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Letter

CT diagnosis for neurocysticercosis and epilepsy in Eswatini

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Abstract: Among many causes of epilepsy, neurocysticercosis is a preventable cause of central nervous system (CNS) infection, which seems to be a high incidence in Eswatini. This study is to analyze the CT findings of two cohorts of patients who were clinically diagnosed with neurocysticercosis, and patients with epilepsy to evaluate the diseases that cause seizures in Eswatini, especially neurocysticercosis. The clinical and CT findings were analyzed in two groups of patients, who were clinically evaluated in the Mbabane Government Hospital in Eswatini, for (1) the 58 patients with a clinical diagnosis of neurocysticercosis with or without a seizure (group 1), and for (2) the 125 patients with epilepsy, related to different causes except for neurocysticercosis (group 2). The CT findings of neurocysticercosis were classified into three CT types; Type 1-Vesicular type, Type 2-Target type, and Type 3-Calcified nodular type. Among the 58 patients with neurocysticercosis, Type 1, vesicular type, were 9 patients (15.5%), Type 2, target type, were 25 patients (43.1%), and Type 3, calcified nodular type, were 24 patients (41.4%). In addition to the findings of neurocysticercosis, associated CT findings, such as halo or surrounding parenchymal edema, were found in 18 patients (31.0%). Among the 3 different subgroups by age, the adult group (21-60 years old) was the highest number, with 46 patients (79.3%). The CT findings of 77 patients with positive findings in the 125 patients with seizures of various causes, except for neurocysticercosis, were Ischemic brain infarct (18), diffuse brain atrophy with lateral ventricle enlargement (17), brain focal atrophy or hemiatrophy (10), encephalomalacia and leukomalacia (8) in the order of frequency. These various causes of epilepsy had different frequencies in different age groups. For the analysis of the cause of epilepsy or seizure in Eswatini, we combine the two patient cohorts (1) with neurocysticercosis and (2) with other causes by adjusting the patient selection periods of the two groups. In the subgroup of adults between 21-60 years, the adjusted number of patients with neurocysticercosis was 32, and the proportion of neurocysticercosis in all causes of epilepsy in adults was 32/85 (37.6%) in Eswatini. CT findings of neurocysticercosis were analyzed in patients with central nervous symptoms in Eswatini. And the CT findings were compared with those in patients with various causes of epilepsy or seizure. The high frequency of the CT findings of neurocysticercosis in the patients of epilepsy in this study suggests that neurocysticercosis is one of the frequent causes in patients with seizures or epilepsy, especially in adults, in Eswatini.

Keywords: computed tomography; epilepsy, neurocysticercosis; brain disease, Tenia solium, parasitic disease

Among brain diseases, neurocysticercosis is an important disease that causes epilepsy. In particular, the incidence is high in economically difficult developing countries, increasing the familial, social, and national burden caused by the disease (1). There are not many studies on diseases that cause epilepsy in Sub-Saharan African countries, but according to a study (2), epilepsy is socially and culturally a stigma, thought to be contagious or controlled by evil spirits, and difficult to diagnose and treat in Sub-Saharan Africa.

Among the various causes of epilepsy in underdeveloped or developing countries such as Sub-Saharan Africa, there are many factors such as home births with poor delivery care, high frequency of infectious diseases, and inadequate medical facilities such as blood pressure control (2). Eswatini's situation is not different from that of other Sub-Saharan African countries, and it is known that the frequency of epileptic seizures is continuously increasing (3). Recently Eswatini, the CT diagnosis at Mbabane government hospital contributes

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to the accuracy and efficiency of diagnosis for the identification of the cause of seizures, and among them, it is particularly contributing to the diagnosis of neurocysticercosis.

In this study, CT diagnosis of epilepsy patients in Eswatini was studied by analyzing and identifying the CT findings of patients who visited the Mbabane Government Hospital, who had CT scans due to seizures, and especially those who were clinically diagnosed with neurocysticercosis. The purpose of this study is to evaluate the diseases that cause seizures in Eswatini, including neurocysticercosis, by analyzing the CT findings of those diseases.

In the Department of Radiology at Mbabane Government Hospital in Eswatini, brain CT scans were performed on patients with central nervous symptoms such as seizures referred from the clinical departments.

