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ORIGINAL ARTICLE

Incidence of Seizures in ESRD Patients on Hemodialysis

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ABSTRACT

Background: The kidneys filtration waste and excess water from your blood as urine. CKD when the GFR of the patient less than 15ml/min. ESKD is the final stage of CKD. HD is a common renal replacement therapy for ESRD patients. CKD may have many effects on nervous system and manifest as headache, seizure and DDS etc. Seizure is one of the complication of HD. Seizures are changes in the brain's electrical activity. The study was conducted to assess the occurrence of seizure in hemodialysis patient and to analyze the possible causes of seizure in renal failure patient during hemodialysis.

Methods and Materials: In this cross-sectional study, collected 202 samples for assessing the causes of seizures in patients on HD. In this study the selected ESRD patients with different types of seizures and causes which leads to HAS. To evaluate the occurrence of seizures in hemodialysis patients, individuals were thoroughly examined.

Results: Among total of 202 hemodialysis patients, 16 patients were found suffered with seizures. Out of 16 patients, 14 patients were agreed to participate in the current study. The finding of this study showed that there are many causes of HAS but some are the most shown in this study. This study revealed that hypoglycemia, hypocalcemia (hyperparathyroidism), uremic encephalopathy, hyponatremia and use of erythropoietin for the cure of anemia in the dialysis patients are the most common causes of seizures seen.

Conclusion: Some neurologic manifestations such as seizure, headache and developmental delay in patients with ESRD are seen. HAS is an important complication of HD. Moreover, treated properly in these cases for decrease of morbidity and mortality and there treatment should be told to medical professionals.

Keywords: Hemodialysis, ESRD, Incidence, Seizures

INTRODUCTION

End-stage renal disease is another name for end-stage kidney disease (ESRD). People with ESRD have kidneys that operate at less than 10% of their usual capacity, which means they are hardly or not functioning1. End-stage renal disease (ESRD) is a condition in which the kidneys' excretory and regulatory functions fail irreversibly. As ESRD advances, remaining renal function can no longer support normal bodily functioning, and survival without some sort of renal replacement treatment is impossible2.

Dialysis is a procedure that takes over your kidney functions if those organs fail to work properly. Dialysis is classified into two types: Hemodialysis involves passing the patient's blood through a filter outside the body, cleaning it, and then returning it to them. Peritoneal dialysis cleans your blood inside your body. A specific fluid is injected into the patient's belly to collect waste from the blood that flows through small capillaries in their abdomen. After that, the fluid is drained3.

Seizures are caused by alterations in the electrical activity of the brain. A seizure is caused by abnormal electrical activity in the brain4. These alterations can result in significant, visible symptoms or, in some situations, no symptoms at all. 5. One of the most significant consequences of HD treatment is hemodialysis-associated seizure (HAS). Hemodialysis-associated seizures [HAS] are a common seizure complication. Seizures are episodes of temporary alteration in the brain caused by hyperexcitation of neuronal activity. Seizures are classified as either triggered or unprovoked. Provoked seizures have a known cause, whereas unprovoked seizures have no known cause8. Seizures occur during or shortly after hemodialysis, as well as metabolic alterations linked with the process5. Seizures are characterised as chronic repeating paroxysmal abnormalities in neurological functioning induced by electrical activity anomalies in the brain9. Seizures are assumed to involve hyper excitable neurons, which is a crucial assumption in the aetiology of seizures and the creation of synchronised neuronal activity with an imbalance between inhibitory [glutamate-mediated] and excitatory [GABA-mediated] neurotransmission10. Hemodialysis-associated seizure (HAS)6 is a common side effect of the treatment. Seizures are estimated to occur in 10% of chronic renal failure patients. 11. Seizures are the most prevalent neurological problem affecting dialysis patients12.

