



Prevalence of Seizure between Chronic Renal Failure Patients in hemodialysis center, King Abdulaziz University Hospital

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Article History

Received: 21 September 2019

Reviewed: 24/September/2019 to 07/November/2019

Accepted: 10 November 2019

Prepared: 12 November 2019

Published: January - February 2020

Citation

Aysha A. Alshareef, Manal M. Alzahrani, Ahd F. Almarzouki, Khalid S. Alhunaiti, Mawadda A. Bayazeed, Shaza A. Alshahrani. Prevalence of Seizure between Chronic Renal Failure Patients in hemodialysis center, King Abdulaziz University Hospital. *Medical Science*, 2020, 24(101), 327-334

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General Note

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ABSTRACT

Background and aim: Chronic kidney disease (CKD) is a common co-morbid and a reason behind patient hospitalization in the medical practice in Saudi Arabia. A variety of neurological symptoms and diseases are associated with both acute and chronic renal damage. Seizure is one of the most commonly reported neurological performances. For this purpose, this study is addressing to estimate the prevalence of seizures among CKD patients, as well as the mortality rate among neurological cases compared to non-neurological cases in the hemodialysis center, King Abdulaziz University (KAU) hospital. *Methodology:* This is a retrospective study, including 417 patients with CKD. Electronic medical records of patients who were admitted to the hospital from 2016 to 2017 were reviewed. Detailed medical history was obtained. Seizures type, possible triggers, anti-epileptics and occurrence of status epileptics

were also investigated. Additionally, MRI and electroencephalography (EEG) findings were utilized in seizures diagnosis. *Results:* Forty-five patients (11%) of total population (n=417) were found to have neurological complications. Eighty percent of CKD neurological convulsion patients were on hemodialysis. Thirty-one percent of the patients were diagnosed with epileptic EEG discharges and 13% with brain MRI. Seizures were the most common neurological complication accounting for 53% while status epilepticus representing 11%. Out of the 24 patients, seizure triggers were identified in 19 patients. Generalized tonic-clonic was more common than partial seizure with 12(50%) and 3(12%), respectively. Other neurological complications were ischemic stroke (38%), hemorrhagic stroke (11%), headache (11%) and peripheral neuropathy (7%). High present of death among neurological patients 24(53%) in comparison to 94 (25%) in patients with non-neurological problems (n=372). *Conclusion:* It may be concluded that seizure is the main neurological complication of CKD depending on the results of this research. Electrolyte imbalance was the most common seizure cause. Among neurologically affected types of CKD patients, mortality was elevated.

Keywords: Chronic kidney disease; Seizures; Neurological complications; Retrospective; Prevalence.

1. INTRODUCTION

Chronic kidney disease (CKD) is a common co-morbidity and a reason behind patients hospitalization in the medical practice in Saudi Arabia, with an estimated prevalence of 5.7% and 5.3% using the 3-variable diet in renal disease (MDRD-3) and CKD-EPI glomerular filtration equations, respectively (Abdulkareem *et al.*, 2010). Chronic renal damage, whether with or without dialysis, is associated with different neurological complications of the central and peripheral nervous system such as seizure, stroke, encephalopathy, cognitive dysfunction, and neuropathies due to various underlying pathophysiology (Renhua *et al.*, 2015 and Robert, 2015).

The seizure is a sudden disturbance in the electrical activity of the brain leading to motor, sensory or autonomic abnormalities. The pathogenesis behind the generation of neuronal activity is explained by an imbalance between excitatory (glutamate-mediated) and inhibitory (g-aminobutyric acid {GABA}-mediated) neurotransmission in favour of the first (Dalby and Mody, 2001). It reported as one of the neurological presentations in CKD patients and according to the previous study, showed an estimated incidence by 10% (Tyler and Tyler, 1984).

Higher risk for developing seizures was observed among patients on hemodialysis which is known as Hemodialysis-associated seizure (HAS) (Glenn, 1992). The possible causes of seizure could be attributed to malignant hypertension, metabolic or electrolyte disturbance, microvascular disease infections, stroke, or over dosage of some medications such as Ciprofloxacin. Seizures in HAS commonly tonic-clonic seizures (Glenn, 1992; Bergen *et al.*, 1994; Beaumont, 2005 and Tattevin *et al.*, 1998). In a retrospective study, seizures in renal failure could be an occasional event that does not usually end up as a chronic complaint. Yet the occurrence of status epilepticus in CKD patients showed poor prognosis and was frequently a preterminal event (Bergen *et al.*, 1994).