The period of the enrollment of brain CT imaging in patients with neurocysticercosis was from December 2019 to the end of August 2022 (33 months). The period of the enrollment of the brain CT in patients with seizures or epilepsy, due to various causes except for neurocysticercosis was from June 2020 to the end of August 2022 (26 months).

The study subjects were two patient cohorts. The inclusion criteria for the first group with a clinical diagnosis of neurocysticercosis were: 1) patients who had a brain CT scan for central nervous symptoms such as seizures, 2) clinical diagnosis of neurocysticercosis, and 3) CT findings corresponding to neurocysticercosis. The first cohort of 58 patients who met all three conditions was enrolled.

For the clinical findings, the sex, age, and symptoms of the patient were analyzed, and brain CT findings were analyzed. The brain CT findings were classified according to the three different types of neurocysticercosis. The number, and location of lesions, and the associated findings were analyzed.

For the second group of patients who were referred for brain CT due to seizures, the inclusion criteria were 1) patients whose complaint was a seizure or epilepsy, 2) patients who were referred to the radiology department for brain CT, and 3) disease other than neurocysticercosis. The second cohort of 125 patients was enrolled.

For the analysis of the second cohort, clinical findings such as the patient's sex, age, and symptoms were analyzed. CT findings were analyzed and categorized patients according to similar CT findings and divide into several representative disease groups.

Cohort 1: Brain CT findings of neurocysticercosis.

1. Sex and age: Among 58 patients, the sex was 30 males and 28 females, and there was no significant difference in the sex ratio. The number of patients according to the different age groups by 10 years was 4 patients under 10 years old, and 2 patients, of 11-20 years old. So, 6 patients were in the young age group. Then, six patients were 21-30 years old, 14 patients were 31-40 years old, 15 patients were 41-50 years old, and 11 patients were 51-60 years old. So, 46 patients were in the adult group. There were six patients in the old group, aged 61-70 years.

2. Chief complaints: In the 58 patients with brain CT findings of neurocysticercosis, the chief complaint was seizures in 50 patients, and the chief complaint was central nervous symptoms other than seizures in 8 patients. Among them, confusion was 1 case, left arm weakness in 2 cases, numbness in 1 case, chronic headache in 2 cases, slurred speech in 2 cases, and face paralysis in 1 case.

3. CT findings: The CT findings are as follows.

1) CT type of neurocysticercosis lesion

(1) Type 1-Vesicular type: Cyst with central dot without calcification, 5mm or larger size, or without a central dot [Fig. 1].

(2) Type 2-Target type: variable-sized cyst with a central calcified dot [Figs. 2, 3, 4, and 5]

(3) Type 3-Calcified type: Small calcified nodule without a cyst [Figs. 4 and 6]

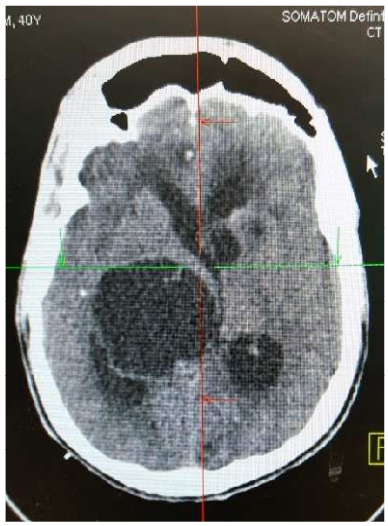

Fig. 1. Neurocysticercosis type 1. Vesicular type. Patient M/40, with seizure. Multiple neurocysticercosis lesions of type 1, vesicular type, with lesions of target type in the brain. Pre-contrast CT of the brain reveals a large vesicle in the right lateral ventricle, in which scolex is not evidently found.

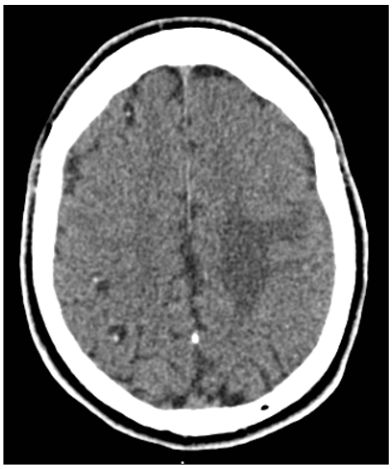

Fig. 2. Neurocysticercosis type 2, target type, with surrounding edema. Patient M/49, with seizure. Multiple cysts with type 2, target type, with calcified dots due to scolex calcification. There are some non-calcified central dots with surrounding edema of white matter. This finding suggests an active stage, such as the colloidal vesicular stage or granular nodular stage of neurocysticercosis in pathophysiological stages.