The seizures in these series were frequently tonic-clonic in form; however, the mechanism of lowered seizure threshold in renal failure is unknown. Seizures are episodes of neurologic alteration induced by synchronised, hyperactive neuronal activity13. HAS affects 7% to 50% of children with ESRD, and their seizures are usually characterised as tonic-clonic14. Correction of chronic renal failure anaemia with recombinant human erythropoietin results in an increase in packed cell volume and blood viscosity, leading to increased vascular resistance and the development of hypertension. Increases in blood pressure have occurred in over half of the patients treated with erythropoietin so far, but the development of seizures in these patients is of greater concern15.

Symptoms of HAS emerge. A sudden feeling of terror or anxiety, a change in vision, abrupt movement of the arms and legs that may lead the patient to drop and lose consciousness, followed by disorientation or frothing at the mouth are examples of these. Biting your tongue, making strange noises such as grunting16, and having sudden, rapid eye movements The first symptom is usually mild cortical speech impairment, which is characterised by stammering, hesitancy of speech, and, in some cases, speech arrest. The speech impairment worsened during and immediately after dialysis. May had initially only been spotted during these times. There are usually mild mental and psychiatric changes associated with the speech disorder17,18.

Stroke, malignancies, alcohol, electrolyte imbalance (mostly metabolic alkalosis), head injuries, congenital factors, and neuroinfections are the most commonly documented etiological factors19. Very low blood sugar (hypoglycemia), repetitive sounds or flashing lights, severe azotemia, severe acid base disruption, hypocalcaemia, hypoxemia, and severe anaemia may also play a role, as may some drugs, medication withdrawal, narcotic use, and any brain infection20. Uremic encephalopathy, dialysis disequilibrium syndrome (DDS), intradialytic hemodynamic instability, aluminum-associated dialysis dementia, and air embolism21 are all conditions that can occur during dialysis. Hypotension and hypertension both cause hemodynamic instability.

Cerebrovascular disease, including hypertensive encephalopathy, myocardial infarction, haemorrhage, and subdural hematoma22.

From the start, generalised seizures affect your entire brain: 1. Tonic and clonic (grand mal). 2. Seizures due to absence (petit mal). 3. febrile convulsions four. infantile spasms There are two forms of partial (focal) seizures: 1. Seizure with focal onset awareness. 2. Seizures with focal onset decreased consciousness. Blood tests or a spinal tap to screen for an infection, Electroencephalography (EEG), in which a technician attaches electrodes to your brain to monitor the electrical activity inside it, and imaging tests such as an MRI, CT, or PET scan20 are some of the testing used to diagnose seizures. Diazepam is a non-dialyzable anticonvulsant medicine, and taking it 30 minutes before each hemodialysis session (0.3-0.5 mg/kg per dosage) may help prevent the recurrence of HAS23. This study aim to find the causes of seizures and the occurrence of seizures in end stage renal diseases.

MATERIALS AND METHODS

A cross-sectional study was conducted in which 202 individuals were analysed at Khyber Teaching Hospital in Peshawar. Twenty-four dialysis patients had some type of convulsive seizure, and 16 were invited to participate in the study since they had HAS in front of me, but only fourteen patients agreed to participate. HAS impacted twelve patients at home. Males and females were both asked to participate in the study on the causes of seizures. Dialysis patients had substantial systemic arterial hypertension and were using antihypertensive medicines. All participants in this study had their total calcium levels tested weekly and were administered aluminium hydroxide.

The dialytic solution comprises 0.89 gramme of NaCl/5L and a calcium content of 3.5 mEq/L. The blood sample was taken when a patient on dialysis, whether pre-dialysis, post-dialysis, or during dialysis, had a seizure or the symptoms of a seizure began, or when the patient recovered from a seizure.

The current study would be an analytical/cross-sectional study. The research was carried out at Khyber Teaching Hospital (KTH). The study lasted four months, from March to June 2020. A total of 202 dialysis patients' samples were obtained for this investigation. In this investigation, a non-probability convenient sampling strategy was applied. The sample size was determined using easy sampling.The sample selection criteria were to simply take the desired participants during the observation time fulfilled the research inclusion criteria.

All in Dialysis Dependent Patients the incidence of seizures in ESRD patients before, after, and during dialysis.

