombin time, which is evaluated ratio of prothrombin time of patient's to a P.T. of normal control. The ration is standard ratio to test the potency of thromboplastin reagent which was prescribed by the WHO.

The formula being,

INR = Prothrombin time of patients /Protheombin time of Control

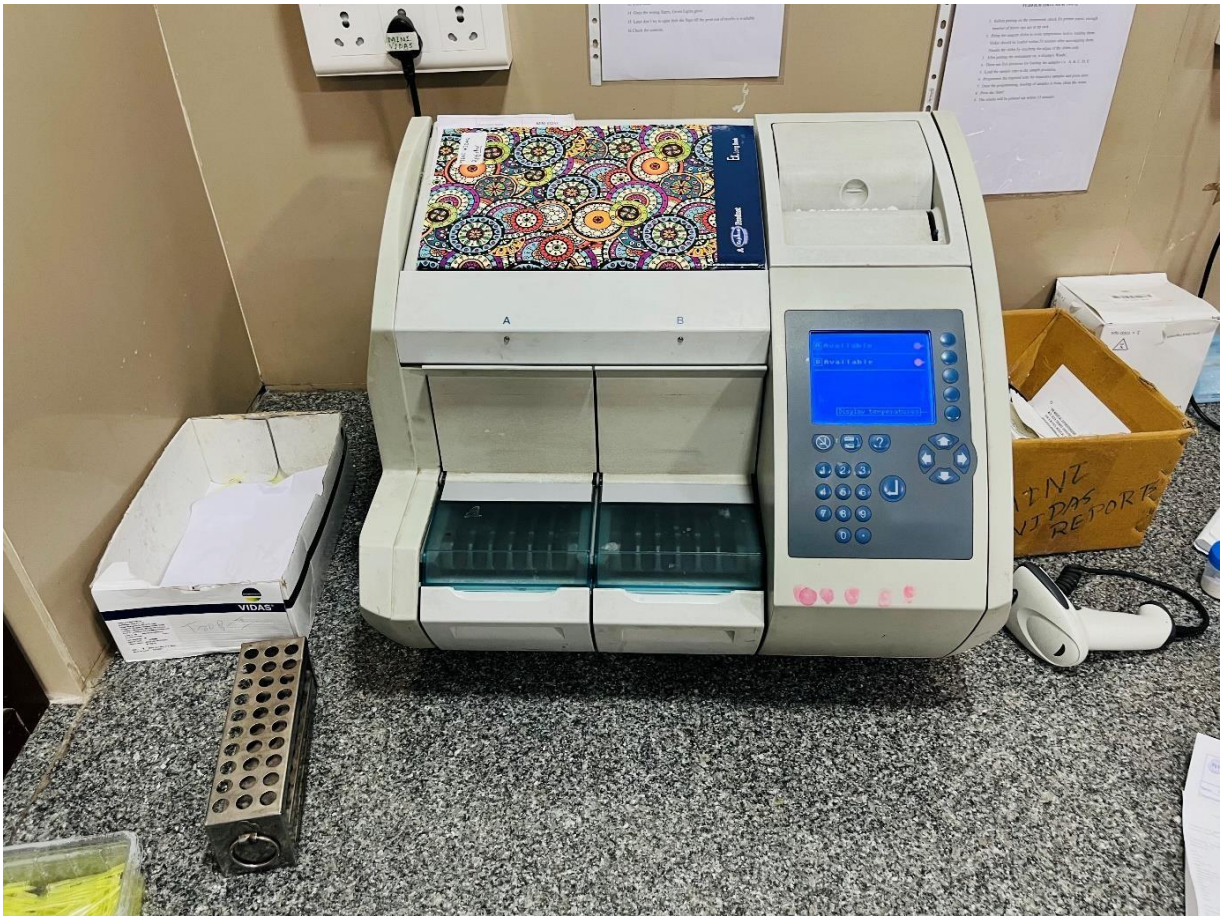
Prothrombin time, the time measured in seconds is evaluated to determine the rate at which the clot is formed in the presence of a high concentration of calcium and tissue thromboplastin as it activates coagulation through extrinsic pathway of coagulation. The values of reference of International Normalised Ratio were taken into consideration among measurement of Prothrombin time in device-related discrepancy, sensitivity, reagents types used, and variation in the tissue factor activation. International Normalised Ratio value is between 2.0 to 3.0.

**INTRINSIC PATHWAY EXTRINSIC PATHWAY**



Coagulometers used in the study are analyzed using the following:

**MINI VIDAS:** This machine can be used for detecting the d- dimer, and it uses sandwich immunoassay with final fluorescent detection (E.L.F.A.). A pipette tip-like device called Solid Phase Receptacle (S.P.R.) is used both as a solid phase and collection of material where sandwiching of antigens takes place and is apparently used for fluorescence detection following catalyzation of sandwich into a fluorescent product.




2. **Automatic coagulometer (ACL ELITE PRO):** The ACL PRO ELITE machine works on the principle of light flow aggregometry


3. VITROS 5.1: It can be used to measure C.R.P., and it works under the principle called turbidometry, where the results are given based on the material absorbed from the serum onto the solid phase present in the device.

COVID-19 pneumonia and bacterial pneumonia patients can be confused clinically as both can show elevated D- dimer levels and subsequently lead to anticoagulant therapy, so to avoid the rational use of anticoagulants, we need to differentiate covid 19 positive patients who need anticoagulant therapy and also reduce the possible use of anticoagulants to patients other than COVID 19 who may show elevated D- dimer and C.R.P. This study is undertaken to compare the coagulation profile and C.R.P. of Coronavirus Disease 2019-related pneumonia patients and Bacterial pneumonia patients who can reduce the rational use of anticoagulant therapy and can serve as differential markers to differentiate between Coronavirus Disease 2019 related pneumonia and bacterial pneumonia patients.

## Materials and methods:

### 7.1 Source of data

Coronavirus Disease 2019 infected patients and Bacterial pneumonia diagnosed patients will get their blood samples referred to the haematology and biochemistry laboratory of the Pathology and Biochemistry departments respectively at B.L.D.E. (DEEMED TO BE UNIVERSITY)

Shri B. M. Patil Medical College, Hospital and Research Centre, Vijayapura.