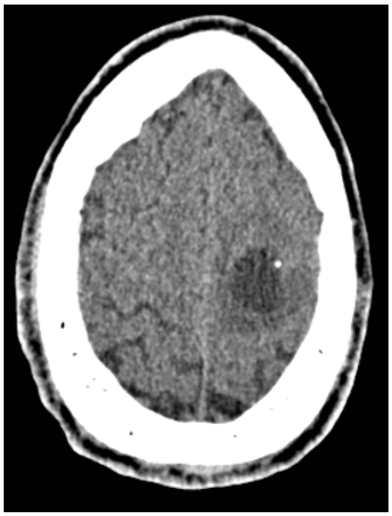

Fig. 3. Neurocysticercosis type 2, target type, with halo sign. Patient, M/38, admitted to a psychiatric hospital due to abnormal behavior with seizures. Multiple neurocysticercosis lesions of type 2, target type. Eccentric calcified scolex with halo sign in a pre-contrast CT.

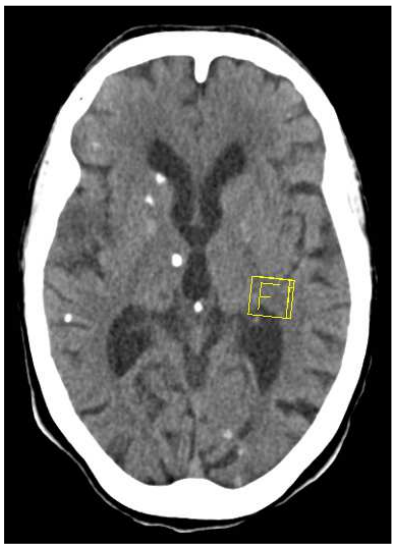

Fig. 4. Neurocysticercosis type 2 and type 3. Patient, F/68, with slurred speech. Non-contrast brain CT shows multiple calcified nodules and non-calcified nodules. A type 2, target type, lesion is noted in the right temporal lobe with surrounding edema. Multiple partially calcified nodules are noted in the right frontal lobe and left occipital lobe. Differentiation with ischemic infarct of the right temporal lobe is difficult in CT.

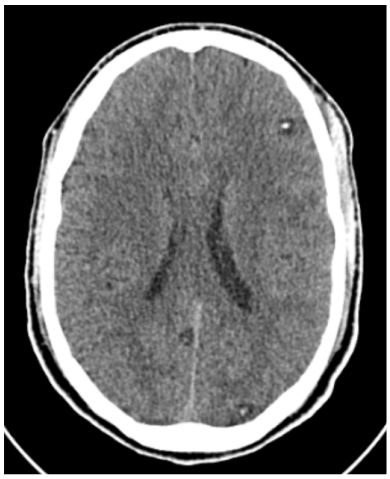

Fig. 5. Neurocysticercosis type 2, target type. Patient M/26, with new onset seizure. Non-contrast CT of the brain shows multiple type 2, target type, lesions in both cerebral hemispheres. A suspicious non-calcified granular nodule is noted in the subcortical area of the right parietal lobe. However, it is difficult to identify the nodule in the brain parenchyma.

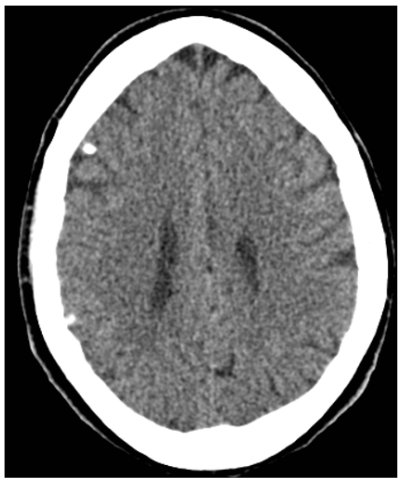

Fig. 6. Neurocysticercosis, type 3. Patient, F/44, with status epilepticus. Pre-contrast CT of the brain reveals two calcified nodules at the cortices of the right frontal and parietal lobes. Multiple calcified nodules in both hemispheres, mostly at the sulci of the cortex.

