International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Common Clinical Presentations of and the Prevalence of Epilepsy in Adult Patients with Neurocysticercosis

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Abstract: ***Cysticercosis is the most common parasitic disease of the nervous system in humans and the single most common cause of acquired epileptic seizures in the developing countries, where prevalence rates of active epilepsy are twice those in developed countries. In Cambodia, neurocysticercosis played an important role as parasitic disease of the nervous system and the common cause of seizure disorders.This study aimed to study of common clinical presentations of neurocysticercosis in hospitalized patients and to investigate the prevalence of epilepsy in patients with neurocysticercosis. This was retrospective cohort study that involved 56 adults subjects diagnosed with neurocysticercosis (NCC) presented at Department of Neurology, Khmer-Soviet Friendship Hospital, between 2015 to 2020. All data were stored and analyzed by using SPSS version 20 and data entry was carried out with coding and verification. The qualitative and quantitative data were expressed as the mean with standard deviation (SD), or median (IQR) and as the number of observation with percentage (%), respectively. Both dependent and independent variables used a nominal measurement scale. There were 56 subjects included in our study, 67.8% were male, and 32.2% were female. The prevalence of epilepsy was 57.1%; the median age 53 years (IQR 40-63 years. Headache and seizure were the common chief complains for neurocysticercosis patients, 66.1% and 57.1%, respectively, motor weakness 28.5% and impaired consciousness 17.8%. During the hospital stay headache was the major symptom among the subjects, 75.0%). The following symptoms were seizure (39.2%), motor deficit (26.7%), nausea/vomiting (14.2%), cognitive decline (12.5%), vertigo and fever were the less common symptoms. This concluded that the definitions of manifestations were very rarely provided, and varied from study to study, the proportion of NCC cases with seizures/epilepsy and the proportion of headaches were consistent across studies. NCC might still have a relevant presence in Cambodia and might play an important role as a cause of acquired epilepsy.***

Keywords: **neurocysticercosis, epilepsy, clinical manifestations, prevalence**

1. Introduction

Neurocysticercosis (NCC) is primarily found in countries with poor sanitation and hygiene and improper slaughterhouse services. However, due to globalization and immigration, NCC is increasingly being reported in developed countries [1]. Humans become infected by ingesting Taenia solium eggs that later develop into oncospheres. These larvae can migrate to any organ in the body, but most reports have focused on cysts located in the central nervous system (CNS), eyes, muscles or subcutaneous tissues. The larvae have been found in several locations in the CNS. This diversity of locations is believed to partly explain the range of NCC's clinical manifestations. In addition, the signs and symptoms associated with NCC depend on the larvae's number, developmental stage (active, transitional or calcified), on the duration of the infection and the host's immune response [2]. The infection is pleomorphic and dependent on a complex range of interconnecting factors, including number and size of the cysticerci, their stage of development and localization within the brain with resulting difficulties in accurate diagnosis and staging of the disease [3]. NCC induces neurological syndromes that vary from an asymptomatic infection to sudden death.

Seizures and epilepsy are considered to be the most common manifestations of NCC. However, several other neurological disorders can also occur [4]. Unfortunately, these less common manifestations are rarely recognized as being linked to NCC, especially in low resource countries where imaging technology is scarce [5]. Thus, data on the full range of clinical expression of NCC are lacking, although such data are essential to accurately estimate the burden of NCC on different communities. This study aimed to study of common clinical presentations of neurocysticercosis in hospitalized patients and to investigate the prevalence of epilepsy in patients with neurocysticercosis for those who were hospitalized at Department of Neurology, Khmer Soviet Friendship Hospital, Cambodia.

2. Material and Methods

2.1 Study Setting and Population

All individuals with neurocysticercosis who were hospitalized at the Department of Neurology, Khmer-Soviet Friendship Hospital were included in the study if they were over 18 years old, of any gender, and had full medical documentation along with either a head CT or MRI scan. Pregnant or breastfeeding women and those with incomplete medical records were not considered for the study.

2.3 Data Analysis

All data were stored and analyzed by using SPSS version 20 and data entry was carried out with coding and verification.

