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Prevalence of Neurocysticercosis among Seizure patients: - Single Center Study

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Background and purpose: The incidence of Epilepsy is high all over Nepal. This study was conducted to analyze the relationship between the incidence of seizure and neurocysticercosis (NCC) among patients admitted to our hospital in Far Eastern Nepal. **Material and method:** A descriptive cross-sectional study was done among patients diagnosed as NCC with a seizure disorder in B & C Medical College Teaching, from September 2017 to August 2018. Neurocysticercosis was diagnosed based on Computer Tomography (CT), Magnetic Resonance Imaging (MRI), clinical features and laboratory investigations matching Del Brutto's absolute and major criteria. **Result:** 103 patients were admitted to the hospital with clinical features of seizure disorder. Neurocysticercosis was diagnosed in 29(28%) patients. Among them, 21(72.41%) were males and 8(27.59%) were females. Patients presented with Generalized tonic-clonic seizure (GTCS) were 18(62%) and 3(10.35%) patients had focal seizures. Focal Seizure with secondary generalization (FSSG) was seen in 5(17%), 2(7%) had status epilepticus and 1(3.45%) patient had presented with absence seizure. Most of the patients 18(62%) had a calcified stage of NCC with perilesional edema in neuroimaging. Phenytoin was the most commonly used intravenous antiepileptic drug (AED) followed by Levetiracetam and Sodium Valproate. Carbamazepine was the most common oral AED used. **Conclusion:** NCC is the most common finding among seizure patients admitted to our hospital. The incidence of NCC is high in Eastern Nepal. Poor hygiene, insanitation, low socioeconomic status and lack of awareness were the key factors in spreading NCC.

Key words: Cysticercosis, Eastern Nepal, Neurocysticercosis, Seizure.

Neurocysticercosis (NCC) is the most common type of parasitic disease that infects the central nervous system. It is the main cause of acquired epilepsy in developing countries. Neurocysticercosis can be acquired via a fecal-oral route from carriers of the adult tapeworm, Taenia Solium. This indicates the presence of T. Solium carriers in the immediate environment like households, neighborhoods or may also acquire by accidental ingestion of contaminated food. There are cases of auto-ingestion that have been reported where persons with taeniasis ingest the eggs of T. Solium into their intestine.[1]

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Material and Methods

A descriptive cross sectional study was done among patients diagnosed as NCC with seizure disorder, admitted to our hospital from September 2017 to August 2018. Neurocysticercosis among those patients was diagnosed based on Del Brutto's absolute and major criteria with Computer Tomography (CT), Magnetic Resonance Imaging (MRI), clinical features and laboratory investigations and matching criteria were included in the study. All other causes of seizures and findings that did not match with Del Brutto's absolute and major criteria were excluded. The variables used in the study were age, gender, geography, profession etc. The written consent was taken from the Hospital Director of B&C Hospital. The collected data were coded and entered in MS Excel 2010.The non-probability sampling technique was used. The analysis was done by using statistical software, SPSS (statistical package for social science) version 21. Percentage and proportion were calculated where ever applicable.

Results

Total of 103 seizure patients were evaluated for NCC with radiological investigations like CECT Head and MRI Brain. Among them, 29(28%) were found to have NCC. The demographic presentation was as given below. The patients suffering from NCC were mainly males and only 8 females were affected (figure1). Patients from hilly regions contributed 18(62%) and rests were from Terai area of east Nepal. This could be due to nearby location and geographic area of service provided by our study institution. Male seem to be consuming more undercooked and raw foods leading them more prone to get the disease, 21(72%).