Our study includes patients of all ages. Those seizure patients who do not have renal disease and those seizure patients who do have kidney disease but are not on dialysis

This study used a prospective study design that included a non-probability, convenient sampling technique and 202 dialysis patients. The study was approved by the institutional ethical review commission, and written consent was obtained in English, although verbal consent was obtained from all subjects in Urdu and Pashto.The study protocol and data use were clearly disclosed to the patients in order to get fully informed consent. The information was gathered from the participants through interviews, and the information was entered into a preforma by the investigators' HR. The proforma included the patient's name, age, gender, time dependent on hemodialysis, dialysis duration, erythropoietin dose, and symptoms associated to the reasons.

All data collected was input and analysed using the statistical package for social sciences version 23.

RESULTS

In the current study a total of n=202 subjects were included. Out of the total 64 %(130 patients) were males. Only 36 %(about 72 patients) were females as shown in figure 1.

This study recorded the age of the subjects visited for hemodialysis patients at Khyber Teaching Hospital peshawar.The age of the study subjects were classified into five groups. Among the total subjects27 % (55 patients) were aged between 10-15 years. The subject's age in group 16-30 years were 28 % (57 patients).Besides, 22% (45 patients) of the subject's fall in 31-45 aged years and about 17 % (35 patients) having aged between 46-60 years, respectively.Only 5%(about 10 patients) of the population fall in more than 60 years of age as shown in figure 2.

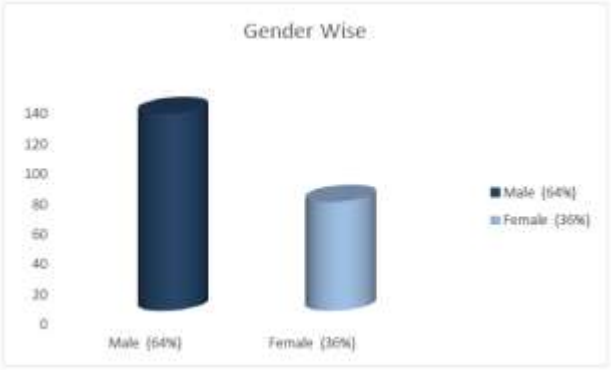

Figure 1: Gender-wise distribution of patients

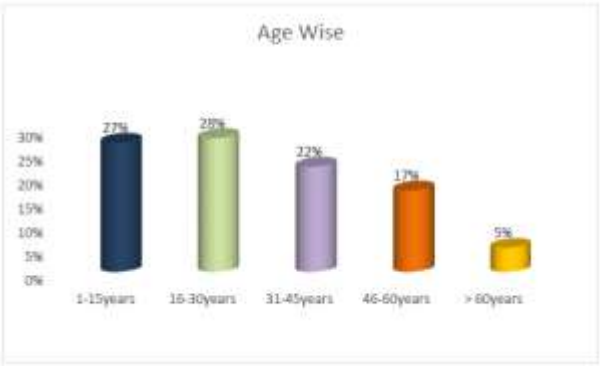

Figure 2: Age-wise distribution of patients

In this study angioaccess recorded the of the subjects for hemodialysis patients at Khyber Teaching Hospital peshawar. Out of the total 202 patients studied, 84% of the study subjects were dialyzed by ArterioVenous Fistula (AVF).Among the total subjects 16% were dialyzed by Double Lumen Catheter (DLC) as shown in figure 3.

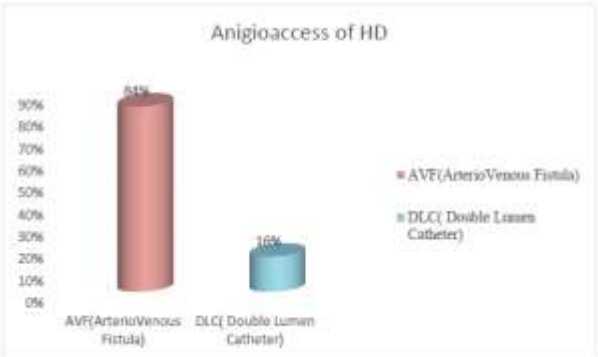

Figure 3: Angioaccess of Hemodialysis

In this study, the patients on hemodialysis, which I studied, were about 202. In this study the causes of renal failure in the patients under dialysis were diabetic nephropathy about 33% (67 patients), hypertensive nephropathy about 21% (43 patients), glomerular disease about 10% (20 patients), stone problems about 12% (25 patients), and other causes include about 23% (47 patients) , respectively as shown in the figure 4.

