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## A Study To Assess The Correlation Of D Dimer Levels In Prediction Of The Need Of Renal Replacement Therapy In COVID Patients With Acute Kidney Injury.

Chandrashekhar HR<sup>1</sup>, Keshava HK<sup>2</sup>, and Foram Joshi<sup>3\*</sup>.

<sup>1</sup>Associate Professor, Department of General Medicine, KIMS BANGALORE, Karnataka, India.

<sup>2</sup>Professor, Department of General Medicine, KIMS BANGALORE, Karnataka, India.

<sup>3</sup>Junior Resident, Department of General Medicine, KIMS BANGALORE, Karnataka India.

### ABSTRACT

Coronavirus disease 2019 is predominantly a respiratory illness that can cause hypercoagulable states with multisystem involvement. A single centre retrospective study was carried out in 37 patients who were diagnosed as COVID 19 with AKI from January 2022 to march 2022. Baseline D dimer was evaluated on hospital admission . Patients who were diagnosed with AKI on admission or during the stay in hospital were included in the study , In this study 37 COVID patients with AKI were analysed. Mean age of subjects was 62.51+/-15.18 years. Majority were in the age group 61-70 years (24.3%). 78.4% were males and 21.6% were females. Mean blood urea among subjects was 131.86+/-56.55(mmol/L), mean serum creatinine was 4.71+/-2.52(mg/dl). mean d dimer at admission was 3.701+/-4.48570(mg/L).70.3% of subjects had AKI at hospital admission and 29.7% developed AKI during hospital stay. Cause of AKI was prerenal in 89.2%, renal 18.9%,and post renal in 8.1%. D dimer levels >3.05 had highest validity in predicting the need for RRT with sensitivity 39.29%, specificity 100%, positive predictive value of 100% and negative predictive value of 34.6%. from this study it was concluded that d dimer has specificity of 100%in predicting the need of RRT .

**Keywords:** AKI, Acute Kidney Injury, RRT:Renal Replacement Therapy, COVID 19:Coronavirus Disease , D Dimer.

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*\*Corresponding author*

## INTRODUCTION

Coronavirus Disease 2019 is a primarily respiratory illness that can cause hypercoagulable states with multisystem involvement [1]. Elevation of D-dimer is a potential biomarker for poor prognosis in COVID-19 [2-4]. Several studies have correlated AKI and renal abnormalities to be associated with severity of COVID 19. D dimer is an important prognostic marker for various outcomes in COVID 19[5]. This study aims to assess the accuracy of admission D dimer in predicting the need of renal replacement therapy in COVID 19 patients with acute kidney injury and to establish the optimal cut off d dimer value to predict the same .

## MATERIAL AND METHODS

A single centre retrospective study was carried out in KIMS HOSPITAL BANGALORE, 37 patients who were diagnosed with COVID 19 and AKI from January 2022 to march 2022 were enrolled. COVID 19 diagnosis was established by standard RTPCR testing. All COVID 19 patients who were aged above >18 years and diagnosed as AKI on admission as per previous recent normal baseline creatinine and patients who developed AKI during the stay in hospital with normal admission creatinine values were taken in study.

We excluded patients who were diagnosed with chronic kidney disease and those patients who didn't have recent normal baseline serum creatinine.

AKI was defined as per KDIGO definition as change in serum creatinine of 0.3mg/dl over 48 hour period or 50% rise in baseline creatinine. For patients with previous baseline creatinine the creatinine value which was most recent was taken into consideration [6-8]. Patients who didn't have previous baseline creatinine values were excluded from study. D Dimer level of all COVID 19 patients with AKI on admission were taken into consideration. Retrospective data of these patients were traced and studied in terms of demographic parameters, mean laboratory parameters , incidence of AKI on presentation and during stay in hospital ,suspected cause of AKI, cause and indication of RRT, frequency of RRT, outcomes. Comparison analysis was done between baseline D dimer levels and need of RRT in COVID 19 patients with AKI.

## RESULTS AND DISCUSSION:

In the study 37 covid positive subjects with AKI were analysed. Mean age of subjects was  $62.51 \pm 15.18$  years Majority were in the age group 61 to 70 years (24.3%) (table I), 78.4% were males and 21.6% were females. Mean blood urea among subjects was  $131.86 \pm 56.55$  (mmol/L), mean Serum creatinine was  $4.71 \pm 2.52$  (mg/dl), mean D Dimer at admission was  $3.701 \pm 4.48570$  (mg/L)(table II). 70.3% of subjects had AKI at hospital admission and 29.7% developed AKI during hospital stay. Cause of AKI was prerenal in 89.2%, renal in 18.9% and post renal in 8.1% (table III). In this study most common suspected cause for AKI was Sepsis in 72.97% (table IV). RRT was required in 75.7% of subjects. The most common indication for RRT was increase in serum BUN ,creatinine levels in 51.4%, followed by metabolic acidosis in 40.5%,hyperkalemia in 32.4% subjects, severe uremic symptoms in 29.7% and hypervolemia in 8.1%(table V). In this study 24.3% had complete recovery ,5.4% had partial recovery and rest had no improvement and were dialysis dependent (table VI). Final outcomes were studied and reported mortality was in 37.8% subjects (table VII) There was no significant difference in mean time between first symptom and COVID diagnosis and total hospital stays with respect to RRT. D Dimer at  $>3.05$  had highest validity in predicting the need for RRT with Sensitivity of 39.29%, specificity of 100%(table VIII) . From the study it was concluded that D Dimer has a specificity of 100% in predicting the need for RRT