**Study period:** January 2021 to July 2022.

### 7.2 Methods of collection of data.

The study will include two groups. Group 1- Covid 19 positive patients (RT PCR positive), Group 2- Bacterial pneumonia patients. D -dimer and C.R.P. will be quantified using an automated machine.

Covid19 positive patients will be detected by R.T.- PCR.

D-Dimer is routinely measured in two machines they are, A.C.L. pro elite and Mini-Vidas; out of these two, the Mini-Vidas is more sensitive as it detects values up to

5000ng/ml, and A.C.L. pro elite detects values up to 1000ng/ml. The two machines have different normal ranges,

Samples will be run in A.C.L. pro elite

A.C.L. pro elite – less than 500ng/ml

Mini-Vidas- less than 250 ng/ml

C.R.P. values can be detected in Vitros 5.1.

Other coagulation parameters, such as P.T. and A.P.T.T., can be detected in A.C.L. pro elite.

NORMAL RANGE:

A.P.T.T.- 30-45 seconds.

Prothrombin time- 11-13.5 seconds.

PT- INR – 0.8 - 1.1

The formula for calculating PT-INR: Prothrombin time of patients

Normal Prothrombin level

Bacterial pneumonia patients can be taken into account through clinical confirmation and reports supporting the presence of pneumonia, and patients should be RT PCR negative. Also, they should not be positive for both IgG and IgM, specific for Covid 19.

# A COMPARATIVE STUDY OF COAGULATION PROFILE AND CRP IN COVID-19 INFECTED PATIENTS AND BACTERIAL PNEUMONIA PATIENTS.

| Parameters | Group 1 | Group 2 | p-value |
|---|---|---|---|
| D-dimer | | | |
| CRP | | | |
| PT | | | |
| APTT | | | |
| CT SCAN | | | |

**Sample Size**:

With the Anticipated correlation coefficient between D-Dimer level and C.R.P. levels in COVID-19 patients and Bacterial pneumonia patients 0.426 (ref), at 95%confidence level and 90 power in the study, the sample size worked out is 66per group.

Formula used is

N=

The standard normal deviate for $\alpha = Z\alpha = 1.9600$

The standard normal deviate for $\beta = Z\beta = 1.6449$

C=0.5*ln =0.455

Total sample size=132

**Statistical Analysis:**

● The obtained data shall be entered into a Microsoft Excel sheet, and analysis statistically shall be performed using a packageof statistics for the social sciences (Version 20).

● Results will be presented as Mean (Median)±SD, counts and percentages, and diagrams.

● For normal distribution of continuous variables among two groups is to be compared by the usage an Independent t-test; Mann Whitney U test is to be used for non continuous variables

● Categorical variables between both the groups will be compared by the usage of Chi-square test.

● A correlation coefficient will be used to find the correlation between quantitative variables.

● p value of less than 0.05 is to be considered significant statistically. Each statistical tests is to be performed to tailed

**Type of Study**

Cross-sectional study.

**Inclusion criteria:**

● Patients with Covid19 infection and patients with bacterial pneumonia in B.L.D.E. (deemed to be university) Shri BM Patil medical college will be included.

● Cases will not be excluded if there is no C.T. report.

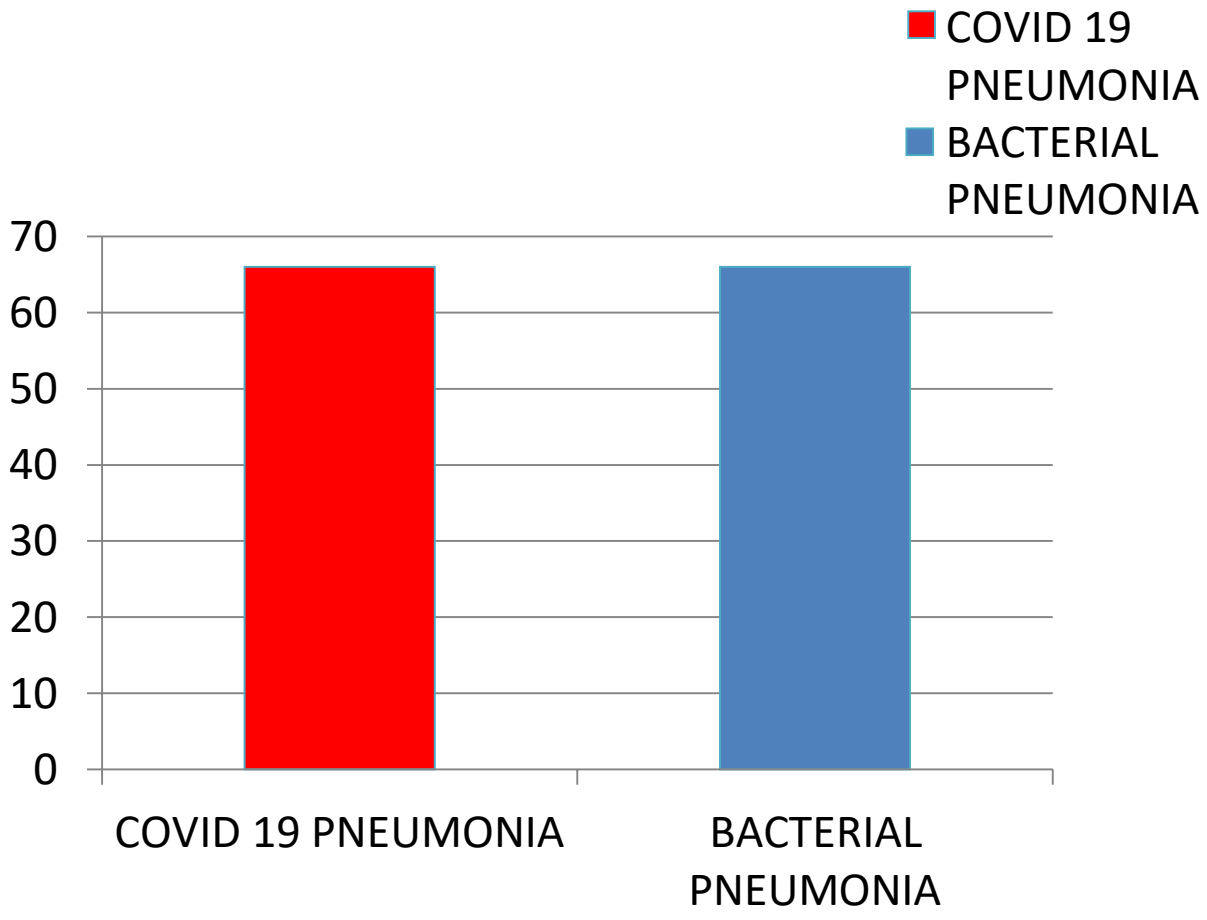
**Exclusion criteria:**

· Patients with Negative RT PCR for Covid 19 were excluded.