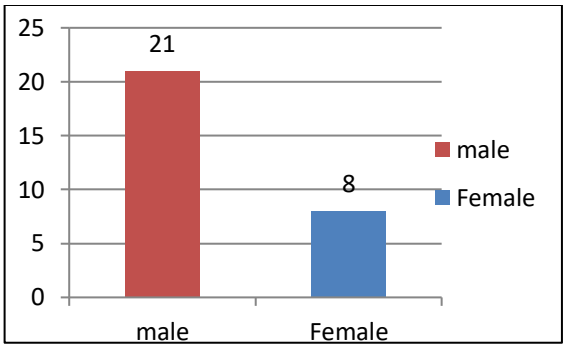


Figure 1: Gender distribution of patients with

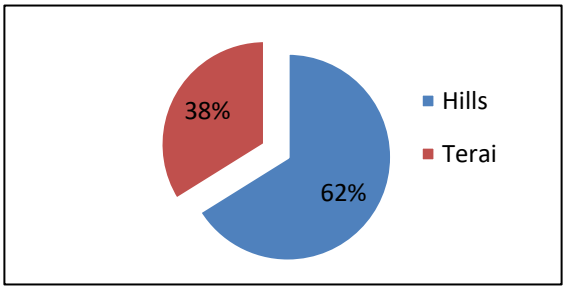


Figure 2: Geographical distribution of the disease

In the current study, large number of middle age group (21-40 years) had been affected by the disease, 13(45%) (Figure 3). Farmers were the highest in numbers presented with seizures and NCC, 55% (n=16) (Figure 4). This could be due to continual migration of middle age group people searching for work, thus acquiring illness from infected foods and water. Additionally, outdoor pooping habits, riotous husbandry, mostly pig farms, feeding night soils to pigs are the major problems of people residing in rural areas. Farmers living in such insanitary areas do lack proper awareness about the disease.

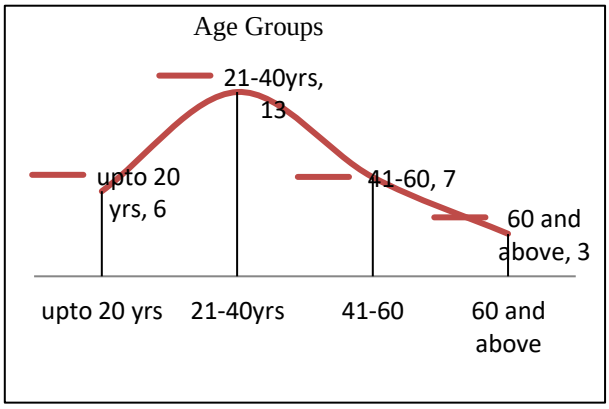


Figure 3: Age groups suffering from NCC

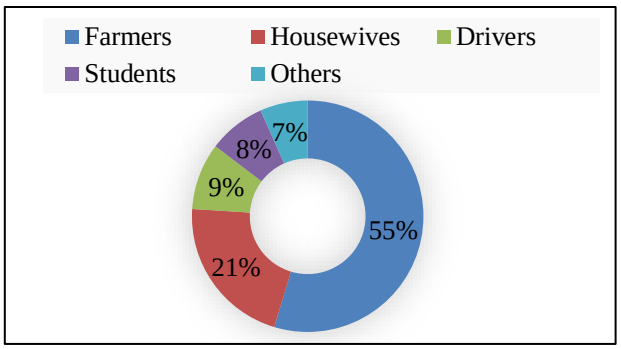


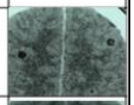
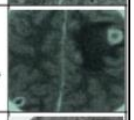
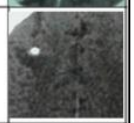
Figure 4: doughnut chart showing profession distribution of the patients

The patients with NCC of stage IIE+ that is dying cyst with enhancing lesion and perilesional edema had a higher incidence of seizure, 51.72% (n=15) than other stages as described in the chart (Table 1, Figure 6)1. In our study; seizure was not observed among the patient with a calcified stage without edema (IIIE-).

Table 1: Different Stages of NCC found in our study

Stages	Number(n)	Percentage (%)
I	4	13.79
IIE-	7	24.14
IIE+	15	51.72
IIIE-	0	0
IIIE+	3	10.35

Table 1. Radiological appearance of cysts and symptoms associated with the status of cyst

Stage	Status of cyst	Radiological appearance	Symptoms	Imaging
I	Living	Hypodense	Incidental	
II	Dying	Ring or disc enhancing lesion with edema (IIE+), Without edema (IIE-)	Seizure Focal ND Rarely ICP	
III	Dead	Hyperdense lesion No enhancement with edema (IIIE+), Without edema (IIIE-)	None or Seizure	

Abbreviation: Focal ND: Focal Neurological deficit. ICP: Intracranial Pressure

Figure 5: Radiological illustration of the NCC stages[1]

In our clinical study, Generalized Tonic-Clonic Seizure (GTCS) was the most common type of seizure 18(62%) and only one patient had an absence seizure (Figure 8). The most common oral AED used for seizure control was Carbamazepine, 31% (n=9) followed by Phenytoin and Sodium Valproate. Phenytoin was the most common intravenous AED used among admitted patients, 45% (n=13) (Figure 7, Figure 8).