Based on these facts, this study aims to determine the prevalence of neurological diseases among CKD patients, particularly seizure, in addition to understanding the etiology behind the neurological manifestations to facilitate the management and predict the prognosis of such cases.

2. METHODOLOGY

Study design

This research was designed as a retrospective study, which was conducted between July 2016-June 2017. This study including 417 patients with CKD. The electronic medical records of patients who were admitted to the hospital during the period of 2005-2016 were reviewed. Data were obtained including: Personal data, seizure type, possible triggers, anti-epileptics, and occurrence of status epileptics. The MRI and EEG findings were taken into consideration. In addition, the occurrence of other neurological complications and their association with dialysis were obtained.

Setting

The data was collected from the hemodialysis center in the Hospital of King Abdulaziz University.

Ethical approval

This study was approved by the Research Ethics Committee, King Abdul-Aziz university hospital.

Including and excluding criteria

Patients who diagnosis with CKD at least one month

Who are on hemodialysis or not

Analysis and results' interpretation

Descriptive statistics, including frequency and percentage of neurological complications, types of seizure, medications to control the seizures, and death among neurological CKD patients.

3. RESULTS

Forty-five patients (11%) of our total population (n=417) were found to have neurological complications (Figure 1). Eighty percent of CKD neurological convulsion patients were on haemodialysis (Figure 2). Thirty one percent of the patients were diagnosed with epileptic EEG discharges and 13% with brain MRI (Figure 3). Seizures were the most common neurological complication accounting for 53% while status epilepticus representing 11% (Figure 4). In 79% of the patient's triggers were identified (Figure 5). The most common seizure trigger was electrolyte disturbance (37%) and ischemic and haemorrhagic stroke (26%) (Figure 6).

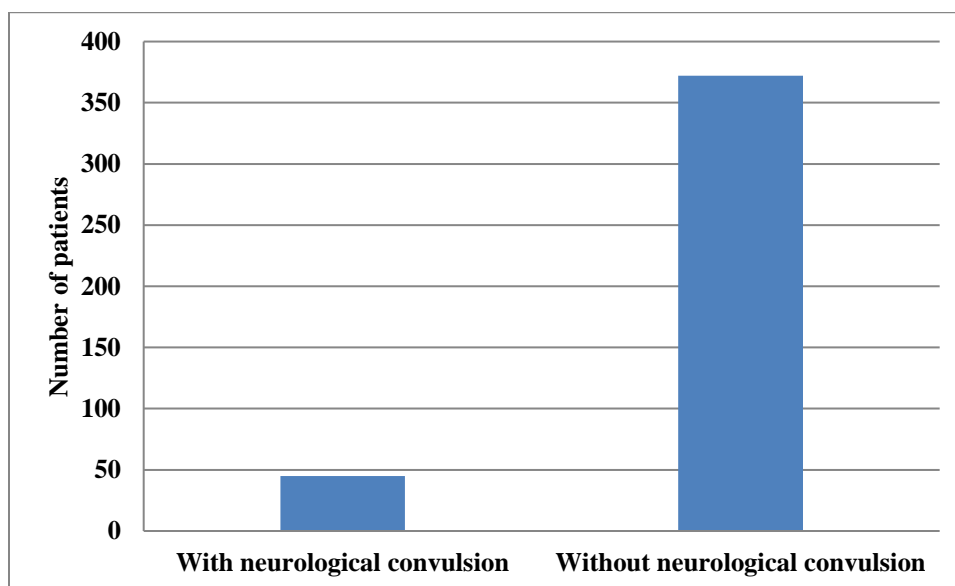


Figure 1 A bar chart showing the number of chronic kidney disease (CKD) patients with and without neurological convulsion. The total number of CKD patients is 417, 45 with neurological convulsion and 372 without neurological convulsion.