· Patients on aspirin therapy are excluded.

· Patients with heart diseases are excluded.

RESULTS:



| NUMBER OF COVID 19 PNEUMONIA PATIENTS | NUMBER OF BACTERIAL PNEUMONIA |
|---|---|
| TOTAL NUMBER OF CASES(n-132) | |
| 66 | 66 |

TABLE 1 AND FIGURE 1: TOTAL NUMBER OF PATIENTS INCLUDED IN THE STUDY

A Total of 132 cases were included in the study, out of which 66 cases were included in each group of COVID 19 and Bacterial pneumonia patients.

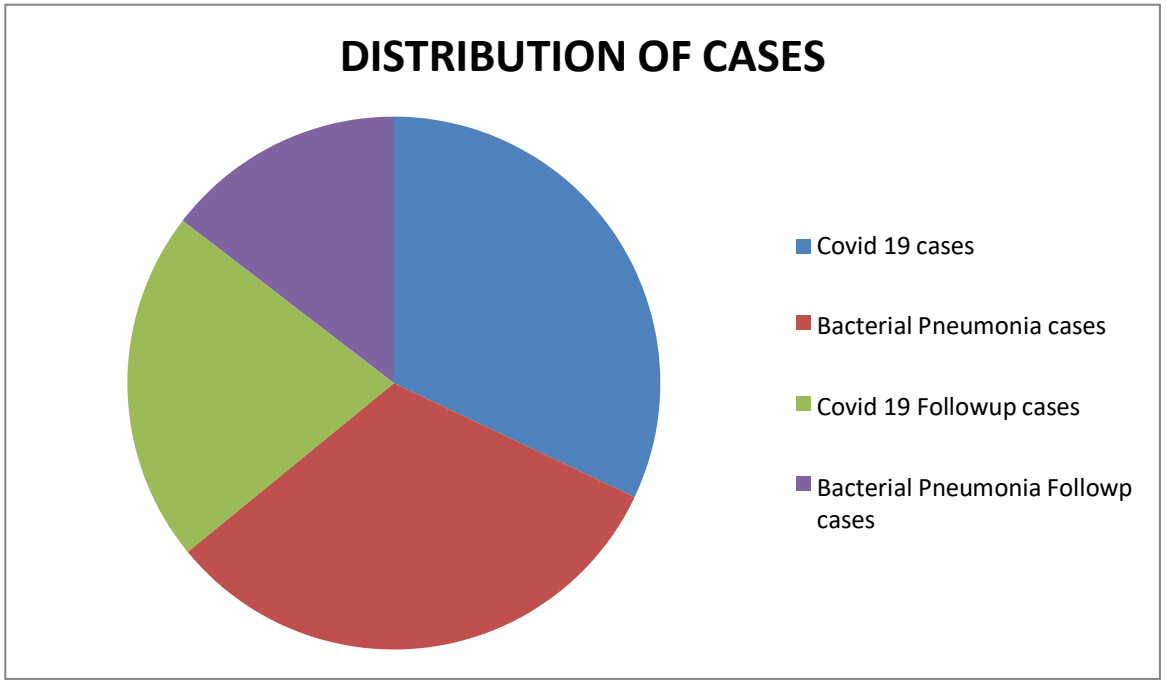
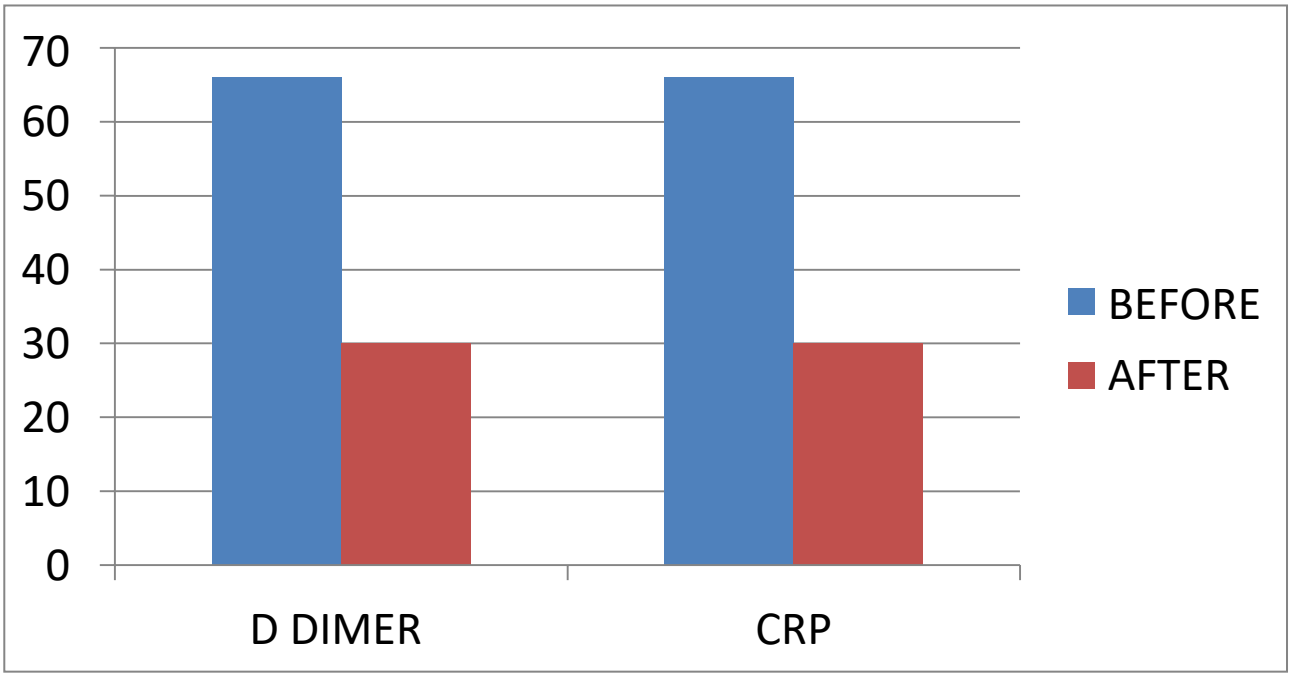



