

## SEIZURES IN RENAL FAILURE – A HOSPITAL BASED OBSERVATIONAL STUDY

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### Abstract

**Background:** Seizures happening in patients with renal failure (acute kidney injury and chronic kidney disease) are multifactorial in causation which includes uremic toxins, hypertensive complications like intracerebral bleed, neuroinfections, dialysis related complications, electrodynamics, metabolic insults. **Materials and Methods:** This is an observational clinical study, done to analyse the spectrum of causes of seizures in patients of renal failure assessed at our center. **Result:** This study showed causes of seizures in renal failure are multiple including dyselectrolytemia, Uremic encephalopathy, hypertensive encephalopathy, neuroinfections and PRES. The most common type of seizure semiology was generalized tonic clinic, followed by myoclonic and focal seizures. **Conclusion:** Patients with renal disease suffer from seizures due to multiple metabolic and structural abnormalities as demonstrated in this hospital-based study. Hence patients of renal disease developing seizures need a systematic evaluation to elucidate the underlying cause for seizures.

## INTRODUCTION

Neurological complications are often seen in both chronic kidney disease as well as Acute Kidney injury. Numerous reviews have documented involvement of both Peripheral and central nervous system in patients with renal disorders. The central nervous system involvement in renal diseases can comprise Cognitive, Vascular, Movement and sleep disorders. It has been projected that seizures occur in 10% of patients with chronic renal failure.<sup>[1]</sup>

The cause for seizures in patients suffering from renal disease as clarified by various authors include Malignant hypertension, Dialysis Dysequilibrium syndrome, Intradialytic hemodynamic instability, dyselectrolytemia [Table 1], Uremia, Stroke, Posterior reversible encephalopathy (PRES), Hypoglycemia and Central Nervous System Infection.

Literature in the past has addressed the cohort of seizure patients in renal failure undergoing dialysis but studies on seizures in all sets of renal failure (AKI and CKD) patients are scarce. This study aims to look at the numerous factors causing seizures in a patient with renal failure (AKI and CKD) in a tertiary hospital setting.

**Table 1: Electrolyte abnormality and seizures in clinical Practice<sup>[2]</sup>**

Electrolyte abnormality	Frequency in clinical practise	Frequency of seizures in acute/severe imbalance
Hyponatremia	+++	++
Hypernatremia	++	++
Hypocalcemia	+	++
Hypercalcemia	++	+
Hypomagnesemia	++	++
Hypokalemia	+++	-
Hyperkalemia	++	-

### Review Of Literature:

The usually accepted operational definition of Epilepsy is the occurrence of at least two or more unprovoked seizures more than 24 hours apart. Bergen and colleagues reported an estimated incidence of seizure of approximately 10% in patients with chronic renal failure.<sup>[3]</sup> In addition Plum and Posner also noted that convulsions occurred in one third of patients with end-stage renal disease (ESRD) and was commonly a preterminal event.<sup>[4]</sup> The seizures in these sequences usually were generalized tonic-clonic type. The mechanism of reduced seizure threshold in renal failure is still not clear as on date. Hemodialysis-associated seizure (HAS) is a common complication of hemodialysis.<sup>[5]</sup> HAS occurs in 7% to 50% of children and adolescence with ESRD, and their seizures are usually reported as generalized tonic

clonic seizures.<sup>[6]</sup> On the other hand, non-convulsive seizures appear to be rare.<sup>[7,8]</sup> Risk factors include young age, prior history of seizures, malignant hypertension, microvascular diseases, uremic encephalopathy and cardiomyopathy. Moreover, induced brain water disequilibrium, hypocalcemia, uremic toxins, the use of acetate in the dialysate, intracranial hemorrhage due to systemic heparinization, treatment with recombinant erythropoietin, simultaneous use of antibiotics hemodynamic and metabolic defects are considered putative factors for seizures.<sup>[9,10]</sup> The present study is projected to explore the causes of seizures in renal failure patients attending our institution.

## MATERIALS AND METHODS

1. To regulate the incidence of seizures in patients with renal failure.
2. To appraise the cause of seizures in patients with renal failure (AKI and CKD) during or after dialysis.
3. To determine the influence of renal failure(AKI and CKD) to the causation of different types of seizures.
4. To correlate and analyze the data in patients of seizures with renal failure (AKI and CKD).

### Type of Study

This is an observational clinical study, on patients with renal failure (AKI and CKD) who developed seizures before or during treatment at Vijayanagar institute of medical sciences, Bellary.

### Inclusion Criteria

All patients with renal failure (AKI and CKD) who were undergoing treatment at Vijayanagar institute of medical sciences, Bellary during the study period and who developed seizures were also included in the study.

### Exclusion Criteria

Patients who had documented seizure disorder prior to the onset of renal failure (AKI and CKD) preexisting epilepsy were excluded.

