



## A study on the prevalence of Neurocysticercosis in a tertiary hospital

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### Abstract:

Neurocysticercosis (NCC) is an infection of brain caused by encysted larval stage (cysticercus cellulosae) of *Taenia-solium*. *Taenia-solium* is worldwide most common in pork eating population. *Taenia-solium taeniasis* is endemic in Mexico, South Africa, Europe, Non Islamic countries of Southeast Asia. In India the infection is found among people who eat pork and in rural area.

**Key words:** utilization of VCT, high-risk, HIV/AIDS.

### Introduction

Neurocysticercosis (NCC) is an infection of brain caused by encysted larval stage (cysticercus cellulosae) of *Taenia-solium*. *Taenia-solium* is worldwide most common in pork eating population. *Taenia-solium taeniasis* is endemic in Mexico, South Africa, Europe, Non Islamic countries of Southeast Asia. In India the infection is found among people who eat pork and in rural area.

In India Neurocysticercosis is one of the principle cause of expansive diseases of skull. Neurocysticercosis is a common disease but its diagnosis is problematic.

*Taenia solium* is the only cestode for which man acts both as definitive and also intermediate host. Larval forms localizing in CNS as cysts, which elicit immune response in the host leading to development of antibodies both in CSF and serum, detected by ELISA or EITB. Cysts are diagnosed by CT & MRI scan.

When cysticerci are found in the brain the condition is neurocysticercosis. Clinical manifestations are seizures, ICT, focal neurological conditions, making a clinical diagnosis difficult. Radiological techniques are main stay in the diagnosis of NCC. Hence there is great need for noninvasive techniques like immunological studies in

the diagnosis of NCC. Various immunological studies of serum and CSF have been used in the past and they in combination with imaging may be increase the diagnostic accuracy of NCC.

### Aims and objectives

To study the prevalence of NCC in NRI Academy of Medical sciences. To determine the predisposing factors, age and sex distribution among NCC in clinically suspected and radiologically proved NCC cases

### Materials and Methods:

The present study was carried out in the department of Microbiology, NRI Medical college and General hospital, Chinakakani, Guntur (Dt). The study was conducted over a period of 1st January 2010 to 30th December 2010.

Patients attending clinical department of General Medicine, Pediatrics and Neurology for the purpose of diagnosis and treatment form the sources of data for the study. A total of 66 suspected neurocystic samples were processed during this period. Isolates from CSF and blood serum samples from neurocystic patients showing symptoms of cysticercosis and radiologically proven were taken. These samples were centrifuged batch wise and supernatant was collected and Cysti cheX test was performed. The results were then tabulated.

Sixty six patients with probable NCC as per proposed diagnostic criteria for NCC 3 were studied. This included patients with cysticercal granuloma in the brain with or without systemic manifestations.

Patients were carefully examined for subcutaneous nodules, muscle hypertrophy and levels of sensation, focal neurological deficits. In all patients complete hemogram with absolute eosinophils count, chest X-ray, montax tests were done.

**Sample size:** CSF samples – 66, controls 24, Serum samples-66, controls 24

### Results

The study period is from 1st January 2010 to 30th December 2010. A total 66 cases of CSF and serum samples were obtained from both the sexes presenting with the symptoms of NCC. All the samples were subjected to ELISA and the following demographic study was performed.

**Table 1: Distribution of total cases according to age and gender**

Age group	Total samples	Males	Females
0-10	6	4	2
10-20	12	8	4
20-30	14	9	5
30-40	10	6	4
40-50	8	5	3
50-60	7	5	2
60-70	3	2	1
70-80	3	3	0
Unknown	3	2	1
Total	66	44	22

Age group ranges from 5-80 years. Mean age was 22 years +/-6.7 yrs. Nearly 2/3 of patients were in the e group of 11 – 30 years.

**Table 2: Distribution of ELISA positive cases according to age and gender**

Age group	Males	Females
0-10	2	1
10-20	6	4
20-30	8	5
30-40	5	2
40-50	4	2
50-60	2	1
60-70	2	1
70-80	2	0
Unknown	1	0
Total	32	16

Out of 66 patients 48 patients were positive in which males were 32 and females were 16. Mean age of positivity was 20 – 30 years.