FIGURE 2: DISTRIBUTION OF CASES

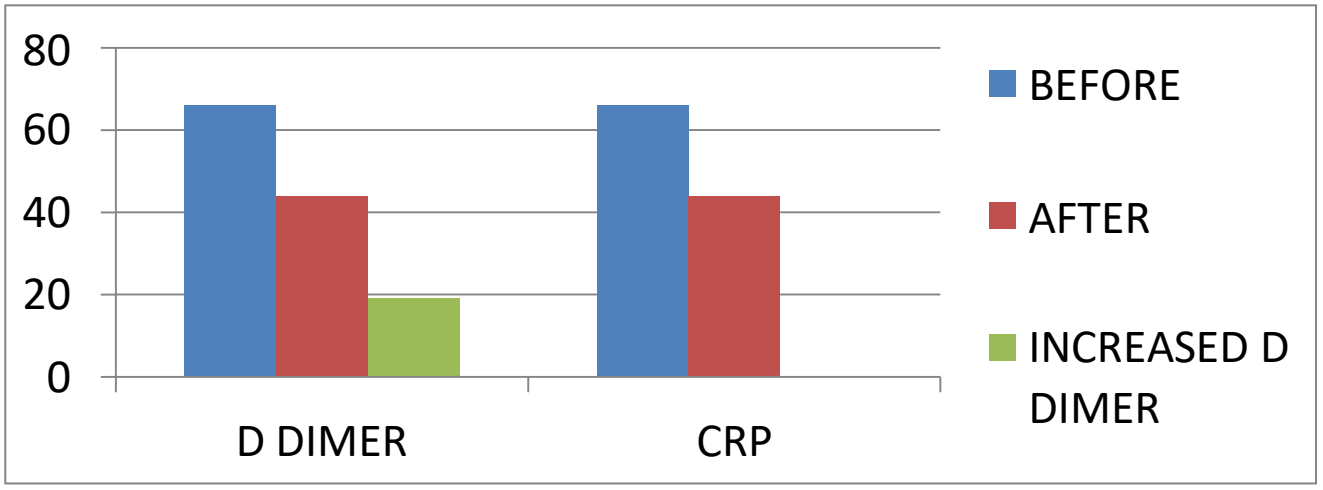



| TOTAL NUMBER OF BACTERIAL PNEUMONIA CASES | NUMBER OF FOLLOWUP CASES |
|---|---|

| | |
|---|---|
| 66 | 30 |

| TOTAL NUMBER OF FOLLOWUP CASES | NUMBER OF CASES HAVING ELEVATED D- DIMER DURING FOLLOWUP | NUMBER OF CASES HAVING ELEVATED CRP DURING FOLLOWUP |
|---|---|---|
| 30 | 0 | 0 |

FIGURE 3 and TABLE 2 : A total of 66 patients included in bacterial pneumonia group, 30 had followup results and it was found that D- Dimer and CRP were directly proportional to each other and there were no cases with elevated D- Dimer during 14 days of followup.




| TOTAL NUMBER OF CASES INCLUDED IN COVID 19 PNEUMONIA GROUP | NUMBER OF FOLLOWUPS AVAILABLE FOR COVID 19 GROUP |
|---|---|

| | |
|---|---|
| 66 | 44 |

| TOTAL NUMBER OF FOLLOWUP CASES | NUMBER OF CASES HAVING ELEVATED D- DIMER DURING FOLLOWUP | NUMBER OF CASES HAVING ELEVATED CRP DURING FOLLOWUP |
|---|---|---|
| 44 | 19 | 0 |

FIGURE 4 and Table 3: Out of the 66 patients included in COVID 19 group, 44 cases were available for followup, out of which 19 cases were having elevated D- Dimer even after fall in CRP after 14 days of followup.

