

**Original Research Article****Study of Neurocysticercosis in the Pediatrics Ward of Atertiary Care Centre in Garhwal Region (Uttarakhand) India**

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Email: aseemitlaxmi@gmail.com**Abstract**

Neurocysticercosis (NCC) is infestation of human central nervous system with tissue cysts of pork tapeworm Taeniasolium. Human beings acquire cysticercosis through faecal oral contamination with T. solium eggs or poor hygiene practices in food handling by tapeworm carriers. Clinical presentation of NCC can be variable. Seizures are the commonest presentation of NCC. Various types of seizures have been described among patients with NCC including generalized, focal and rarely myoclonus and acquired epilepticaphasia. In general, it seems that about half the cases have partial seizures and the other half generalized seizures, a proportion similar to that of the general population. Neuroimaging is the mainstay of diagnosis of NCC. Lesions suggestive of NCC on CT, in patients with compatible clinical picture in endemic areas are usually diagnosed as NCC. The study was based on 540 total number of patients admitted with neurocysticercosis (NCC) over a period of three years. These all patients were admitted in department of pediatrics, VCSGGMS&RI (Government Medical College, Srinagar Garhwal), Uttarakhand. All Neuroimaging investigations were investigated in department of Radio diagnosis, Government medical college and hospital, Srinagar. Pathological and microbiological investigation also done in central lab of government medical college and Hospital, Srinagar. All the patients were examined clinically and were investigated with neuro imaging. In addition to above X-Ray chest, Mantoux test, Hematological investigations including ESR and CSF was done to rule out Tuberculoma. Routine stool examination was also done. During our 3 years of study period NCC has emerged as an alarming public health problem of our region and its incidence has risen from 33.33% in 2012 to 42.26 % in 2014 in pediatric patients. The rising incidence could be due to high index of suspicion in every case presenting with seizures. A strikingly high incidence of Neurocysticercosis (NCC) was found among the pediatric patients of our tertiary care hospital. A high incidence of NCC in this region reflects the endemic presence of Taeniasolium.

Keywords: Neurocysticercosis, Pediatric patients, Seizures, Taeniasolium, Neurologic disease

INTRODUCTION

The term neurocysticercosis is generally accepted to refer to cysts in the parenchyma of the brain. It presents with seizures and, less commonly, headaches^[1]. *Cysticercus* in brain parenchyma are usually 5–20 mm in diameter. In subarachnoid space and fissures, lesions may be as large as 6 cm in diameter and lobulated. Cysts located within the ventricles of the brain can block the outflow of cerebrospinal fluid and present with symptoms of increased intracranial pressure^[2]. Racemose cysticercosis refers to cysts in the ventricular system and subarachnoid space. These can occasionally grow into large lobulated masses causing pressure on surrounding structures. Neurocysticercosis involving the spinal cord most commonly presents as back pain and radiculopathy^[3].

The variable manifestations include seizures, hydrocephalus, and other neurologic dysfunctions. Its clinical effects vary depending upon site of larval lodging, larval burden and host reaction. These effects include seizures, headaches, focal neurological symptoms, visual disturbances and localized skeletal muscle nodules and pain^[4]. Neurocysticercosis is the most common helminthic infection of the CNS but its diagnosis remains difficult. Clinical manifestations are nonspecific, most neuroimaging findings are not pathognomonic, and some serologic tests have low sensitivity and specificity. The diagnostic for neurocysticercosis is based on clinical, imaging, immunological, and epidemiological data.^[5] These include four categories of criteria stratified on the basis of their diagnostic strength:

(1) Absolute criterion—histologic demonstration of the parasite from biopsy of a brain or spinal cord lesion, cystic lesions showing the scolex on CT or MRI, and direct visualization of subretinal parasites by fundoscopic examination. (2) Major criterion—lesions highly suggestive of neurocysticercosis on neuroimaging studies, positive serum enzyme-linked immune electrotransfer blot for the detection of anticysticercal antibodies, resolution of intracranial cystic lesions

after therapy with albendazole or praziquantel and spontaneous resolution of small single enhancing lesions; (3) Minor criterion—lesions compatible with neurocysticercosis on neuroimaging studies, clinical manifestations suggestive of neurocysticercosis, positive CSF enzyme-linked immune-sorbent assay for detection of anticysticercal antibodies or cysticercal antigens, and cysticercosis outside the CNS; and (4) Epidemiologic criterion—evidence of a household contact with *Taeniasolium* infection, individuals coming from or living in an area where cysticercosis is endemic, and history of frequent travel to disease-endemic areas.^{[6][7]} Interpretation of these criteria permits two degrees of diagnostic certainty: 1) definitive diagnosis, in patients who have one absolute criterion or in those who have two major plus one minor and one epidemiologic criterion; and 2) probable diagnosis, in patients who have one major plus two minor criteria, in those who have one major plus one minor and one epidemiologic criterion, and in those who have three minor plus one epidemiologic criterion.^[8]

NCC is not only a public health problem in developing countries but its incidence is increasing currently in developed countries too due to migration movements from endemic countries^{[9][10]}.