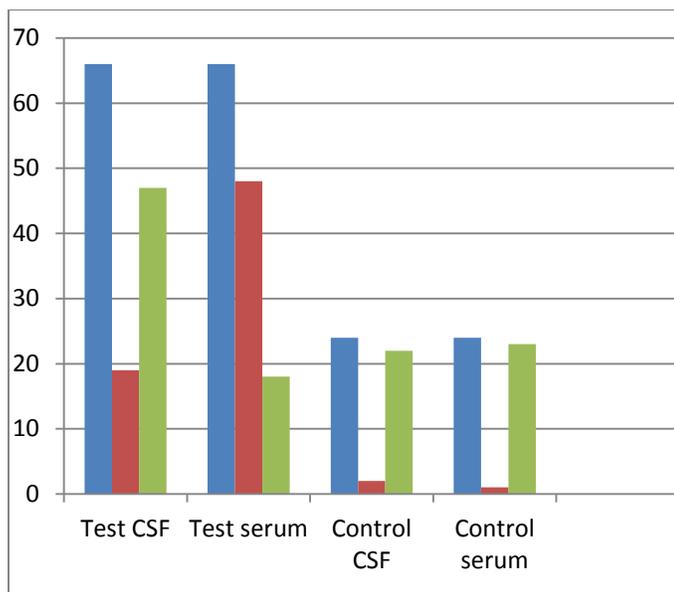
Distribution of 66 samples according to age.

Out of 66 patients 48 (78%) were adults are of 18 (22%) were children.

**Table 3: Distribution of positive cases as per ELISA in serum and CSF according to age**

	Adults	Children	Total
Serum	37	11	48
CSF	13	6	19

**Figure 1: Distribution of positive cases as per ELISA in both cases and controls.**



*Type of samples*

Out of 66 Serum, 48 serum samples were positive and 18 were negative.

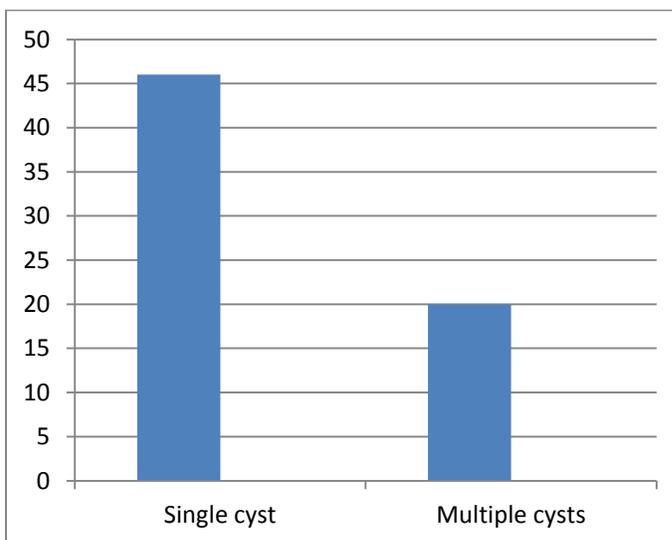
Out of 66 CSF Samples 19 CSF samples were positive and 47 were negative. Out of 24 CSF controls, 2 samples were positive. In serum out of 24 samples, 1 sample was positive.

**Table 4: Treatment history**

Treatment	No. of patients	Percentage
Anti Epileptic drugs(AED)	8	12%
AED+steroid	4	8%
AED+steroid+albendazole	46	70%
Anti edema measures	3	3%
Steroid alone	5	5%
Cystectomy	1	2%
Total	66	100%

Most of the patients were treated with anti epileptic drugs (AED) alone (12%). 8% were treated with AED and steroid. Albendazole was used in total of 46 patients ( 70%) out of 66 patients. One patient with intraocular cysticercosis had under gone surgical removal of cysticercal cysts.

**Figure 2: Distribution of data according to number of cysts**



*No of Cysts*

Majority (46/66, 70%) had only one (single) lesion in brain CT, 20 patients (30%) had (multiple) more than two lesions. Scolex was visible in 11 patients (17%).