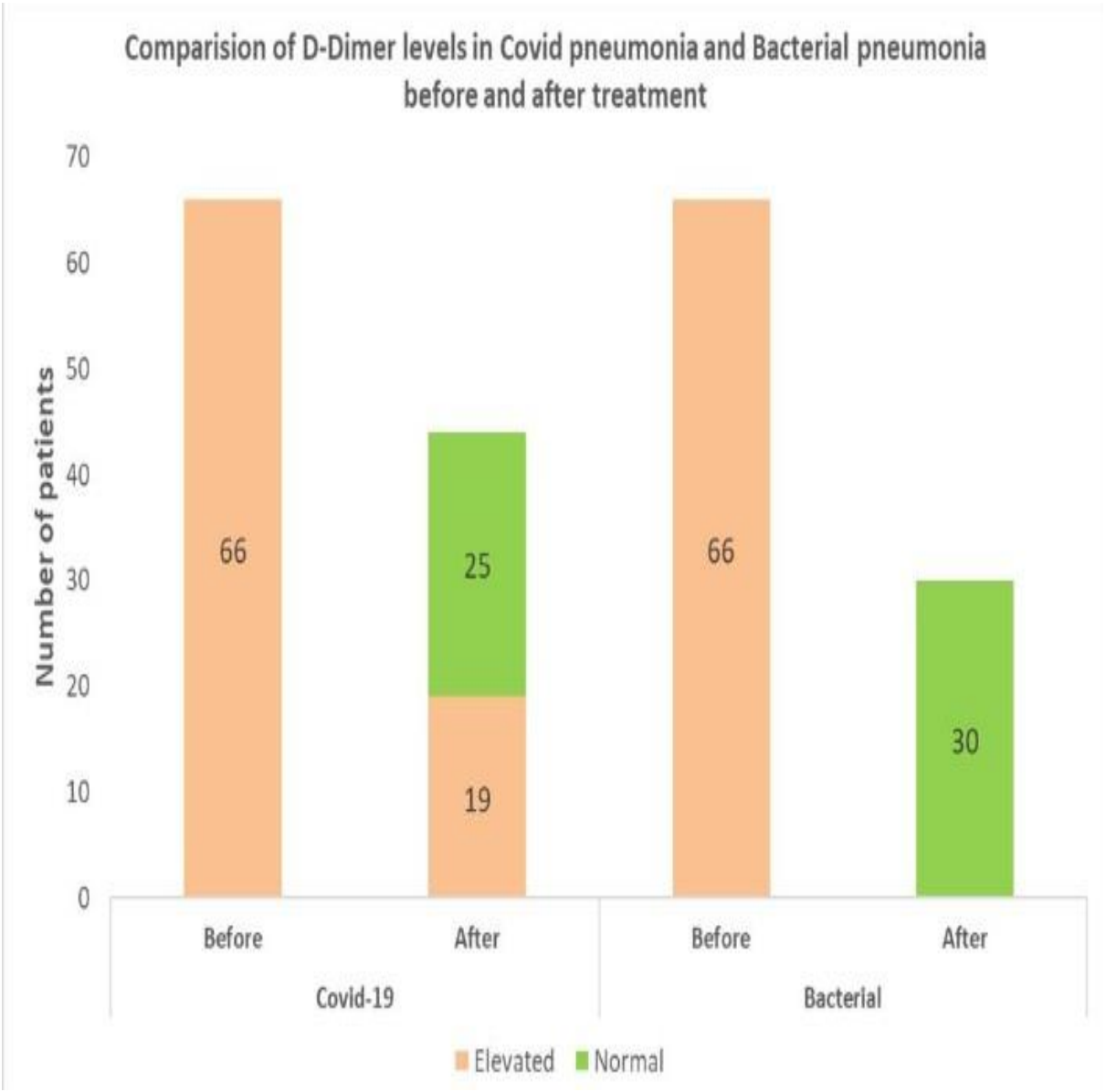
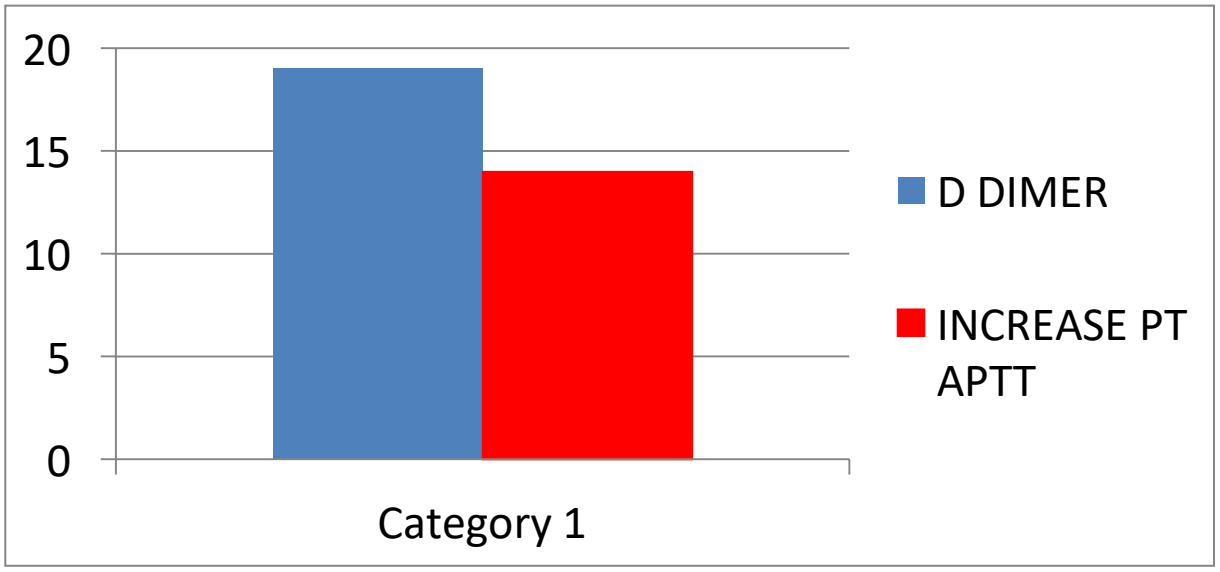



FIGURE 5:Out of the 66 patients included in COVID 19 group, 44 cases were available for followup, out of which 19 cases were having elevated D- Dimer even after fall in

CRP after 14 days of followup.




| NUMBER OF CASES HAVING ELEVATED D- DIMER AFTER 14 DAYS OF FOLLOWUP | NUMBER OF CASES HAVING ELEVATED PT AND APTT |
|---|---|
| 19 | 14 |

FIGURE 6 and Table 4:There were 19 COVID 19 Patients who had elevated D- Dimer and these patients were tested for other entities in coagulation profile such as the PT and APTT and it was found that 14 patients out of the 19 had elevated or abnormal PT and APTT levels.

## STATISTICAL ANALYSIS:

● The obtained data shall be entered into a Microsoft Excel sheet, and analysis statistically shall be performed using a packageof statistics for the social sciences (Version 20).

● Results will be presented as Mean (Median)±SD, counts and percentages, and diagrams.

● For normal distribution of continuous variables among two groups is to be compared by the usage an Independent t-test; Mann Whitney U test is to be used for non continuous variables

● Categorical variables between both the groups will be compared by the usage of Chi-square test.

● A correlation coefficient will be used to find the correlation between quantitative variables.

● p value of less than 0.05 is to be considered significant statistically. Each statistical tests is to be performed to tailed

$p<0.05$ was obtained, and it was found statistically significant.

## DISCUSSION:

Historically, it has caused two pandemics: Middle East respiratory syndrome and severe acute respiratory syndrome, followed by the present COVID-19 that emerged from China. The virus originated from a zoonotic source and spreads direct or by contact transmission. The initial manifestion are fever, cough and myalgia which finally leads to severe respiratory failure. (27)

COVID 19 virus uses Angiotensin converting enzyme-2 receptors on the host cell surface to get into the inner aspect of the cellular elements. Specific morbidities were in association to a higher of expression Angiotensin Converting Enzyme-2 receptor and increased secretion of proprotein enzyme which increases the entry of virus into the host.(28)

Ground glass opacity was defined as grey areas with increased density in lungs with maintainace of respiratory and arterial margins, which may be caused by the displacement of air partially or interstitial thickening. Consolidation is alveolar air replaced by fluids as apart of parenchymal infection, manifested by an increase in pulmonary parenchymal density that obscures the margins of pulomonar vascular tract and respiratory walls. The reticular pattern is thickened pulmonary interstitial structures

which includes interlobular septa and lines, manifested as a collection of innumerable small linear opacities on examination with C.T. scan.(29)