**Table I: Age distribution of subjects,**

		Count	%
Age	<40 years	3	8.1%
	41 to 50 years	4	10.8%
	51 to 60 years	8	21.6%
	61 to 70 years	9	24.3%
	71 to 80 years	9	24.3%
	>80 years	4	10.8%
	Total	37	100.0%

Majority of subjects were in the age group 61 to 70 years (24.3%).

**Table II: Mean values of Laboratory parameters among subjects**

	Mean	SD	Median
Urea(mmol/L)	131.86	56.55	137
Creatinine(mg/dl)	4.71	2.52	4.17
Na(mmol/L)	135.49	8.92	135
K(mmol/L)	5.15	0.95	5.1
LDH(UL)	435.29	183.55	396
Procalcitonin(ng/L)	2.13	1.25	2.60
Hb(g/dl)	10.45	2.13	10.30
Leucocyte count	13148.92	8734.40	11610
Neutrophil count	82.42	16.51	88.0
Lymphocyte count	10.45	7.42	8.0
Thrombocyte count	2.07	1.09	1.89
CRP levels	16.79	14.64	14.20
D dimer (mg/L)	3.7041	4.485	1.83

Mean D Dimer in the study is 3.7041 ± 4.485 mg/L (SD: Standard deviation, Hb: hemoglobin, Na: sodium, K: potassium, CRP: C-reactive protein, LDH: lactate dehydrogenase)

**Table III: Suspected causes of AKI**

		Count	%
Prerenal	No	4	10.8%
	Yes	33	89.2%
Renal	No	30	81.1%
	Yes	7	18.9%
Postrenal	No	34	91.9%
	Yes	3	8.1%

In the study 89.2% of AKI was due to Prerenal causes, 18.9% had Renal causes and 8.1% had Postrenal cause.

**Table IV: Suspected causes of AKI**

		Count	%
Dehydration		5	13.51%
GI loss		1	2.70%
Heart failure		1	2.70%
Sepsis		27	72.97%
Thrombotic microangiopathy		1	2.70%
Nephrotoxic drugs		1	2.70%
Postrenal (urological) causes	BPH	2	5.41%
	Cystitis	2	5.41%
	Prostatomegaly	1	2.70%
Others	TLS	1	2.70%

In the study most common suspected cause for AKI was Sepsis in 72.97%. (TLS: TUMOUR LYSIS)

**Table V: Indication for RRT:**

	No		Yes	
	Count	Row N %	Count	Row N %
Increase in serum BUN creatinine levels	18	48.6%	19	51.4%
Hyperkalaemia	25	67.6%	12	32.4%
Metabolic acidosis	22	59.5%	15	40.5%
Hypervolemia	34	91.9%	3	8.1%
Severe uremic symptoms	26	70.3%	11	29.7%

In the study most common indication for RRT was Increase in serum BUN creatinine levels in 51.4%.

**Table VI: Renal Outcome distribution**

	No		Yes	
	Count	Row N %	Count	Row N %
Complete recovery	28	75.7%	9	24.3%
Partial recovery	35	94.6%	2	5.4%
No improvement and/or dialysis dependence	12	32.4%	25	67.6%

In the study 24.3% had Complete recovery, 5.4% had partial recovery and 67.6% had No improvement and/or dialysis dependence.

**Table VII: Patient Outcome distribution**

Patient Outcome	Count	%
	Discharged	23
Death	14	37.8%

In the study 37.8% had mortality and 62.2% were discharged.

**Table VIII: Validity of D Dimer in predicting RRT:**

Area under the ROC curve (AUC)	0.607
Standard Error	0.0975
95% Confidence interval	0.433 to 0.763
z statistic	1.099
Significance level P (Area=0.5)	0.2717

**Youden index**

Youden index J	0.3929
Associated criterion	>3.05

In the study D Dimer at >3.05 had highest sensitivity 39.29%, specificity 100.00%, PPV of 100% and NPV of 34.6.

**CONCLUSION**

D DIMER is a breakdown product of plasmin and is an important prognostic marker in predicting the severity and outcomes of COVID 19 [9]. Many studies have determined cut off d dimer values and its correlation with predicting the various clinical outcomes in COVID 19[10-15]. However this study determines d dimer values >3.05 in predicting need of RRT in COVID 19 patients with AKI. Hence a positive association between elevated d dimer, AKI and need for RRT is established. This study does have limitations being a single centre , retrospective study and a smaller sample size.

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