PATHO-PHYSIOLOGY OF T.SOLIUM

The larvae of *T. solium* (*Cysticercus cellulosae*) causes neurocysticercosis. This pork tapeworm can vary in size but is notable for a scolex (head) with approximately 25 hooklets, 4 suckers, and a body with 700-1000 proglottids^[11]. The ova of the tapeworm are spread via the fecal-oral route and are approximately 40 microns in diameter with a radially striated shell^[12]. The intermediate host is the pig, which harbors the larvae after eating ova, and the definitive host is the human being.

If pig products infected with larvae are ingested, a tapeworm infection in the intestines ensues; however, if ova are ingested, neurocysticercosis may occur. The ingested ova develop into larvae (cysticerci) and lodge in soft tissues, especially

skin, muscle, and brain. Cysticerci are fluid-filled oval cysts, approximately 1-2 cm in diameter, with an internal scolex^[13].

The eggs are found in human feces because humans are the only definitive hosts. Greatest risk for infection occurs in regions where plants in gardens or farms are fertilized with human feces and humans are exposed to contaminated soil^[14].

In the CNS, *T.solium* is deposited in the cerebral parenchyma, meninges, spinal cord, and eyes. Unless large numbers of cysts are present, the

body's immune system does not destroy the organism, and cysts can live for many years undetected^[15]. A live cyst can go undetected for as long as 5 years before dying or causing symptoms in the host.

Neurologic symptoms arise when the encysted worm dies and the human mounts an associated inflammatory response. If the cyst lodges in the ventricular system (especially the fourth ventricle), hydrocephalus can occur.^[16]

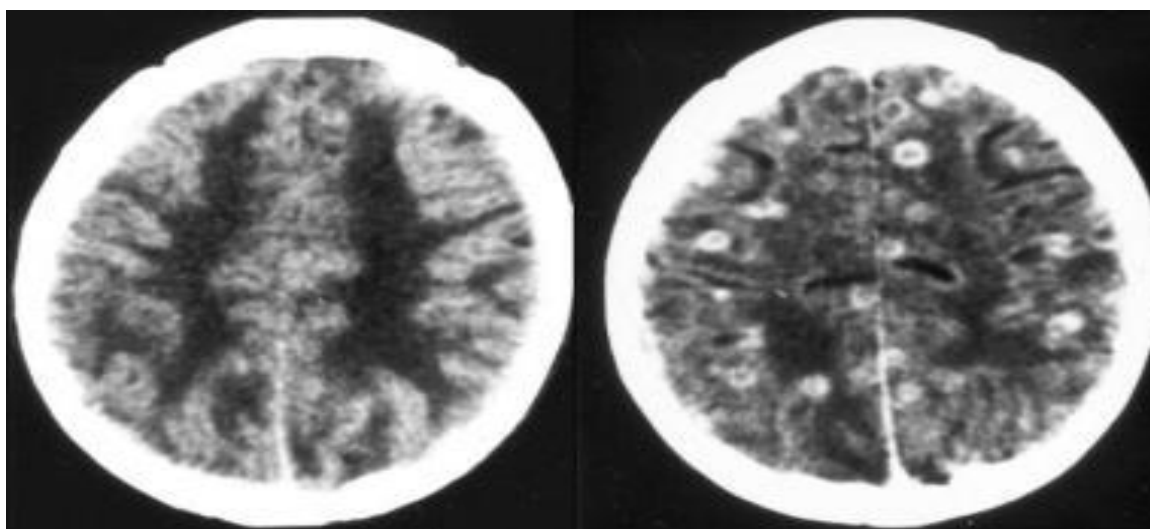


Fig (1): Nonenhanced (left) and enhanced (right) CT scans of the brain in a patient with neurocysticercosis show multiple ring-enhancing lesions with perifocal edema.

MATERIAL AND METHODS

This retrospective study was conducted on 540 patients admitted in IPD, Deptt of Pediatrics government medical college hospital, Srinagar, Garhwal, Uttarakhand from January 2012 to December 2014. All admitted patients had seizure disorder.

Patients were classified according to their age groups, rural or urban status and the type of seizures. Through history regarding seizures type, presence of fever, number of episodes of unconsciousness was taken into account. Other important history i.eH/O contact with tuberculosis, family H/O seizures, socio-economic status, environmental and sanitation facilities, water supply, sewage and drainage system, type of toilet was also considered. Proper clinical examination on all patients was done.