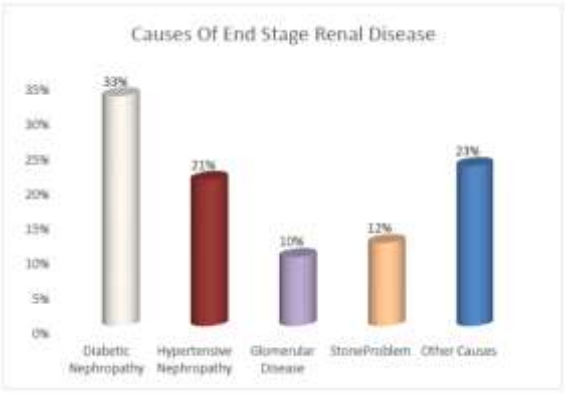

Figure 4: Causes of End Stage Renal Disease

In this study, the visited patients of End Stage Renal Disease under hemodialysis in which hemodialysis associated seizures were to be recorded are about 202 in number. In the all study, subjects I visited there were about 14 patients (7%) suffered from seizures during the dialysis in all the total number of patients of End Stage Renal Disease. Among the total subjects, 10 patients (about 5%) suffered from the seizures at home (post dialysis). The remaining 178 patients (about 88%) did not suffered from seizures as shown in the figure 5.

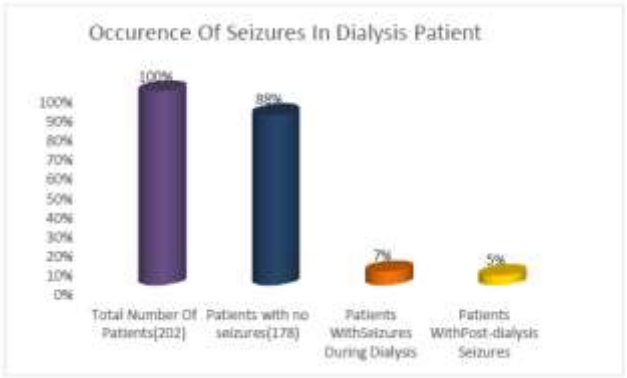

Figure 5: Occurrence of Seizures in Dialysis Patient

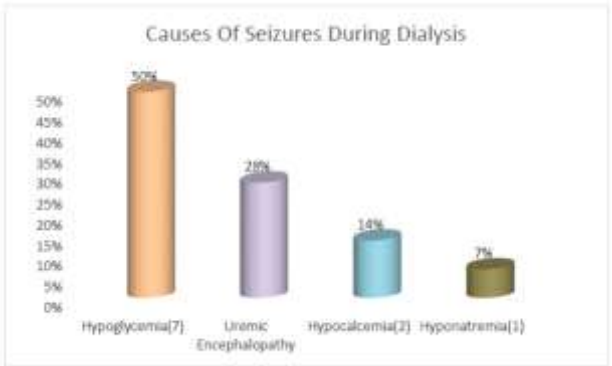

Figure 6: Causes of Seizures during Dialysis

In my study, the assessed patients of End Stage Renal Disease under hemodialysis were about 202 in number but not all suffered from seizures. In the all study, subjects I visited there were about 14 patients (7%) suffered from seizures during the dialysis in all the total number of patients of End Stage Renal Disease of which I assessed the leading causes of seizures in Khyber Teaching Hospital Peshawar. In these 14 patients different causes of hemodialysis associated seizures about 7 patients (50%), suffered cause of seizures was hypoglycemia, 4 patients (28%) suffered cause of seizures was uremic encephalopathy. In addition, 2 patients (15%) had hypocalcaemia as the noted cause of seizure. Among these, only 1 patient (7%) had hypernatremia as the cause of seizures as shown in the figure 6.