When divided into the above three types, 9 cases (15.5%) were Type 1, and 3 of them were accompanied by other types: Type 2, 1 case, Type 3, 1 case, and both types 2 and 3 were 1 case.

Type 2 findings were the most common in 25 cases (43.1%). Among them, 20 cases were accompanied by Type 3.

There were 24 cases (41.3%) with only Type 3 findings.

2) Number and location of the lesions

The number of lesions was 10 cases with single lesions, 8 cases with two lesions, and 38 cases with multiple lesions.

The location of the lesion included the left ventricle in 3 cases. Among them, 1 case had cerebrum and cerebellum lesions, and 2 cases had cerebrum lesions. The location of the lesion was cistern or Sylvian fissure in 5 cases, and among them, cistern in 1 case, Sylvian fissure in 2 cases, and cistern and cerebrum in 2 cases.

The most common location of the lesion was the cerebral or cerebellar parenchyma (50 cases). Among them, the lesions were in the parenchyma of the cerebrum in 44 cases, in both the cerebrum and cerebellum in 5 cases and only in the cerebellum in 1 case.

3) Associated findings

In addition to the CT findings of neurocysticercosis itself, associated secondary findings were edema around neurocysticercosis in 15 cases (Fig. 2, Fig. 4), which were all seen in Type 1 and Type 2 lesions. As another finding, there were 4 cases of ring enhancement of the halo around the lesion in the pre-contrast (Fig. 3) or post-contrast images, and among them, edema was present in 3 cases, and all cases were Type 1 and 2 lesions. Another finding was unilateral hydrocephalus in 2 cases.

The CT findings of neurocysticercosis including types and additional findings according to the different age groups are summarized in Table 1.

Table 1. The CT findings of 58 patients with neurocysticercosis including types and additional findings.

Total patients N=58	Type 1. Vesicular N=9 (15.5%)	Type 2. Target N=25 (43.1%)	Type 3. Calcified N=24 (41.4%)
Young. N=6 (10.3%)	4	2	-
	Edema (1)	Edema+halo (1)	
Adult. N=46 (79.3%)	4	21	21
	Edema+halo (1)	Edema+ring E. (1) Edema (11) Unilateral hydro (1)	Asymmetric lateral ventricle (1)
Old. N=6 (10.3%)	1	2	3
	Ring E. (1)	-	-

Cohort 2: Brain CT findings in patients with non-neurocysticercosis seizures.

1. Sex and age: Of the total 125 patients, 52 were male and 73 were female. By age, 6 were under 1 year old; 36 were 1-10 years old; 17 were 11-20 years old; with subtotal 59 patients in the young age subgroup below 20 years. 19 patients were 21-30 years old; 14 people were 31-40 years old; 13 people were 41-50 years old; 7 people were 51-60 years old, with subtotal 53 patients in the adult age subgroup between 21-60 years old. Six were 61-70 years old; seven were over 71 years old, with a subtotal 13 in the old age subgroup.

2. Main symptoms:

In the analysis of 125 patients, epilepsy was the chief complaint in 33 patients and a seizure was the chief complaint in 92 patients. There is a possibility that patients with recurrent seizures may be included in this subgroup of patients with complaints of a seizure because the past history could not be accurately known among the patients whose complaint was a seizure. Among these seizure patients were those described as a dystonic movement, focal seizure, generalized seizure, petit mal seizure, and infantile spasm.

3. Associated condition:

Secondary findings other than seizures recorded on the medical recording were retroviral disease in 6 patients, trauma in 3 patients, past brain surgery in 2 patients, end-stage renal disease in 5 patients undergoing hemodialysis, and post-partum in 2 patients.

4. CT findings:

Of the total 125 brain CT findings, 77 patients showed positive epilepsy or seizure-related findings, and 48 (38.4%) were negative, without abnormal CT findings. Among the 77 patients who had positive findings, the types of abnormal findings were as follows in order of frequency.