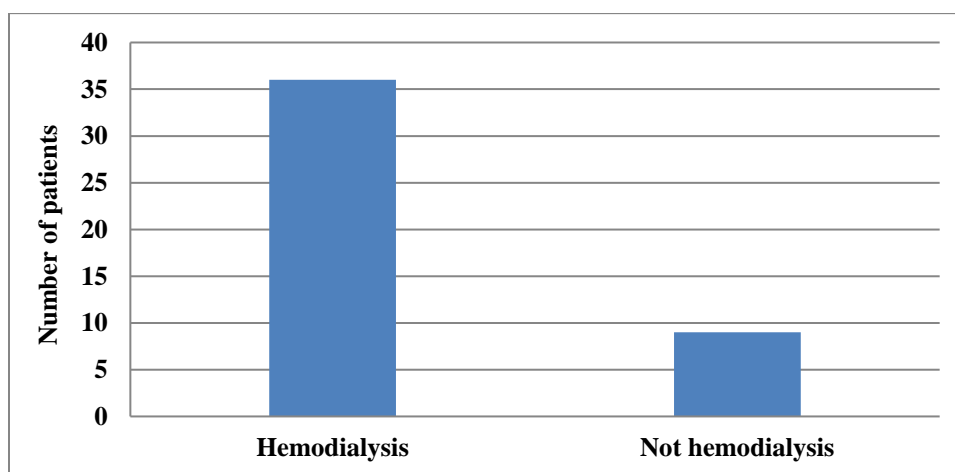


Figure 2 A bar chart showing the number of patients with neurological convulsion with haemodialysis and without haemodialysis. The total number of CKD neurological convulsion patients is 45, 36 with hemodialysis, and 9 without hemodialysis.

Generalized tonic-clonic were more common than partial seizure with 50% and 12% respectively (Figure 7). Seventy one percent of CKD neurological convulsion patients were treated with anti-epileptics (Figure 8). The most frequent antiepileptic drug utilized was phenytoin (47%) (Figure 9).

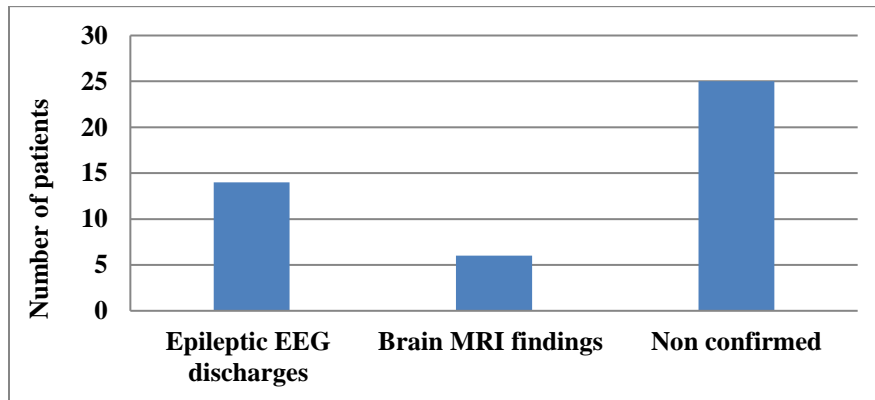


Figure 3 A bar chart showing the number of patients with chronic kidney disease (CKD) patients with confirmed neurological convulsion diagnosis. The total number of CKD patients with confirmed neurological convulsion is 45, 14 with epileptic EEG discharges, 6 with brain MRI findings, and 25 non-confirmed diagnosis.

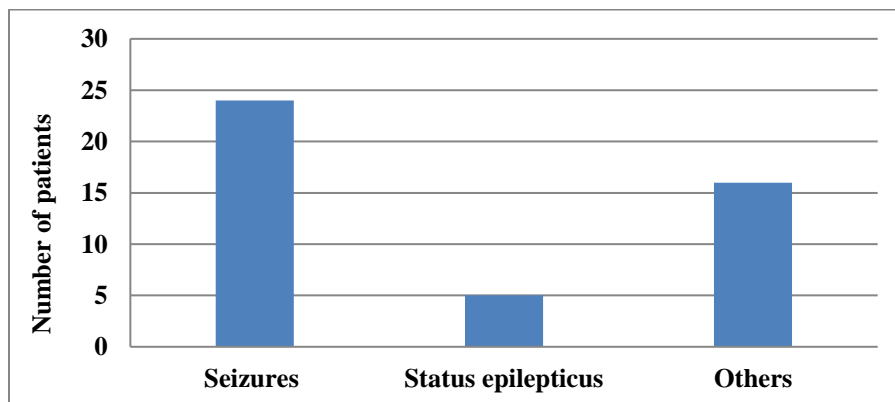


Figure 4 A bar chart showing the number of patients with seizures, status epilepticus, and others convulsion among CKD with neurologic convulsion. The total number of CKD patients with neurological convulsion is 45, 24 with seizures, 5 with status epilepticus, and 16 with other types of neurological convulsion.