The Coagulation abnormality which is most frequently seen Coronavirus disease-19 is the elevation in FDP, and prognosis based on the FDP has to be discussed for clinical purposes. However, there are few limitations to the usage of determining D-dimer values alone. As there is a chance when there can be change in coagulation/fibrinolytic conditions , regular evaluations in recognition of the significance of the assessment are needed. The progress of disseminated intravascular coagulation (D.I.C.) in association with Coronavirus disease 2019 is very different from the D.I.C. associated with sepsis

. (30)

The complications due to thrombosis and coagulopathy frequently occur in Coronavirus disease 2019. The parameters of Coronavirus disease 2019-associated coagulopathy (C.A.C.) is different from that caused in bacterial sepsis-induced coagulopathy (SIC) and disseminated intravascular coagulation (D.I.C.), with C.A.C. potraying elevated FDP and fibrinogen levels but with abnormalities in prothrombin time and platelet count being minimal. Venous and arterial thrombosis are more often seen in C.A.C.(31)

The findings were concurrent with the present study.

In the present study,

Both D- Dimer and C.R.P. are increased in both Covid 19 and bacterial pneumonia patients before treatment.

The Follow-up patients were available for 44 covid 19 patients and 30 Bacterial pneumonia patients.

Following treatment, for 14 days, there was a significant decrease in both D- dimer and C.R.P., and they were directly proportional to each other.

However, out of the 44 covid -19 patients with available follow-up,19 showed high D-dimer even after a fall in C.R.P. following treatment of 14 days...

Out of the 19 patients who had elevated D - dimer even after treatment and fell in C.R.P.,14 showed elevated coagulation profile (PT,aPTT).

**CONCLUSION:**

To conclude, D-dimer was directly proportional to C.R.P. in the majority of patients in both groups.

Upon follow-up in 44 covid patients, there were 19 patients for whom d-dimer levels were high even after reduced C.R.P. following treatment, out of which 14 had prolonged P.T.,aPTT and PT-INR.

Anticoagulant therapy can be considered in these 14 patients who had elevated D-dimer following treatment and fell in C.R.P. with the elevation of coagulation profile.

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ANNEXURE I

**B.L.D.E (Deemed to be University),**

**SHRI B. M. PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTER,VIJAYAPURA-586103**

INFORMED CONSENT FOR PARTICIPATION IN DISSERTATION/RESEARCH

I, the undersigned,_____,S/OD/O W/O_____,aged _____years, ordinarily resident of_____do hereby state/declare that Dr._____of Hospital has examined me thoroughly on at_____(place) and it has been explained to me in my own language that I am suffering from _ ____disease (condition) and this disease/condition mimic following diseases . Further Doctor informed me that he/she is conducting dissertation/research titled__under the guidance of Dr._____requesting my participation in the study. Apart from routine treatment procedure, the pre-operative, operative, post-operative and follow-up observations will be utilized for the study as reference data.

Further Doctor has informed me that my participation in this study help in evaluation of the results of the study which is useful reference to treatment of other similar cases in near future,and also I may be benefited in getting relieved of suffering or cure of the disease I am suffering.

The Doctor has also informed me that information given by me, observations made/ photographs/ video graphs taken upon me by the investigator will be kept secret and not assessed by the person other than me or my legal hirer except for academic purposes.

The Doctor did inform me that though my participation is purely voluntary, based on information given by me, I can ask any clarification during treatment / study related to diagnosis, procedure of treatment, result of treatment or prognosis. At the same time I

have been informed that I can withdraw from my participation in this study at any time if I want or the investigator can terminate me from the study at any time from the study but not the procedure of treatment and follow-up unless I request to be discharged.

After understanding the nature of dissertation or research, diagnosis made, mode of treatment,I the undersigned Shri/Smt_____under my full conscious state of mind agree to participate in the said research/dissertation.

Signature of patient:

Signature of doctor:

Witness: 1.

2.

Date:

Place:

IEC/No-09/2021
Date-22/01/2021

B.L.D.E. (DEEMED TO BE UNIVERSITY)
(Declared vide notification No. F.9-37/2007-U.3 (A) Dated. 29-2-2008 of the MHRD, Government of India under Section 3 of the UGC Act, 1956)
The Constituent College
SHRI. B. M. PATIL MEDICAL COLLEGE, HOSPITAL AND RESEARCH CENTRE

# INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Institutional ethical committee of this college met on 11-01-2021 at 11-00 am to scrutinize the synopsis of Postgraduate students of this college from Ethical Clearance point of view. After scrutiny the following original/corrected and revised version synopsis of the Thesis has been accorded Ethical Clearance

**Title:** A comparative study of certain parameters in coronavirus 2019 infected patients and community acquired pneumonia patients and association of consecutive D-DIMER results with inflammatory markers.

**Name of PG student:** Dr Akash K, Department of Pathology

**Name of Guide/Co-investigator:** Dr Prakash.M.Patil , Associate Professor of Pathology

DR .S.V.PATIL
CHAIRMAN, IEC
Institutional Ethical Committee
L.D.E (Deemed to be University)
Shri B.M. Patil Medical College,
VIJAYAPUR-586103 (Karnataka)

**Following documents were placed before Ethical Committee for Scrutinization:**

1. Copy of Synopsis / Research project
2. Copy of informed consent form
3. Any other relevant documents.

8

A comparative study of coagulation profile and crp in covid 19

ORIGINALITY REPORT

| 7% | 6% | 3% | 3% |
|---|---|---|---|
| SIMILARITY INDEX | INTERNET SOURCES | PUBLICATIONS | STUDENT PAPERS |

PRIMARY SOURCES

| | | |
|---|---|---|
| 1 | Submitted to (school name not available)<br>Student Paper | 2% |
| 2 | Zheng Ye, Yun Zhang, Yi Wang, Zixiang Huang, Bin Song. "Chest CT manifestations of new coronavirus disease 2019 (COVID-19): a pictorial review", European Radiology, 2020<br>Publication | 1% |
| 3 | mail.ijsurgery.com<br>Internet Source | 1% |
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| 7 | Amal A. Gharamti, Fei Mei, Katherine C. Jankousky, Jin Huang et al. "Diagnostic utility of a Ferritin-to-Procalcitonin Ratio to differentiate patients with COVID-19 from those with Bacterial Pneumonia: A | 1% |