1) Ischemic brain infarct: 18
2) Diffuse brain atrophy with lateral ventricle enlargement: 17
3) Brain focal atrophy or hemiatrophy: 10
4) Encephalomalacia and leukomalacia: 8
5) Lateral ventricle asymmetry: 8
6) Congenital anomaly: 3
7) Hydrocephalus: 3 (obstructive type: 1, communicating type: 2)
8) Brain tumor: 2 [Fig. 7]
9) Brain abscess: 2
10) Tuberous sclerosis: 2 [Fig. 8]
11) Others: Venous aneurysm: 1, Hemorrhagic stroke: 1, Lissencephaly: 1, Leukoriasis: 1

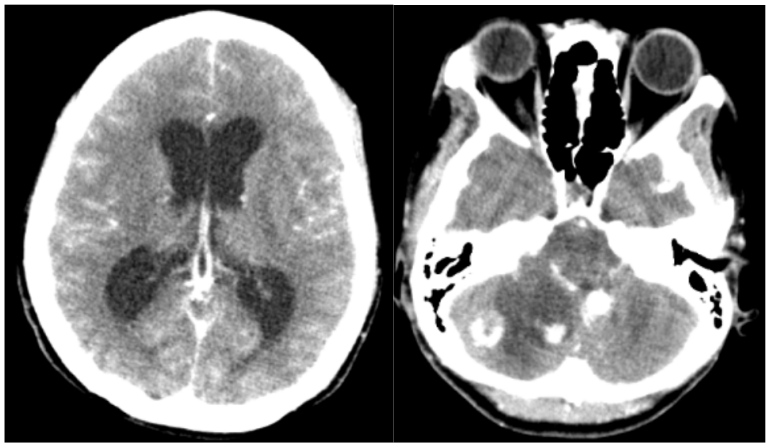

Fig. 7. Brain tumor of cerebellum. Patient, F/27, with convulsion and loss of consciousness. Post-contrast CT of the brain shows obstructive hydrocephalus of ventricles due to posterior fossa tumor (left), and multiple cystic tumors with enhancing nodules in the cerebellum, hemangioblastomas most likely (right).

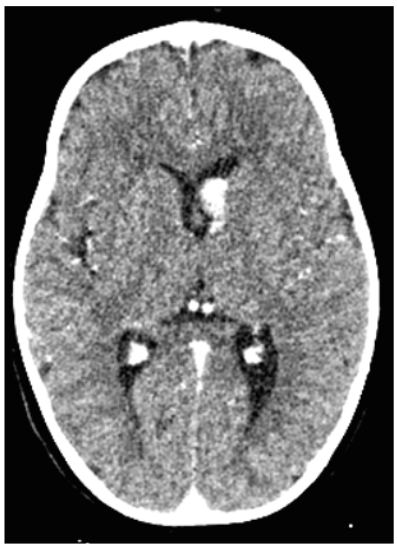

Fig. 8. Tuberous sclerosis. Patient, F/1, with infantile spasm and clinical diagnosis of the neurocutaneous syndrome. Post-contrast CT of the brain revealed three subependymal nodules, calcified and enhancing tubers, at both lateral ventricles. One subependymal tuber is seen at the left frontal horn.

5. Clinical and CT findings of Seizure patients according to the age subgroups.

5-1. Symptoms according to the different age groups

The chief complaint was epilepsy in 15 patients (25%), and seizure (75%) in the 59 patients of the young age subgroup. In the 53 patients of the adult age subgroup, it was epilepsy in 15 patients (28%), and seizure in 38 patients (72%). In the 13 patients of the old age subgroup, it was epilepsy in 3 patients (23%), and seizure in 10 patients (77%).

5-2. Associated conditions according to the different age groups.

As a secondary finding other than seizure or epilepsy, 6 patients were with retroviral disease. Among them, 5 were in the adult age subgroup, and 1 was in the young age subgroup. All three trauma were in the young age subgroup. In addition, 2 patients with a previous history of brain surgery, 5 patients with end-stage renal disease, and 2 patients from post-partum were all in the adult age subgroup.

5-3. CT findings according to the different age groups.

1) Among the 18 patients with ischemic brain infarct, the adult age subgroup was 11 patients (20.7%) of 53 patients, and the old age subgroup was 5 patients (38%) of 13 patients.

2) Among the 17 patients with brain atrophy with lateral ventricle enlargement, there are 7 of 59 young patients (11.8%), 4 of 53 adults (7.5%), and 6 of 13 old patients (46.2%).