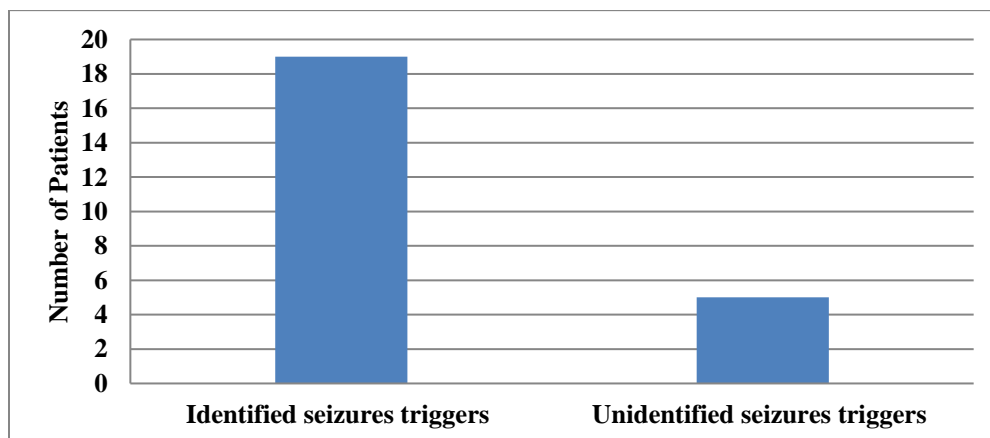


Figure 5 A bar chart showing the number of patients with identified seizures triggers and unidentified seizures triggers. The total number of CKD patients with seizures is 24, 19 with seizures, 5 with identified seizures triggers, and 5 with unidentified seizures triggers.

Other neurological complications were ischemic stroke (38%), haemorrhagic stroke (11%), headache (11%) and peripheral neuropathy (7%) (Figure 10). Lastly, we recognized higher percentage of death among neurological patients (53%) in comparison to (26%) in patients with non-neurological problems (Figure 11).

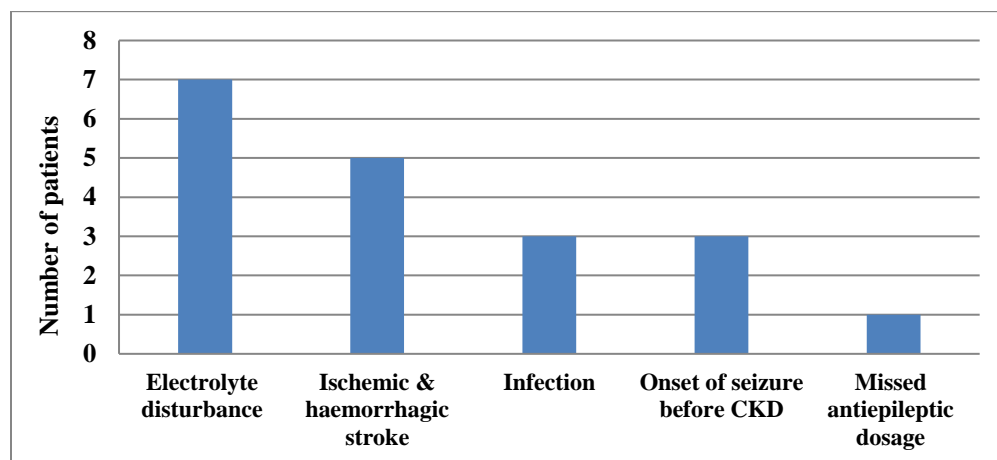


Figure 6 A bar chart showing the number of patients with different seizure triggers. The total number of patients with identified seizures triggers are 19, 7 with electrolyte disturbance, 5 with ischemic and hemorrhagic stroke, 3 with infection, 3 with the onset of seizures before CKD, and 1 with missed antiepileptic dosage.