The qualitative and quantitative data were expressed as the mean with standard deviation (SD), or median (IQR) and as the number of observation with percentage (%), respectively. Both dependent and independent variables used a nominal measurement scale.

2.4 Ethical Consideration

This study was conducted with approval from the committee of Khmer Soviet Friendship Hospital. To avoid having patients' privacy disclosure and to secure patient's confidentiality, there was no any identification of the patients on our case record form (CRF) and database. All records were kept as anonymous. CRF was written in English, the obtained data dealt confidentially and entered and kept in a safe place.

3. Results

3.1 Demographic Background

There were 56 subjects enrolled in the study, 38 (67.8%) were males and 18 (32.2%) were females. The median age for the study population was 53 years (IQR 40-63 years). Most subjects were married (60.7%). For the occupation, there were 46.4% were farmer following by police, elderly, housewife, and employee. Table 1.

Table 1: Demographic data of patients with neurocysticercosis

Characteristics	Total Subjects (n=56)	Frequency (%)	p-value
Gender			0.18
Male	38	67.8	
Female	18	32.2	
Age (years)	53 (40-63) †	N/A	0.45
Marital Status			0.21
Single	20	35.7	
Married	34	60.7	
Divorced	2	3.6	
Occupation			0.27
Farmer	26	46.4	
Police	11	19.6	
Elderly	8	14.2	
Housewife	7	12.5	
Employee	4	7.3	

†Median (IQR)

3.2 Clinical Signs and Symptoms on Admission

The clinical presentations as a chief complain were presented in Table 2. Headache and seizure were the common chief complains for neurocysticercosis patients, 66.1%% and 51.7%%, respectively. There was a significant different in seizure symptom, p = 0.01. Followed by hemibody weakness (28.5%), and impaired consciousness (17.8%). During the hospital stay headache was the major symptom among the subjects, 42 (75.0%). The following symptoms were seizure (39.2%), motor deficit (26.7%), cognitive decline (12.5%), fever, vertigo and nausea and vomiting were the less common symptoms. Table 3.

Table 2: Clinical presentations of neurocysticercosis at admission

Chief Complain	Total subject (n=56)	p-value
Headache	37 (66.1)	0.42
Seizure	32 (57.1)	0.01*
Hemibody weakness	16 (28.5)	0.32
Impaired consciousness	10 (17.8)	0.25

*Statistical significance p<0.05.

Table 3: Clinical symptoms during hospitalization

Symptoms	Total subject (n=56)	p-value
Headache	42 (75.0)	0.32
Seizure	22 (39.2)	**<0.001***
Motor deficit	15 (26.7)	0.27
Nausea/Vomiting	8 (14.2)	0.72
Cognitive decline	7 (12.5)	0.47
Vertigo	5 (8.9)	0.33
Fever	4 (7.1)	0.53

*Statistical significance p<0.05.

3.3 Imaging Study

All the subjects were done with head CT scanner. The most majority of the subjects 26 (46.5%) had viable parenchymal stage followed by nonviable calcified lesion 30 (53.5%). Table 4.

Table 4: Staging of lesion by head CT

Stage of Lesion*	Total subject (n=56)
Viable parenchymal	26 (46.5)
Non viable calcified	30 (53.5)

**Staging by CT scan*

3.4 Treatment and Outcomes

The treatment and outcomes were presented in Table 5. There were 26 (46.5%) subjects prescribed with anthelminthic and 21 (37.5%) were used steroid drug. There were no significant differences between these two medications. The antiepileptic was also prescribed in 30 subjects (53.5%) out of 56 with a significant difference for seizure in neurocysticercosis. The median of duration of stay in hospital was 6 days (IQR: 5-8 days). There was no association in hospital stay. There were 29 patients presented with seizures and were classified in Table 6. Generalized tonic clonic (GTC) seizure was common among subjects (22, 68.7%) and 9 (28.1%) subjects were focal seizure, and 1 (3.2%) was absence seizure.