3) Among the 10 patients with brain focal atrophy or hemiatrophy, there are 6 of 59 young patients (3.5%), and 4 of 53 adult patients (7.5%).

4) Among the 8 patients with encephalomalacia and leukomalacia, there are 4 of 59 young patients (6.8%), and 4 of 53 adult patients (7.5%).

5) Among the 8 patients with lateral ventricle asymmetry, there are 6 of 59 young patients (10.2%), and 2 of 53 adult patients (3.4%).

6) The 3 patients with the congenital anomaly are observed in 2 of 59 young patients, and 1 of 53 adult patients.

7) Among the 3 patients with hydrocephalus, communicating type hydrocephalus is seen in 2 of 59 young patients, and obstructive type hydrocephalus is seen in 1 of 53 adult patients.

8) The 2 patients with a brain tumor are one adult patient and one old patient. The 2 patients with a brain abscess are one young patient and one adult patient. The 2 patients with tuberous sclerosis are one young patient and 1 adult patient.

9) Among the 48 patients with negative CT findings, there are 27 of 59 young patients (45.7%), 20 of 53 adult patients (37.7%), and 1 of 13 old patients (7.7%)

The CT findings of 125 patients with seizures are summarized in Table 2.

Table 2. The CT findings of 125 patients with seizures according to the different age groups in the order of frequency.

Groups	CT findings	N(%)	Additional CT findings	N
Total	Ischemic infarct	18(14.4)	Retroviral disease	6
N=125	Diffuse brain atrophy	17	End-stage renal disease	5
	Focal atrophy	10	Trauma history	3
	Encephalomalacia	8	Previous brain surgery	2
	Asymmetric lateral ventricle	8	Post-partum	2
	Others	16		
	Negative	48(38.4)		
Young	Diffuse brain atrophy	7(11.8)	Trauma	3
N=59	Focal atrophy	6	Retroviral disease	1
	Asymmetric lateral ventricle	6		
	Encephalomalacia	4		
	Ischemic infarct	2		
	Congenital anomaly	2		
	Hydrocephalus	2		
	Others	3		
	Negative	27(45.7)		
Adult	Ischemic infarct	11(20.7)	Retroviral disease	5
N=53	Diffuse brain atrophy	4	End-stage renal disease	5
	Focal atrophy	4	Previous brain surgery	2
	Encephalomalacia	4	Post-partum	2
	Asymmetric lateral ventricle	2		
	Others	8		
	Negative	20(37.7)		
Old	Diffuse brain atrophy	6(46.2)		
N=13	Ischemic infarct	5		
	Brain tumor	1		
	Negative 1 (7.7%)	1(7.7)		

- Epilepsy in Sub-Saharan Africa and Eswatini

The incidence in less developed countries was reported to be 81.7 per 100 000 (95% CI 28.0-239.5) compared with 45.0 per 100 000 (30.3-66.7) in more developed countries (2). In another study, active epilepsy was estimated to affect 4.4 million people in Sub–Saharan Africa, whilst lifetime epilepsy was estimated to affect 5.4 million. The prevalence of active epilepsy peaks in the 20–29 age group at 11.5/1000 and again in the 40–49 age group at 8.2/1000 (4). The disease burden can be expected with the high prevalence of epilepsy, especially in young adults, who are to be in the workforce to support the community structure (4). Among the various causes of epilepsy in Sub-Saharan Africa, the most implicated risk factors are birth trauma, CNS infections, and traumatic brain injury. About 60% of patients with epilepsy receive no antiepileptic treatment, largely for economic and social reasons (2). The understanding of the possible risk factors and incidence of epilepsy mandates further epidemiological studies to improve disease prevention and access to treatment. In another study, the prevalence of active epilepsy was 9 per 1000 people, and the prevalence of lifetime epilepsy was 16 per 1000 people in Sub-Saharan Africa (5). In the report, the prevalence of epilepsy was twice as high in rural areas the in urban areas.

So far, there is no systematic study on the incidence of epilepsy in Eswatini (4). In the Fourth Quarter Parliament Report in 2017, epilepsy cases were 19,202 in 2014 and 16,446 in 2015 (3). Considering the population of Eswatini around 1.3 million, the gross incidence of epilepsy is 12 to 14 per 1000 population.

- Neurocysticercosis, and epilepsy in Africa.