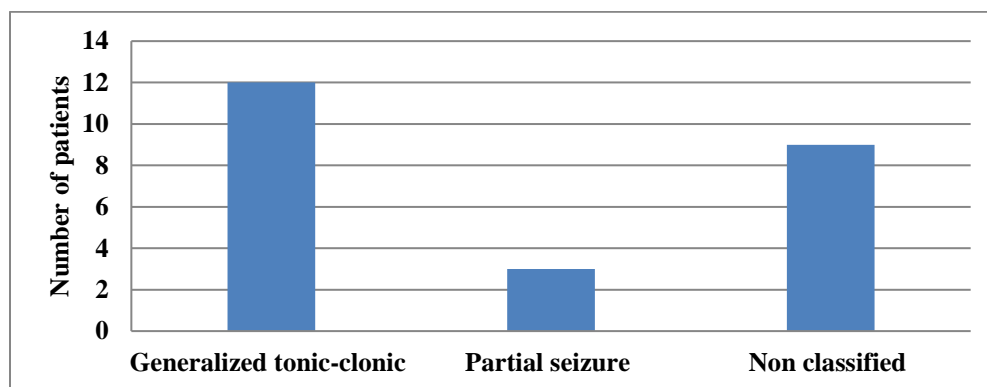


Figure 7 A bar chart showing the number of patients with different seizures types. The total number of patients with identified seizures is 24, 12 with generalized tonic-clonic seizures, 3 with partial seizures and 9 not classified seizures.

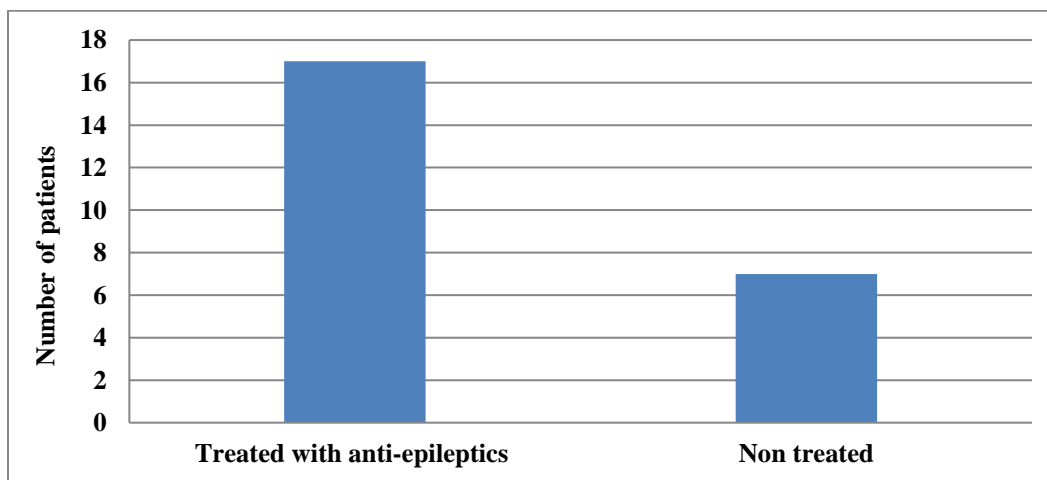


Figure 8 A bar chart showing the number of patients treated and non-treated with anti-epileptics. The total number of patients with identified seizures is 24, 17 treated with anti-epileptics, and 7 non-treated patients.