INVESTIGATIONS

Haematological investigations, RBS, S. electrolytes (Na,K, Ca), liver function test(SGOT, SGPT, ALP, bilirubin),renal function test (Serum Creatinine, serum urea), X-Ray chest, Mantoux test, neuroimaging (CT) was done.

RESULTS

No significant correlation was found between different biochemical profiles and severity of neurocysticercosis.

The total number of 540 children having seizures were studied over a period of 3 years. In 540 cases 202 patients were suffering with Neurocysticercosis, and the average percentage of children with neurocysticercosis was 37.13% (Table-1).

Out of 202 cases with neurocysticercosis, 93 Patients were suffering from generalized tonic clonic seizures, 64 patients suffering from

Complex partial seizure and 45 patients were suffering from simple partial seizure (Table-2).

Table 1. Seizures cases with Neurocysticercosis (NCC)

S.NO	YEARS	CHILDREN (0-15yrs)		
		Seizure	Neurocysticercosis	Percentage (%)
1.	2012	159	53	33.33
2.	2013	187	67	35.82
3.	2014	194	82	42.26
TOTAL		540	202	Average % = 37.13

Table (2): Types of Seizures in patients with neurocysticercosis

Type of seizure	Number of patients	Percentage
Generalized Tonic – clonic seizures	93	46.03
Complex partial seizure	64	31.68
Simple partial seizure	45	22.27
Total	202	100

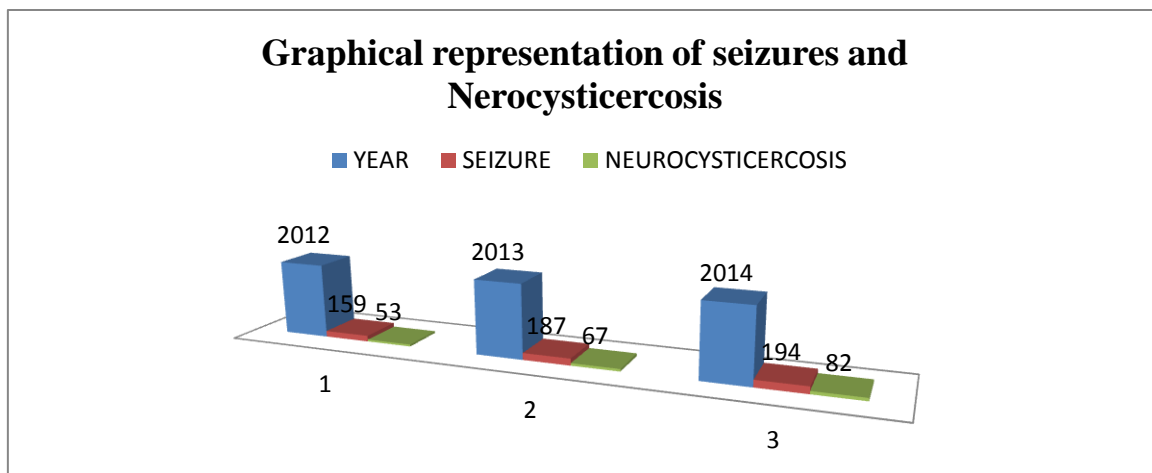


Fig (2): Graphical representation of seizures and Neurocysticercosis

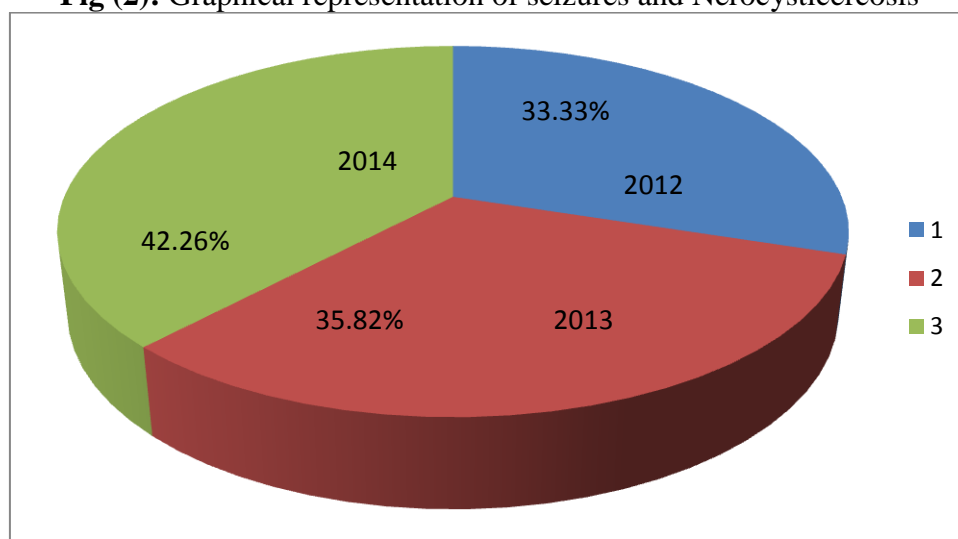


Figure (3) Percentage of Neurocysticercosis in different years.