The infection of the central nervous system, which may be treated and prevented, is one of the most important causes of seizures in Sub-Saharan Africa (2). Among them, neurocysticercosis is the important cause evidently related to epilepsy and is prevalent, reported to be 22% of people with epilepsy in cysticercosis endemic areas of Sub-Saharan Africa (6). The geographic variation, 6-37%, in the prevalence of neurocysticercosis in epilepsy was reported, with the highest estimate in the southern Africa sub-region, which may be related to the method of diagnosis of neurocysticercosis (6).

- Clinical diagnosis of neurocysticercosis

In the clinical diagnosis, there are recommended guidelines for the diagnosis of neurocysticercosis in patients with epilepsy. The absolute criteria include a histologic demonstration of the parasite in the brain in gross or microscopic specimens, direct visualization of subretinal parasites by fundoscopic examination, and scolex within a cystic lesion on CT or MRI. The major criteria include neuroimaging suggestive of neurocysticercosis, serological test with anticysticercal antibodies by EITB (Enzyme-linked immunoelectrotransfer bolt) assay, and resolution of cysts or ring-like enhancement spontaneously or after antiparasitic therapy. A definite diagnosis can be made in patients with one absolute criterion or in those with two major criteria, one minor and epidemiological criteria including a history of living and visiting an endemic area (7, 8). In most endemic countries, the diagnosis of neurocysticercosis is sufficient with a CT scan. MRI may be more sensitive to detect scolex not calcified, and extra parenchymal neurocysticercosis (9).

- Neurocysticercosis: CT findings and pathophysiology

It is known that there are 5 developmental stages in the pathophysiological course of neurocysticercosis in the human brain. According to the different stages, the CT findings may be different. At the first time of the non-cystic stage, there is usually no symptom, when focal edema with nodular contrast enhancement may be seen in the neuroimaging. In the vesicular stage, a rounded fluid-filled cyst, 5-20 mm in diameter is seen with a 2-4 mm mural nodule, the scolex, which is isointense relative to the brain parenchyma. The third stage, colloidal-vesicular, may show intense perilesional edema and the formation of a capsule. In neuroimaging with CT or MR, a ring-like enhancement of the wall is seen in two-thirds of cases after contrast enhancement due to the death of the parasite. The cyst may show hyperattenuating on CT images, and increased signal on MR images. A fluid-fluid level can also be observed. In this stage, the cyst begins to contract (8, 9, 10). In the granular nodular stage, the cyst retracts and forms a granulomatous nodule that will later calcify with scolex calcification. CT may show a hypoattenuating, or iso-attenuating cyst with a hyperattenuating calcified scolex (8, 9, 10). Peripheral edema and enhancement after contrast administration may be seen. Nodular or micronodular enhancement is commonly observed in this stage, which suggests granuloma. A target sign is seen with the calcified scolex in the center of the cystic lesion. In the calcified nodular stage, it shows single or multiple calcified nodules of granuloma (8, 9, 10). In our study, we classified the CT findings into 3 types: type 1 vesicular, type 2 target, and type 3 calcified nodular. In type 1, vesicular type, a scolex may be seen with a central isoattenuation nodule. Type 2, the target type is a cyst with a central dot with partial or full calcification. The cyst size is variable according to the different contraction times. In most cases, the scolex shows full

calcification, still within the cyst not fully contracted. And it is difficult to identify a hyperattenuating cyst with a central nodule in the stage of colloidal vesicular stage and to identify the uncalcified scolex in the fully contracted cyst in the non-enhanced brain CT. So those two stages may be included in the type 2 target group. However, in the type 1 group, 9 cases, another type is associated in 3 cases, and in the type 2 group of 25 cases, type 3 is associated in 20 patients. It was reported that the neuroimaging findings of a combination of two or more stages are observed in about half of the patients with neurocysticercosis (10). A single small contrast-enhancing CT lesion was reported as a typical CT finding of neurocysticercosis (9). However, it was difficult to make a conclusive clinical diagnosis only with CT. Such cases may be excluded from the case selection process of this study, which is a limitation of CT diagnosis and one of the limitations of this study.