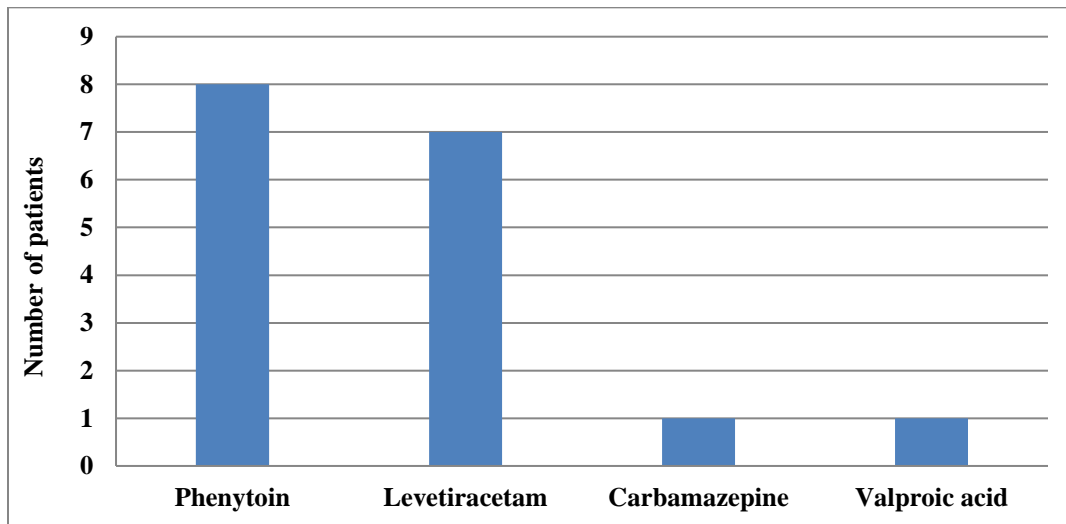


Figure 9 A bar chart showing the number of patients with different anti-epileptics utilized. Total number of patients with anti-epileptic treatment is 17, 8 treated with phenytoin, 7 treated with levetiracetam, 1 treated with carbamazepine, and 1 treated with valproic acid.

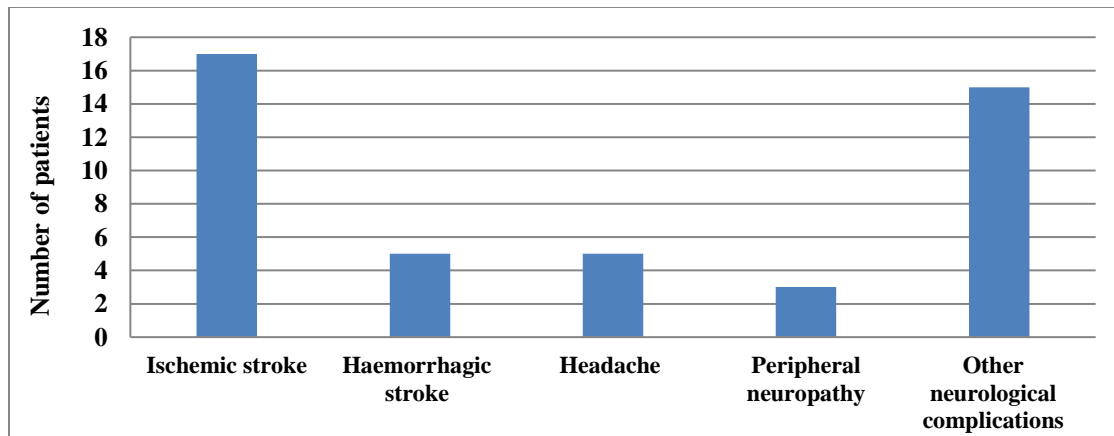


Figure 10 A bar chart showing the number of patients with different neurological complications associated with CKD seizures. The total number of CKD patients with neurological convulsion is 45, 17 with ischemic stroke, 5 with hemorrhagic stroke, 5 with headache, 3 with peripheral neuropathy and 15 with other neurological complications.