Table 5: Treatment and outcomes

Variable	Total WBC (n=56) N%	p-value
Anthelminthic	26 (46.5)	0.72
Steroids	21 (37.5)	0.55
Antiepileptic Drugs	30 (53.5)	**0.001***
Hospital Stay	6 (5-8) †	0.76

†Median (IQR: Interquartile range),*Statistical significance p < 0.05

Table 6: Type of seizure in patients with neurocysticercosis

Parameter	Total subject, (n=32) N%
Type of Seizure	
Generalized tonic clonic seizure	22 (68.7)
Focal seizure	9 (28.1)
Absence seizure	1 (3.2)

4. Discussion

Neurocysticercosis is a diverse disease with clinical features influenced by the location, size, and stage of the cyst, as well as the intensity of the inflammatory response triggered by the interaction between the host and the parasite. In our research, the common complaints among NCC patients were headaches (66.1%) and seizures (57.1%), followed by motor weakness (28.5%) and impaired consciousness (17.8%). Upon admission, headaches were the primary symptom (75.0%), followed by seizures (39.2%), with other symptoms such as cognitive decline, motor deficits, nausea/vomiting, vertigo, and fever reported at varying frequencies. A majority of symptomatic NCC patients, over three-quarters, presented with seizures or epilepsy at neurological clinics. Despite inconsistencies in defining these conditions, studies of specific quality have shown consistent estimates of NCC cases with seizures and epilepsy, ranging from 70% to 90% [6,7].

Our data also showed an important contribution of NCC to epilepsy cases. There were 46.5% individuals had viable brain cysts and 53.5% with non-viable calcification. There are 61% of patients with seizures had viable parenchyma and 39% with calcified lesions. Assessing the distribution of manifestations among people with active and inactive lesions can inform us somewhat about the natural history of NCC. Seizures and epilepsy were more frequent among patients with calcified lesions. The higher proportion of seizures/epilepsy in those with inactive lesions may also reflect that NCC and epilepsy may be co-occurring conditions rather than be causally linked. The effect of NCC on altered mental state and psychiatric symptoms remains poorly described. However, in our study there was no case with altered mental status and psychiatric symptoms [8]. In the studies of Pradhan 2003 and Varma 2002 [1,4], there were the presenting manifestations in about 5% of cases of NCC, where 52% were found to have depression at presentation.

The choice of using CT scans instead of MRI may have led to misclassification by potentially overlooking small cysts, ventricular cysts, or those close to the skull, diminishing the accuracy of the study. Despite a consistent link between antibody serology and seizure disorders, many individuals who test positive for antibodies in field conditions do not exhibit neurological symptoms. Additionally, a considerable number of symptomatic NCC patients already have calcified lesions, causing their antibody serology results to turn negative. This suggests that serology in general population studies may offer a rough estimate of transmission magnitude rather than precise clinical case detection. Praziquantel and albendazole are antiparasitic agents that are effective against T. solium cysticerci killing between 60% and 85% of parenchymal brain cysticerci [9]. The antiepileptic was also prescribed in 30 subjects (53.5%) out of 56 with a significant different for seizure in neurocysticercosis. Generalized tonic clonic (GTC) seizure was common among subjects 68.7% and 28.1% subjects were focal seizure, and 3.2% was absence seizure.

5. Conclusion

In conclusion, our study found most common clinical presentations of NCC as the chief complains for the patients were headache and seizure, respectively, and followed by motor weakness and impaired consciousness. During admission the clinical presentations were headache as the main symptom, followed by seizures. The other presenting symptoms such as cognitive decline, motor deficit, fever, nausea/vomiting, and vertigo. NCC might still have a relevant presence in Cambodia and might play an important role as a cause of acquired epilepsy as we found the prevalence of 57.1%. Although, the real burden of NCC is still unknown. Traditional NCC and epileptic endemic zones were recognized as high-risk zones even though more recent clusters of both diseases seem to have appeared

6. Limitation of the Study

This is a retrospective study, the missing data for some variables often occur, which might be affected the ability of analysis. Our study was single-center and limited sample size therefore we suggest that a multi-center should be conducted for the next study to minimize the limitations and confirm with the results of our study.

Conflict of Interest Statement

All authors disclose no conflict of interest related to this submission.

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