-The proportion of neurocysticercosis in the population with seizures in Eswatini

In the analysis of the CT findings of 125 patients with epilepsy in Eswatini, the CT findings suggestive of the cause of epilepsy are different according to the different age groups. At the young age below 20, the CT findings are focal or general brain atrophy, asymmetric lateral ventricle, encephalomalacia, ischemic infarct, congenital anomaly, and hydrocephalus in the order of frequency. In the adult age group between 21 and 60, ischemic infarct was the most frequent finding, followed by brain atrophy, focal atrophy, encephalomalacia, and asymmetric lateral ventricle. In the old age group over 61 years old, CT diagnosis was brain atrophy, ischemic infarct, and brain tumor. The patients with neurocysticercosis are excluded from the analysis in the cohorts of patients with seizures in this study. To estimate the proportion of neurocysticercosis in the patients with epilepsy or seizure in Eswatini, the number of patients with neurocysticercosis was 50 among the first cohorts of 58 patients. Two cohorts of the patient group with neurocysticercosis and the patient group with the seizure of various causes may be combined, considering the period difference in patient enrollment, the adjusted number of patients with neurocysticercosis will be 39 patients and the proportion of neurocysticercosis in the total patients will be 39/164(125+39), 23.8%. In the age group of adults between 21-60 years, the adjusted number of patients with neurocysticercosis is 32, and the adjusted number of the total adult subgroup is 85 patients (32+53). Then the proportion of neurocysticercosis among the various causes of epilepsy in the adult age will be 32/85 (37.6%). In this indirect gross estimation, it may be suggested that neurocysticercosis is the most frequent CT finding in the CT diagnosis of patients with seizures or epilepsy, especially in adults, in Eswatini.

One of the merits of the CT diagnosis in patients with epilepsy may be the target sign, in which the scolex and surrounding cyst or tissue halo and edema can be observed. In addition, demonstration of various parenchymal abnormalities, such as atrophy, ischemic changes, and congenital anomaly will be evidence of abnormality, that may cause epilepsy.

In this study, 2 cases of tuberous sclerosis were diagnosed as a cause of epilepsy. Tuberous sclerosis is the most common neurocutaneous syndrome inducing epilepsy (11).

- The limitation of the study, and the role of CT and MRI in the diagnosis of epilepsy

In this study, the CT finding was negative in 48 patients (38.4%) of 125 patients with seizures, excluding neurocysticercosis. Especially in the young patient group, the brain CT finding was negative in 27 (45.7%) in 59 patients. CT has limitations in the demonstration of minor parenchymal abnormality of the brain. Though availability in the world, especially in developing countries, is high with a relatively low operating cost, CT has low sensitivity in the detection of minor cortical abnormality and lesions in the base of the skull, as in the orbitofrontal and medial temporal regions. The overall percentage of success of CT in detecting lesions in focal epilepsies is low (12). Instead, in the diagnosis of patients with seizures, neuroimaging with MRI has merit in detecting the cause, especially in patients with focal seizures including mesial temporal sclerosis, vascular anomalies, low-grade glial neoplasms, and cortical malformations (12, 13). Mesial temporal sclerosis is the most common cause of intractable epilepsy in adults, characterized by hippocampal gliosis and neuronal loss, relatively well demonstrated in MRI (13).

The limitations of this study are 1) that the study design was a retrospective analysis with collections of two cohorts of patients in different time periods in the Mbabane Government Hospital, 2) that the patients were selected based on clinical diagnosis with CT findings, reported by a radiologist in Eswatini, and 3) that the number of patients was relatively small. 4) This study is not conclusive on the true incidence of neurocysticercosis. In the clinical experience in Eswatini, genetic or traumatic causes are far more common than neurocysticercosis. In addition, most epilepsy patients who are well controlled by medication have no chance to receive a brain CT scan. It seems that there is a selection bias in the enrollment of the patient groups, better to make a conservative conclusion from this study.

However, this study may be the first attempt to analyze the CT findings of neurocysticercosis in patients with seizures in Eswatini. It emphasizes the importance of neurocysticercosis as one of the important etiologies of the seizure in Eswatini, especially in adults. The analysis of the CT findings of the patients with seizures in this study may provide a gross profile of the distribution of the causes of seizures according to the different age groups in Eswatini. It is expected that this study is to contribute to the efficient diagnosis of patients with neurocysticercosis and other causes of epilepsy and seizure, and the control of those diseases with further preventive measures in Eswatini.

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