DISCUSSION

Hemodialysis is the most prevalent kind of renal replacement therapy for patients with end-stage renal failure. Furthermore, according to various studies on hemodialysis-associated seizures, seizures are one of the most common complication of hemodialysis in the first three months. Seizures are frequently related with renal failure, its consequences, and concomitant medications. Seizures are expected to occur in 10% of people with chronic renal insufficiency. Renal failure as a direct cause of seizures Although the particular metabolic reason is unknown, acute renal failure is a powerful epileptogenic state.

Seizures have long been assumed to be rather prevalent in patients suffering from systemic disorders24. According to our findings, only 7% of our patients had HAS. As a result, our findings contradict previous study, which discovered a 10% prevalence of seizures in people with chronic renal failure25.

It is uncertain what causes a decreased seizure threshold in renal insufficiency. Proconvulsive metabolites such as guanidinosuccinic acid, creatinine, and creatine, according to one idea, are found in human subjects26. Despite research showing that a past history of seizures increased the incidence of seizures in hemodialysis patients25. In the absence of a previous clinically confirmed stroke, it was long considered that severe hypertension can increased the risk of unprovoked seizures in the elderly27,28. HAS risk factors include young age, a history of seizures, malignant hypertension, microvascular illness, uremic encephalopathy, cardiomyopathy, and treatment with recombinant erythropoietin6,25. In this investigation, no link was found between HAS and age, underlying disease, past history of seizures, type of dialysate, or length of HD, but seizures can be caused indirectly. As these affect dialysis efficiency, they can lead to other issues such as uremic encephalopathy, hyperparathyroidism, and a variety of other disorders that can result in hemodialysis-associated seizures. Before seizures developed, patients with HAS had hypertension due to hypervolemia. Although there was no significant link due to the small number of patients tested, it is hypothesised that hypertension, in addition to osmotic and chemical alterations in extracellular fluid, may play a role in the aetiology of HAS.

Dialyzable anticonvulsants may raise HAS6 risk. This could be because these medicines were removed at a period when metabolic stress causes seizures. Schwartz observed an evident risk of HAS recurrence in patients receiving hemodialyzable antiepileptic treatment for past seizures25.

The staff should be aware of and educated on correct hemodialysis guidelines, such as the KDOQI recommendations for hemodialysis and complications during dialysis. The personnel should pay close attention to the patient, and the dialysis should be completed on time, as long-term practise can lead to major consequences such as uremic encephalopathy, which can lead to hemodialysis-associated seizures and other issues.It is advised that neurologic problems be evaluated and treated appropriately in these circumstances. It could be avoided if patients are appropriately examined, electrolyte imbalances, hormone imbalances, and blood pressure are addressed, as these are the major causes of hemodialysis-associated seizures.

According to the data, hypoglycemia, hyperparathyroidism, and the use of erythropoietin as a treatment for anaemia are the primary causes of all other causes. Hypoglycemia is controlled if the patient's sugar level is appropriately checked before dialysis begins and the patient is guided to skip the dose of insulin or any medicine used to lower the glucose level in the body. As for the other two causes, they can be avoided by performing effective dialysis on the patient and lowering the dose of erythropoietin through its method of administration, which can be demonstrated intravenously and subcutaneously, so it is recommended to use the subcutaneous method of administration, which may reduce the chances of seizures, respectively.

CONCLUSION

Seizures, headaches, and developmental delays are some of the neurologic signs reported in ESRD patients. HAS is a major HD complication. Hypertension and the use of dialyzable anticonvulsants may predict HAS recurrence. This can lead to a dangerous condition in which a dialysis patient may go into a coma or possibly die. As a result, it should be evaluated or every dialysis patient should be evaluated properly to avoid seizures and to manage these situations appropriately to reduce morbidity and death.

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