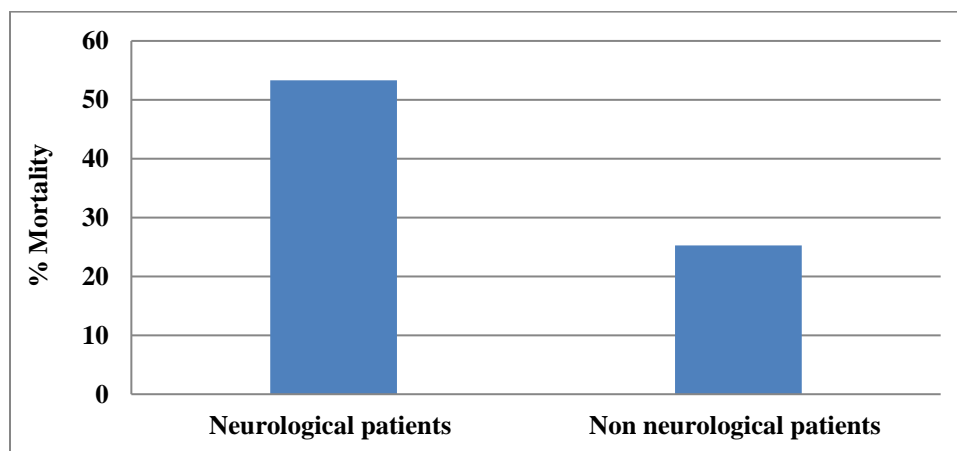


Figure 11 A bar chart showing the % mortality of CKD patients with neurological seizure and non-neurological CKD patients. Total number of patients with neurological convulsion are 45, 24 dead. Total number of patients without neurological convulsion are 372, 94 dead.

4. DISCUSSION

With the increasing population of elderly people and exacerbation of vascular diseases, chronic kidney disease (CKD) has turned to critical health trouble. CKD may predispose to various neurological complications such as myoclonus, asterixis, chorea, uremic encephalopathy, and eventually seizures. In addition, there may be persistent seizures in patients with a proven diagnosis of epilepsy associated with CKD (Hamed, 2019). In patients with CKD, previous studies showed an incidence of seizure of approximately 10% [Fisher *et al.*, 2005 and Scorza *et al.*, 2005]. In general, nearly one-third of patients with uremic encephalopathy experience acute seizures (Lacerda *et al.*, 2010 and Diaz *et al.*, 2012). The uremic seizures can vary, ranging from myoclonic, simple focal or non-motor seizures with diminished memory, seizures of absence, to generalized tonic-clonic seizures in final stages (Burn and Bates, 1998 and Diaz *et al.*, 2012).

Our study evaluated the prevalence of seizures in patients with CKD in King Abdul-Aziz university hospital from 2016 to 2017. Concomitant to the previous findings, the current study results revealed that 11% of the CKD population encountered neurological convulsion. Besides, it found that seizure was the commonest neurological complication in CKD patients with a prevalence of 53%, while the prevalence of status epilepticus was 11%. Ischemic stroke, hemorrhagic stroke, headache, peripheral neuropathy, and other neurological manifestations showed a prevalence of 38%, 11%, 11%, 7%, and 33%, respectively. Previous studies reported that stroke has an incidence of 17 % in CKD patients on chronic dialysis relative to 10 % in patients with non-dialysis and 4 % in the rest of the population (Burn and Bates, 1998 and Bugnicourt *et al.*, 2013).

There was a higher risk of seizure in haemodialysis patients and various causes such as electrolyte and metabolic disorders, hypertensive emergencies and systemic infections were involved (Glenn, 1992, Beaumont, 2005, Krzesiński and Cohen, 2007 and Shasha *et al.*, 2016). In the present study, the results found that electrolyte disturbance was the most common trigger of seizure, with the prevalence of 39% while ischemic and hemorrhagic stroke presented 26%, infection 16%, and the prior onset of seizure 16%. For patients with sodium disorders (particularly hyponatremia), hypocalcemia, and hypomagnesemia, seizures are more often encountered. Patients with CKD are potentially experienced hypervolemia, hyperkalemia, hyperphosphatemia, hypocalcemia, and bicarbonate deficiency. Sodium is typically preserved, but due to dilution from water retention, it may look normal or hyponatremia (Chambers, 1987). This may explain our results.

The results of this study showed that generalized tonic-clonic were more common (50%) in comparison to partial seizure (12%), which was expected result based on understanding the pathophysiology of seizure in systemic diseases. However, in about 20 % of all people with epilepsy, generalized tonic-clonic seizures are the primary type of seizure. In addition, these are also the universal type of seizures arising from metabolic disruption and are thus often present in many diverse clinical cases (Goldenberg, 2010). Far from our findings, Onodugo *et al.* (2013) reported that only 3.4% of chronic kidney disease patients who presented to the University of Nigeria had seizures (mostly generalized tonic-clonic). This can be understood on the basis that the study sample size is small.