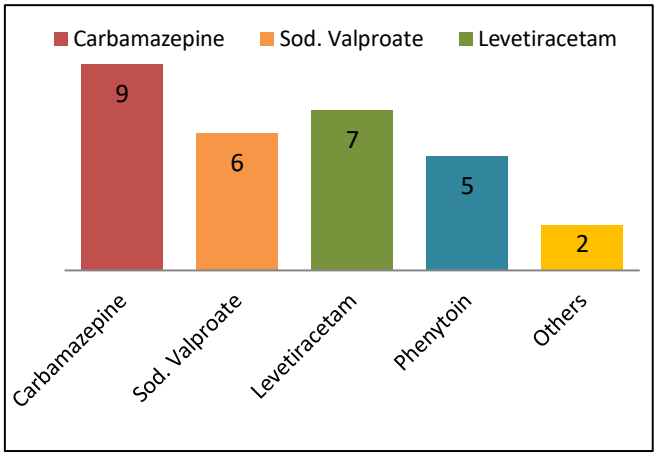


Figure 6: Oral AEDs used for controlling seizure

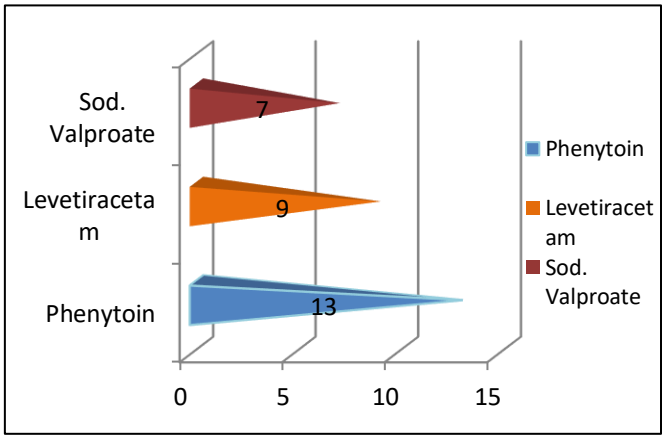


Figure 7 : Intravenous AEDs used for controlling seizure

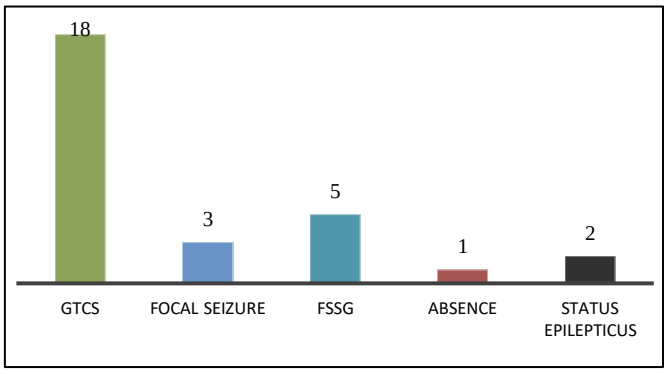


Figure 8: Different types of seizure among NCC patients

Discussion

Cysticercosis is an unhealthy food and poor hygiene borne disease; it has different incubation periods with multiple signs and symptoms. Neurocysticercosis (NCC) is an infection of the nervous system by the larvae of T. Solium (pork tapeworm). Although neurocysticercosis could be possible at any age, however adults are more vulnerable. The incidence of epilepsy in Nepal is increasing. 7.3 per 1,000 populations suffer from epilepsy annually, and almost 50% of the cases are due to neurocysticercosis.[2] Another study showed that the prevalence of Neurocysticercosis ranges from 0.002-0.1 % in the general population in Nepal.[3] It is the oldest and most common parasitic infection that leads to acquired epilepsy worldwide.[4] The diagnosis of NCC can be done through various techniques such as CT/MRI with or without a combination of laboratory investigations. The living scolex is seen as hyper-intense nodule (hole–with–dot) as well as puncture calcification, which are the characteristic features of neurocysticercosis. Intra-parenchymal calcifications are best seen in CT. MRI is useful to detect the extra-parenchymal cysts and helpful to analyze the severity of illness.[5] It has been reported that a T. solium cyst fluid-based lymphocyte transformation test (LTT) is a diagnostic laboratory test for NCC with sensitivity of 93.7% and specificity of 96.2%. The sensitivity was 87.5% even for a single cyst infection.[6] EITB (Enzyme-linked Immunoelectro Transfer Blot) was once considered as the most specific and sensitive test developed for the diagnosis of NCC by the Centers for Disease Control, Atlanta, USA with 100% specific and 98% sensitive. This test was considered a gold standard in serological diagnostic tests for NCC; however, Wilson and associates in 1991 found that EITB is only 28% sensitive when serum samples were collected from patients with single cysts. The serum EITB is more sensitive than that of CSF EITB.[5]

In our study, males were predominantly affected by NCC (72%). This finding is consistent with most of the other studies conducted nationally and internationally.[7, 8, 9] Among some national studies, higher incidence of NCC was found in male as compared to females (55% Vs. 45%).[8] However, there are few studies, which revealed female predominance (60% vs. 40%). [10,11,12,13]