**BACTERIAL PNEUMONIA CASES**

| Name: | Age/Gender | D dimer(ng/ml) | FOLLOW UP AFTER 14 days |
|---|---|---|---|
| | | 801 | 256.2 |
| Pavan kulkarani | 29/Male | 775.3 | |
| Mr.Vijay Kumar S Kengav | 31/Male | 633.5 | |
| Bhimaraya | 69/Male | 546.8 | 259.8 |
| Ishwar ramau devarmani | 72/ Male | 578.9 | 440.3 |
| Mr.Pawadeppa Shrishailappa Galgali | 47/Male | 667.5 | 432.8 |
| Prabhu naykodi | 54/Male | 591.2 | |
| Mr.Balavantraya Basavanagouda Hadalageri | 39/Male | 776.2 | 400.1 |
| Revansidda ikkalaki | 57/Male | 532.8 | 223.1 |
| Rajesh mallappa honnutagi | 62/Male | 682.4 | |
| Mr.Ashok Jain | 31/Male | 532.6 | 230.2 |
| Shivanand | 67/Male | 832.1 | |
| Mr.Shrikanta Bagewadi | 59/Male | 665.9 | |
| Sangamma c metri | 43/Female | 778.4 | 220.2 |
| Mrs.Indumati Gennur | 37/Female | 889.7 | |
| Jayathirata Ashtaputre | 42/Male | 546.8 | |
| Ravi kumar pujari | 75/Male | 734.6 | |
| Mr.Baban Dattu Kandagale | 82/Male | 819 | 330.3 |
| Shobha padamakar atre | 49/Female | 796.4 | |
| Kasthuri | 32/Female | 566.3 | |
| Yashodha doranalli | 29/Female | 889.3 | 466.8 |
| Mrs.Ambawwa Biradar | 56/Female | 622.3 | |
| Mrs.Kashibai Bhimu Rajput | 51/Female | 637.8 | 246.2 |

| | | | |
|---|---|---|---|
| Pundalinga shivayogi | 46/Male | 666.3 | 240.5 |
| Jattappa | 58/Male | 847.6 | |
| Mrs.Kalavati Sheishail Kori | 40/Female | 670.4 | |
| Basavraj guru appa Gouda | 37/Male | 790.3 | 110.2 |
| Narayan | 35/ Male | 679 | |
| Mr.Sanganabasu Madagi | 48/Male | 800.3 | 456.8 |
| Madarappa y Bagalkot | 78/Male | 602.4 | |
| Mr.Nagaraj Gadyappa Nelawashi | 50/Male | 787 | 237.8 |
| Annappa b navi | 56/Male | 903.5 | |
| Hanumantaray | 73/Male | 543.1 | 319.3 |
| D b galagali | 81/Male | 745.2 | |
| ChandrAkant | 45/Male | 500.3 | |
| Mr.Kalavati Sangappa Shivapur | 49/Male | 897.2 | |
| Siddappa shavar appa | 71/Male | 585.3 | |
| Mr.Kartik Shivaputrayya Shantagiri | 39/Male | 566.3 | |
| Goudappagouda siddanagouda | 74/Male | 630 | |
| Mansingh lakku chavan | 63/Male | 546.2 | |
| Mrs.Rashmi Bapuray Medegar | 75/Female | 897 | |
| Mallikarjun bhimaraya | 58/Male | 695 | 282.8 |
| Vila’s vyas | 69/Male | 929 | 478.3 |
| Jagadish patil | 70/Male | 594.6 | |
| Mr.Somanath Lachyan | 84/Male | 752.1 | 387.3 |
| Prakash .n | 76/Male | 745.5 | |
| Ashok. S | 58/Male | 660.8 | 210.3 |
| Shantagouda bheemangouda patil | 40/Male | 790.3 | 400.9 |
| Seetabai | 50/Female | 550.2 | |

| | | | |
|---|---|---|---|
| Parasappa h gundakarajagi | 67/Male | 788 | 346.8 |
| Mrs.Sangamma Mallangouda Patil | 60/Female | 655.7 | 226.4 |
| Nirmala | 45/Female | 596.03 | |
| Nurajan kanamdi | 43/Female | 871.2 | 498.3 |
| Ramesh | 38/Male | 546.6 | |
| Sheela s kori | 60/Female | 899.4 | 490.4 |
| Mr.Vittal Ningappa Hirekol | 48/Male | 964.7 | |
| Kasturi lamani | 47/Female | 589 | |
| Badepeer | 68/Male | 900.1 | 229.8 |
| Mrs.Neelagangavva Yankappa Halangali | 72/Female | 653.1 | 100.3 |
| Basavaraj malakashtti | 80/Male | 809.2 | 431.5 |
| Bharathi | 41/Female | 598 | |
| Mr.Pramod Pedarpet | 26/Male | 565 | 225.4 |
| Bayawwa babu shiranal | 36/Female | 549.2 | 110.8 |
| Sunanda | 49/Female | 504 | |
| Mr.Kallappa Babu Sonnad | 54/Male | 729 | 109.3 |