### Methods of Collection

After informed consent the data was collected and recorded in the proforma. This included information on patient profile, detailed history, biochemical profile, ECG, EEG (wherever applicable) and radiological data.

For EEG, a portable RMS EEG machine was used to record the findings.

### Statistical Analysis

Descriptive correlation of the data is done with respect to the variables done in the present study.

Of the Numerous etiologies causing seizures in patient's with renal disease in our study,

Hypertensive encephalopathy was found to the most common cause and the least being neuro infections.

### Etiology

Etiology	Cases	Percentage
UREMIC ENCEPHELOPATHY	5	10.5
DYSELECTROLYTEMIA	5	10.5
PRES	1	2.5
IC BLEED	1	2.5
CVT	1	2.5
HYPERTENSIVE ENCEPHALOPATHY	7	14.5
INFECTIVE	1	2.5

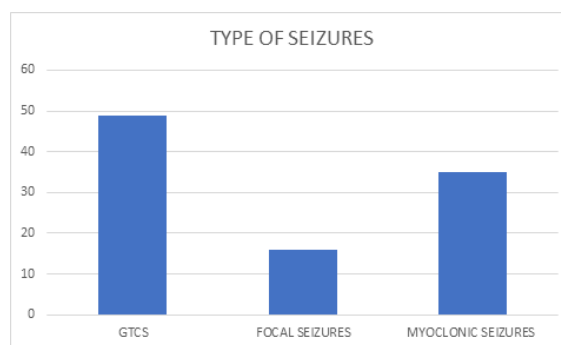
### Type of Renal failure

In our study we found that incidence of seizures was more common in patients with chronic kidney disease than Acute kidney injury.

## RESULTS

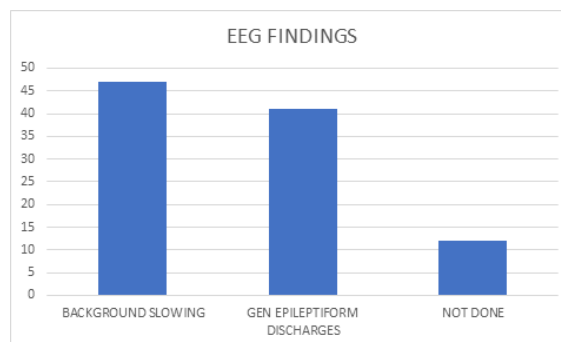
### Semiology

Out of the total number of cases included in our study, 49% had Generalised tonic clonic type of seizures followed by 16% of cases had focal type of seizures with retained consciousness and the remaining 35% presented with myoclonic seizures.



### EEG Findings

In our study most common EEG findings among the cases was background slowing (47%), followed by generalized epileptiform discharges (41%).



### Neuro imaging findings

Of the total number cases, abnormal neuroimaging findings were seen in sixteen cases. Most common neuroimaging finding was cerebral edema.

## DISCUSSION

The pathophysiology of uremia is probably multifactorial and associated with problems in cognition and memory which may progress to delirium, convulsions, and coma. Seizures are commonly generalised tonic clonic in type, although focal motor seizures and myoclonic seizures are also common.<sup>[11]</sup> Multi focal myoclonus characterise the later stages of the encephalopathy.<sup>[11]</sup> Causes of seizures in renal failure are multiple including dyselectrolytemia, uremic encephalopathy, hypertensive encephalopathy, neuro infections, strokes, drug induced and dialysis disequilibrium syndrome. In this study Hypertensive encephalopathy, Uremic encephalopathy and dyselectrolytemia were the leading causes of for seizures in patients with renal failure as elucidated above. The EEG in uremia is usually shows generalized slowing, most marked frontally with an excess of delta and theta waves. Bilateral spike and wave complexes, in the absence of evident clinical seizure activity, have been reported in up to 14% of patients with chronic renal failure.<sup>[12]</sup> Similar findings were noted among the subjects who underwent EEG in our study. Acute and/or severe electrolyte imbalances frequently cause seizures in renal failure, especially, sodium disorders, hypocalcemia, and hypomagnesemia. Dyselectrolytemia (Hyponatremia) was the cause of seizures in eleven cases in our study. Successful management of patient seizures begins with the establishment of an accurate diagnosis of the underlying electrolyte disturbance, because rapid identification and correction of the disturbance is necessary to control seizures and prevent permanent brain damage.<sup>[13]</sup> Neuroimaging in renal failure can give an etiological clue for seizure, depicting ischemic and hemorrhagic strokes, CVT and PRES.<sup>[14]</sup> Sixteen patients had abnormal Neuroimaging findings in our study and these included cerebral edema in seven cases, CVT, PRES and IC Bleed in three patients each.

## CONCLUSION

Patients with renal disease suffer from seizures due to multiple metabolic and structural abnormalities as demonstrated in this hospital-based study. Hence patients of renal disease developing seizures need a systematic evaluation to elucidate the underlying cause for seizures.

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