5. CONCLUSION

Based on the results of this study, it might be concluded that the incidence of neurological convulsion among Saudi patients with CKD was nearly the same international rates. Besides, seizure is the common neurological complication of CKD. The most common trigger of seizure was the electrolyte imbalance. Mortality was higher in neurologically affected CKD cases.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

REFERENCE

1. Abdulkareem OA, Youssef MKF, Abdulla AA, Dujanah M, Fayez A, Ali A, Abdulrahman H, Bharati VM, Ajay KS. Epidemiology of chronic kidney disease in the Kingdom of Saudi Arabia (SEEK-Saudi investigators) - a pilot study. *Saudi J. Kidney Dis. Transpl* 2010; 21(6): 1066–1072.
2. Beaumont A. Seizures in renal and hepatic failure and endocrine disease. In *Seizures in Critical Care Humana Press*. 2005. (pp. 139-160).
3. Bergen, D. C., Ristanovic, R., Gorelick, P. B. and Kathpalia, S. Seizures and renal failures. *Int J Artif Organs* 1994; 17(5):247-51.
4. Bugnicourt JM, Godefroy O, Chillon JM, Choukroun G, and Massy ZA. Cognitive disorders and dementia in CKD: the neglected kidney-brain axis. *J Am Soc Nephrol* 2013; 24: 353–363.
5. Burn DJ, Bates D. Neurology and the kidney. *J Neurol Neurosurg Psychiatry*. 1998; 65(6):810 – 821.

6. Chambers JK. Fluid and electrolyte problems in renal and urologic disorders. *NursClin North Am* 1987; 22(4):815– 826.
7. Dalby NO, Mody I. The process of epileptogenesis: a pathophysiological approach. *CurrOpinNeurol*. 2001; 14(2): 187–192.
8. Diaz A, Deliz B, Benbadis SR. The use of newer antiepileptic drugs in patients with renal failure. *Expert Rev Neurother* 2012; 12(1):99 –105.
9. Fisher RS, Boas WE, Blume W, Elger C, Genton P, Lee P, Engel Jr. Epileptic seizures and epilepsy: definitions proposed by the International League Against Epilepsy (ILAE) and the International Bureau for Epilepsy (IBE). *Epilepsia* 2005; 46(4):470–472.
10. Glenn, C., Astley, S. J. and Watkins, S. L. Dialysis-associated seizures in children and adolescents. *Pediatr Nephrol*, 1992; 6(2):182-6.
11. Goldenberg MM. Overview of drugs used for epilepsy and seizures: etiology, diagnosis, and treatment. *P T* 2010; 35(7):392–415.
12. Hamed SA. Neurologic conditions and disorders of uremic syndrome of chronic kidney disease: presentations, causes, and treatment strategies. *Expert Rev Clin Pharmacol* 2019; 12(1):61–90.
13. Krzesiński JM, Cohen EP. Hypertension and the kidney. *ActaClinBelg*. 2007; 62(1):5–14.
14. Lacerda G, Krummel T, Hirsch E. Neurologic presentations of renal diseases. *Neurol Clin*. 2010; 28(1):45 –59.
15. Onodugo OD, Onwuekwe IO, Arodiwe EB, Ijoma CK, Ulasi II, Ubani-Ukoma CB. Seizure disorder among chronic kidney disease patients in Enugu, South East Nigeria. *Niger J Med* 2013; 22(4):351–353.
16. Renhua LU, Matthew CK, Anne M, Mitchell HR, Claudio R. Kidney-brain crosstalk in the acute and chronic setting. *Nat Rev Nephrol*. 2015; 11(12): 707–719.
17. Robert SR. Interrelationships between renal and neurologic diseases and therapies. *Neurology*. 2015.
18. Scorza FA, Albuquerque M.D, Arida RM, Cysneiros RM, Henriques TM, Scorza CA, Cruz J, Kesrouani S, Gomes RA, Cavalheiro EA. Seizure occurrence in patients with chronic renal insufficiency in regular hemodialysis program. *ArqNeuropsiquiatr* 2005; 63(3B):757–60.
19. Shasha L, Weihua Y, Yang L. The causes of new-onset epilepsy and seizures in the elderly. *Neuropsychiatr Dis Treat* 2016; 12: 1425–1434.
20. Tattevin P, Messiaen T, Pras V, Ronco P, Biour M. Confusion and general seizures following ciprofloxacin administration. *Nephrol Dial Transplant* 1998; 13(10): 2712–2713.
21. Tyler HR, Tyler KL. Neurologic complications. In: Eknayan G, Knochel JP, eds. *The Systemic Consequences of Renal Failure*. New York: Grune & Stratton; 1984.