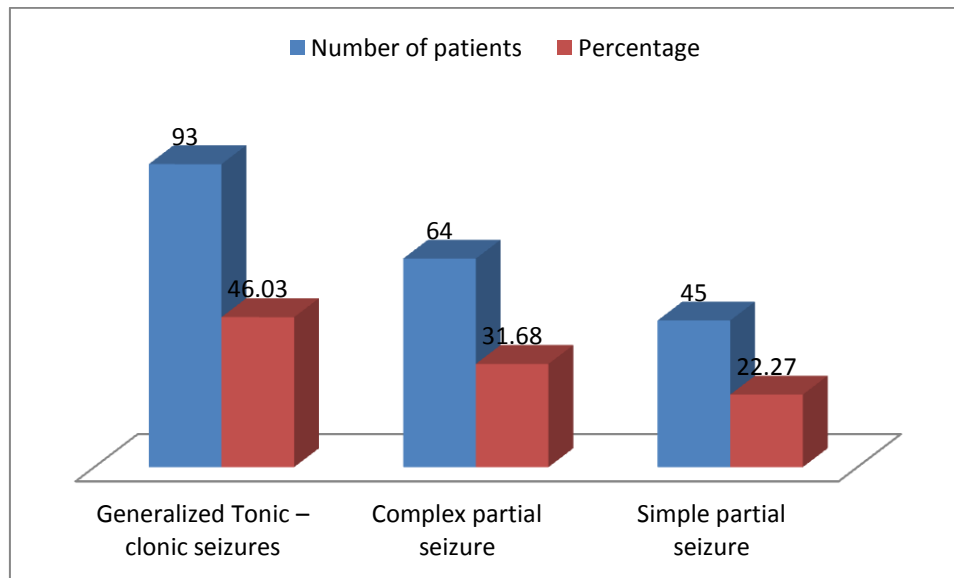


Figure (4): Percentage of types of seizures

DISCUSSION

Many standard texts mention that 1st episode of single unprovoked seizure need not be investigated and treated. But the rising trend in the incidence of NCC was seen during our study period of 3 years which could be attributed to neuroimaging being an essential investigation in every case of seizures due to high index of suspicion. During our 3 years of study period NCC has emerged as an alarming public health problem of our region and its incidence has risen from 33.33% in 2012 to 42.26 % in 2014 in pediatric patients. The rising incidence could be due to high index of suspicion in every case presenting with seizures. Earlier thought to be a disease of developing nation, the incidence of NCC is rising currently in developed countries as well; due to migration movement from endemic countries. Various studies have shown that NCC is the most common cause of acquired seizures worldwide.

A study in vellore district showed overall incidence of NCC to be about 28.4% among total patients of active epilepsy which is comparable to the results of our study which shows an overall incidence of NCC to be 37.13% in all age groups of pediatric population.

Clinical presentation of NCC in patients depends on the site of focus of the cysticerci. Different studies mention seizures as the commonest

presentation. In our study 540 patients presenting with seizures 37.13% was due to NCC.

CONCLUSION

During the course of our study we concluded that NCC should be suspected in every case of seizures irrespective of its type in endemic regions, and subjected to neuroimaging even in cases of first episode of unprovoked seizures though some standard texts suggest that neuroimaging is generally not recommended after a first episode of unprovoked seizures.

Moreover we conclude that a high incidence of NCC in our region reflects the endemic presence of taeniasolium which is a cause of high morbidity and financial burden to the individual and society. Keeping in view the preventable nature of the disease more emphasis should be laid on providing better sanitation facilities and safe drinking water. The masses should be educated to practice better hygiene, use of filtered water and avoid eating anything raw.

The education programme should start from schools and panchayats, where audio-video programmes can be shown for a better and long lasting impact. The government agencies should provide facilities for safe drinking water by installing water purifier and filtration units at common places like hospitals, schools and working places. The vegetable markets should be

on a raised platform with water points where the vendors can wash the vegetables. The drainage facilities should be adequate to avoid water logging.

RECOMMENDATION

All cases of seizures whether first or recurrent should be thoroughly investigated (including neuroimaging) for the presence of neurocysticercosis. The most common type of seizure in pediatric patients with neurocysticercosis is generalized tonic clonic seizure which is potentially life threatening.

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