**Table 5: Distribution of serum and CSF positive cases in both single and multiple cysts**

Single		Serum	CSF
	Positive	30	10
Negative	16	36	
Total	46	46	
Multiple	Positive	18	9
	Negative	2	11
	Total	20	20

**Table 6: Distribution of positive ELISA cases in Serum**

Test Result	Disease present	Disease absent	Total
Positive	48(a)	1 (b)	49
Negative	18 ©	23 (d)	41
Total	66	24	90

Sensitivity = a/a+c in %  
 $48/(48+18) \times 100 = 72.72\%$

Positive predictive value = a/a+b X100  
 $48/49 \times 100 = 98\%$

Specificity = d/d+b in %  
 $23/(23+1) \times 100 = 95.8\%$

Negative predictive value = d/c+d x100  
 $23/43 \times 100 = 53.5\%$

No of false positives = 1,  
 No.of true negatives = 23  
 P value < 0.0001, shows highly significant.

**Table 7: Distribution of positive ELISA cases in CSF**

Test Result	Disease present	Disease absent	Total
Positive	19(a)	2 (b)	21
Negative	47 ©	22 (d)	69
Total	66	24	90

Sensitivity = a/a+c in %

**Discussion:**

The development of an active cysicercus, from the time the eggs are ingested, is completed within 60-70 days. Cysts can be parenchymal, subarachnoid, or intraventricular. A viable larva in an active phase can live upto 7 years [1]. Intraventricular cysts have a more aggressive behavior than their parenchymal counter part. Symptoms associated with the parenchymal lesions largely result from hosts inflammatory response to the dead or dying larva. They include irritation, edema of the brain and epileptic seizures [2].

**Prevalence & Incidence**

In this study, prevalence rate in NRIGH and surrounding area was found to be less than 1. NCC is endemic in central south America, Africa and Indian subcontinent. Indonesia and China reaching an incidence of 3.6%. It is rare in Europe, Australia, Japan and New Zealand, Israel and in Muslim countries. NCC can be seen in immigrant population with a relatively high frequency as in United States. It represents major cause of morbidity among the Hispanic population in USA, because of ingestion of infected food that was handled by carriers of T-Solium and travel to the endemic places. In India majority of patients present with seizures. The commonest pathological substrate of disorder in Indian patients is the solitary parenchymal degenerating cysts.

In our study 10 patients (17%) had history of pork meat consumption, 7 patients (10%) were on vegetarian diet, remaining were mixed diet. This suggests that risk of NCC is not limited only to those who consume pork meat. Consumption of improperly cooked pork leads to intestinal Taeniasis and not necessarily to NCC.The magnitude of T-solium infestation and the frequency of pork consumption in a population appear to influence the quantum of cyst load in effected individual.

$19/(19+47) \times 100 = 27.8\%$   
 $PPV = a / a+b \times 100 =$   
 $19/21 \times 100 = 90.5\%$   
 Specificity = d/d+b in %  
 $22 / (22+2) \times 100 = 91.7\%$   
 $NPV = d/c+d \times 100 =$   
 $22/69 \times 100 = 31.9\%$   
 No. of false positives = 2 ,  
 No. of true negatives = 22  
 P value shows not significant.

In this study the prevalence of anticysticercus antibody in different population group was 27(40%) in slum area, 19(30%) in rural area and 13(20)% in urban area. A comparative analysis for the prevalence of anticysticercus antibodies was carried out in Chandigarh and it was found to be - 24% in slum, 20% in rural and 8% in urban population, in and around union territory of Chandigarh.

The prevalence is maximum in communities that breed pigs and where standards of hygiene, and sanitation are poor and in people eating undercooked pork. While in labour colonies and slum where pigs are raised, the figure rose to 12-15% [3].

**Age and sex distribution**

Age group in our study ranged from 5 – 80 years with a mean age of 22+ / - 6 years. Most of them were between 11-30 years. This is in accordance with most other studies. Rajasekher (1993) [4] reported 25 patients with NCC where the age group was 8-53 years. Del Brutto (1994) [5] reported 40 patients with NCC where in the age ranged from 7-55 years with a mean age of 30 years. However Lefever et al [6] (1968) found predominance in children .

There is slight male predominance in our study (55%). Asenjo (1961) and James.C [7] (1995) also found a similar male predominance in their study. The reason could be due to a gender bias in seeking medical attention in our country. Alternatively it may be related to greater probability of men consuming contaminated food and water outside the homes.

**Conclusion**

The sensitivity of ELISA using ES antigen for detection of antibodies in Neurocysticercosis increases with the increase in number of live cysts,

multiple cysts, close to proximity of cysts to CSF and in patients of Neurocysticercosis with dissemination.

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