**COVID 19 PNEUMONIA CASES**

| S no | NAME | AGE/SEX | D dimer(ng/ml) | CRP | APTT | PT | CT SCAN | | D dimer(ng/ml) | PT | APTT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Sunanda Boragi | | 901.24 | 36.8 | | | 15/25 | | 689.2 | 17.3 | 40.3 |
| 2 | Kallangouda | 68/M | 675.11 | 32.5 | | | 14/25 | | 456.3 | 12.2 | 27.2 |
| 3 | Yarsan | 29y/M | 7331.5 | 25.1 | | | 20/25 | | 1006.3 | 24.3 | 49.8 |
| 4 | Shakuntala | 56/M | 3999.1 | 84.4 | | | 14/25 | | 987.3 | 25.2 | 54.3 |
| 5 | Shantappa | 62/M | 846.72 | 48.8 | | | 17/25 | | | | |
| 6 | Shivagouda | 65/M | 732.2 | 34.6 | | | 13/25 | | 223.2 | | |
| 7 | Chandrakala | 39/F | 500.96 | 67 | | | 13/25 | | 110.3 | | |
| 8 | Bowramma | 60/F | 1170.8 | 72.6 | | | 13/25 | | 687.4 | 20.6 | 43.2 |
| 9 | Shivappa | 33/M | 532.8 | 62.3 | | | | | | | |
| 10 | Ragavendra | 34/M | 580 | 60.2 | | | | | 113.8 | | |
| 11 | Somalinga | 40/M | 558.3 | 47.1 | | | | | 109.3 | | |
| 12 | Priyanka | 29/F | 732.3 | 46.9 | | | 18/25 | | | | |
| 13 | Ramdas | 58/M | 565.62 | 39.9 | | | 16/25 | | 240.1 | | |
| 14 | Shashidar | 40/M | >10000 | 32.8 | | | 21/25 | | 3398.3 | 26.2 | 52.1 |
| 15 | Appasab | 51/M | 3962.2 | >90 | | | 15/25 | | 789.2 | 21.2 | 45.3 |
| 16 | Basappa | 32/M | 9729.9 | 67.4 | | | 19/25 | | 990.2 | 23.4 | 47.7 |
| 17 | Dayandgouda | 73/M | 832.2 | <5 | | | 22/25 | | 546.7 | 11.3 | 34.2 |
| 18 | Lalitha | 80/M | 919 | 132 | | | 13/25 | | 532.8 | 12.3 | 31.8 |
| 19 | Raziya | 57/M | 1094.2 | 19.4 | | | 13/25 | | 682.3 | 20.8 | 40.9 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | Mahadevi | 61/F | 532.3 | 27.3 | | | | | | | |
| 21 | Shrikanth | 89/M 1573.36 | 1573.4 | 18.2 | | | | | 732.4 | 22.1 | 41.3 |
| 22 | Ratnabai | 50/F | 622.3 | 13.4 | | | | | | | |
| 23 | Rangubai | 45/F | 739.2 | 27.8 | | | 13/25 | | 443.2 | | |
| 24 | Ravi | 53/M | 588 | 89.5 | | | | | | | |
| 25 | Ramesh | 42/M | 784.1 | 60.2 | | | 22/25 | | 534.3 | 11.3 | 34.2 |
| 26 | Prakash | 40/M | 760.81 | >90 | | | 18/25 | | 453.2 | | |
| 27 | Hanumath | 35/M | 800.82 | 28.2 | | | 16/25 | | 540.3 | 13.2 | 29.4 |
| 28 | Rajashekar | 35/M | 597.76 | >90 | | | 13/25 | | 442.1 | | |
| 29 | Ramesh | 55/M | >10000 | 18.6 | | | | | 998.3 | 26.7 | 48.2 |
| 30 | Shrishail | 52/M | 732.4 | 21.3 | | | | | | | |
| 31 | Bouramma | 45/F | 887.2 | 56.7 | | | | | 449.3 | | |
| 32 | Rayappa | 53/M | 803.2 | 20.7 | | 11.5 | 13/25 | | | | |
| 33 | Laxmikanth | 40/M | 502.8 | 23.4 | | | 25-May | | 210.3 | | |
| 34 | Kamala | 56/M | 574.2 | 22.8 | | | 25-Aug | | | | |
| 35 | Basavaraj | 55/M | 397.23 | 9.7 | | | 13/25 | | 102.3 | | |
| 36 | Shakuntala | 60/F | 3999.1 | 84.4 | | 11.5 | | | 860.4 | 20.2 | 42.3 |
| 37 | Jagadish | 43/M | 598 | 9.8 | | | 16/25 | | | | |
| 38 | Shivaraj | 73/M | 396 | 7.9 | | | 18/25 | | 114.3 | | |
| 39 | Dandappagouda | 62/M | 530 | <5 | | | 18/25 | | | | |
| 40 | Satyabama | 60/M | >10000 | 27.2 | | | 18/25 | | 1000.3 | 25.6 | 46.4 |
| 41 | Narayana | 60/M | 991 | 28.7 | | 15.7 | 17/25 | | 678.9 | 21.8 | 41.9 |
| 42 | Mallikaarjun | | 396 | >90 | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 43 | Raziya | 57/F | 992 | 26 | | | 13/25 | | 667.4 | | |
| 44 | Rayappa | 55/M | 532 | 27 | | 12 | | | 230.3 | | |
| 45 | Laxmeekant | 40/F | 3010.7 | 23.4 | | | 14/25 | | 886.3 | 21.3 | 45.2 |
| 46 | Kamala | | 574.2 | 22.8 | | | 25-Aug | | 310.5 | | |
| 47 | Basavaraj | 55/M | 555 | 9.7 | | | 25-Jul | | 103.2 | | |
| 48 | Kasuri | | 2013 | 47.8 | | | | | | | |
| 49 | Shivalingawwa | 45/F | 1200.3 | 58 | | | | | | | |
| 50 | Somashekaryyya | 32/M | 2728.7 | 61.8 | | | 15/25 | | | | |
| 51 | Lalsingh | 38/M | 82.1 | 803.89 | | | | | 445.6 | | |
| 52 | Neelawwa | 65/F | 596 | 37.3 | | | | | 121.8 | | |
| 53 | Rajashree | 30/F | 1551.7 | 45.4 | | | 25-Dec | | | | |
| 54 | Sangeeta | 41/F | 566 | 54.6 | | | | | 110.2 | | |
| 55 | Amarsing | 52/M | 998 | 8.1 | | | 14/25 | | | | |
| 56 | Manjula | | 942.24 | 38.6 | | | | | | | |
| 57 | Ratnabai | 55/F | 666.88 | 81.4 | | | | | 356.3 | | |
| 58 | Channamma | 65/F | 1275.3 | 28 | | | 13/25 | | | | |
| 59 | Amoghsidda | 58/M | 633.83 | 54.4 | | | | | 300.1 | | |
| 60 | Sunanda Boragi | 45/F | 901.24 | 36.8 | | | | | | | |
| 61 | Shantabai | 70/F | 394.4 | 15.2 | | | 13/25 | | 146.8 | | |
| 62 | Basappa | 48/M | 548 | 18.2 | | | | | 246.7 | | |
| 63 | Mahadevi | 50/F | 540.28 | 82 | | | | | | | |
| 64 | Goramma | 45/F | 504 | 19.8 | | | 14/25 | | 199.8 | | |
| 65 | Taranmum | 42/F | 643 | 56.8 | | | | | | | |
| 66 | Sidamma | 32/F | 596 | 27.4 | | 11 | 25-Nov | | 200.3 | | |