In the current study, Generalized Tonic-Clonic Seizure (GTCS) was the most common form of seizure (62%). This finding is similar to other clinical researches found in PubMed and Google Scholar, where one had shown increased frequency of seizures between 2nd and 5th decade of life, and GTCS was the commonest among them.[1,14] The treatment of NCC should be individualized based on the pathogenesis of the disease in each patient. Factors used to tailor medical therapy should be based on the location of the NCC, presenting symptoms, viability of the cysts and the degree of host response.[15] The most common treatment strategy for neurocysticercosis is described in figure 9.[1]

Types and locations of NCC	Treatment
Parenchymal neurocysticercosis	
Viable cysts	Cysticidal treatment + steroids
Calcified	AED; No cysticidal therapy
Enhancing lesions	
Single	AED; Cysticidal drugs if persistent
Multiple	Anticonvulsant + cysticidal and steroids
Extraparenchymal neurocysticercosis	
Intraventricular cyst	Neuroendoscopic removal
Subarachnoid cyst	Cysticidal treatment + steroids
Spinal cysticercosis	Cysticidal treatment + steroid

Figure 9 : Types of treatment strategies used to treat NCC patients

In a double blind placebo controlled trial, 63 children with a single NCC administered with Albendazole (15mg/kg/day) for a 4 weeks period resulted in a marked reduction in the onset of seizures and faster disappearance of lesions (41% within a month as compared to 16.2% in placebo patients).[16] However, our patients did not receive any cysticidal treatment. The main purpose of the treatment was to control the seizure. The choice of AEDs, dose, and duration of administration was varied according to the clinical feature of the patients. In our group, seizure was best controlled by Carbamazepine as an oral AEDs followed by Levetiracetam (Figure 7), while Phenytoin was the most common intravenous AED among admitted patients (Figure 9). Anti-edema measures like Mannitol and steroids were used to lower intracranial pressure (ICP) in those cases with moderate to severe perilesional edema. NCCs located in ventricles causing acute hydrocephalus or parenchymal NCCs causing intractable seizure despite multiple AEDs administration should be treated surgically[1], however we had no such patient included in our study.

Conclusion

NCC is a leading cause of acquired epilepsy in developing countries like Nepal. NCC being preventable parasitic disease, multi-system approach is needed for the prevention and control of the disease. Adequate clinical management should be targeted to solve the seizure burden among NCC patients. Newly discovered vaccines to treat human and swine cysticercosis should be made available easily to farmers and low socio-economic population to minimize prevalence of the disease. Government and private sectors should collaborate to spread the awareness and help civilians to overcome their low socio-economic status.

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