Variability of Presentations and CT-Scan Findings in Children with Neurocysticercosis

Gauchan E, Malla T, Basnet S, Rao KS

Department of Pediatrics

Manipal teaching Hospital

Pokhara, Nepal.

Corresponding Author

Eva Gauchan

Department of Pediatrics

Manipal Teaching Hospital,

Pokhara, Nepal

Email: eva_gauchan@yahoo.com

Citation

Gauchan E, Malla T, Basnet S, Rao KS. Variability of presentations and CT-scan findings in children with neurocysticercosis. *Kathmandu Univ Med J* 2011;34(2)17-21.

ABSTRACT

Background

Neurocysticercosis is one of the common neurological morbidities in childhood.

Objectives

To find the commonest mode of presentation of this disorder in children. The study also aims to find out the age at which it commonly occurs, commonest site affected in the brain and the ethnic group and region most commonly affected in Western Nepal.

Methods

Retrospective hospital based study carried out in the Department of Pediatrics, Manipal Teaching Hospital, Pokhara from June 2004 to June 2009.

Results

Over the period of five years, 678 patients were admitted for seizures; out of which 109 patients were diagnosed as having neurocysticercosis (16%). Out of them, 66 (60.5%) were males and 43 (39.4%) were females. The age of presentation varied from 18 months to 16 years, with mean age 9.77 years. The most common age of presentation was between 6-10 years (n=47; 43.1%) and 11-15 years (n=47; 43.1%). Maximum number of patients were from Kaski district (n=41; 37.6%) followed by Syangja (n=34; 31.1%).The commonest presentation was with seizures (n=85; 77.9 %); generalised seizures was present in 45 patients (52%). Psychiatric manifestations were present in 3 patients (2.7%). The lesions were found mostly in the parietal region (n=65; 59.6 %). Most of the lesions were single (n=89; 81.6%). Out of 109 patients, 74 patients (67.8%) improved without any recurrence of symptoms on two years follow-up.

Conclusion

Neurocysticercosis is a preventable zoonotic disease which results in significant morbidity in children where sanitary measures are inadequate. Any child presenting with a first episode, afebrile seizure should be screened for neurocysticercosis provided other common causes are ruled out.

KEY WORDS

neurocysticercosis, seizures

INTRODUCTION

Neurocysticercosis (NCC), the commonest cause of neurological disease worldwide is an important cause of epilepsy and found to be the commonest cause of focal seizure. NCC is a common parasitic infestation of the central nervous system in children of developing countries.[1] WHO estimates that nearly 50 million people from developing countries are infested with taeniasis and 50,000 die from parasitic infestation each year.[2] The disease is endemic in parts of South America and Eastern Europe, the Indian subcontinent, South-East Asia, and sub-Saharan Africa.[2] Cysticercosis is rare in Eastern and Central Europe, the Caribbean Islands (except Haiti) and parts of South and North America.[2] NCC is uncommon in Australia, Japan, New Zealand, and the Pacific Islands, except among immigrants and tourists.[2] NCC is less common in those countries where pork consumption is not allowed for religious reasons.[2] Human and porcine taeniasis / cysticercosis is the major zoonotic disease in Nepal.[3-5] Certain ethnic groups in Nepal

rear and consume pigs.[4] The pig population in the Western region of Nepal is about 11.6 % with pork production being 12.2 % as compared to 53% and 49% respectively in Eastern Nepal.[4]

Taeniasis refers to a human infection with the adult tapeworms: *Taenia solium* and *Taenia saginata*. The infective stage of *T. Solium* (Cysticercus cellulosae) develops in the pig. The CNS manifestation is termed as Neurocysticercosis (NCC). The CNS manifestation in humans occurs due to infection with the larval stage of Taenia solium (cysticerci) affecting the brain.The infection occurs due to poor sanitary conditions with increased risk of spread in the poorer population due to lack of proper hygiene.

Prevalence rates of cysticercosis in children in Nepal is not really known; although in certain ethnic groups, the cases of adult taeniasis is considered to be 10-50 % and porcine cysticercosis is seen in 14-32 %.[4, 6] This study attempts to find out the commonest mode of presentation and site of affection in the brain. Besides this it also aims to find out prevalence rate of NCC in children in Western Nepal and age at which it commonly occurs.

METHODS

This was a retrospective hospital-based study conducted in the inpatient ward of the Pediatric department of Manipal Teaching Hospital, Pokhara. To conduct this study IRC approval was taken. Patients admitted to Pediatric ward from June 2004 to June 2009 with diagnosis of NCC on the basis of history and CT-scan findings were considered for this study. Patients who presented with neurological manifestation but CT scan not showing evidence of ring-enhancing lesions and patients with seizures where CT scan was not done were excluded. Data were entered using Microsoft excel and the data were analyzed by using SPSS version 13.

RESULTS

There were a total of 9064 patients admitted to the ward beyond one month of age during the study period. Out of these patients, total number of children presenting with seizures was 678 and 109 (16%) patients were diagnosed as NCC on the basis of history and CT-scan.

The mean age of presentation was 6-15 years (43.1%). The youngest age at diagnosis was 18 months (0.91%) while the eldest was at 16 years (0.91%) (Fig.1). Results showed that the infestation is more common in male as compared with female, ratio being 1.5:1.

The disease was seen to be more in the Brahmin community (n=40; 36.6%) followed by Chhetris (n=20; 18.3%) and then the lower socio-economic class (Dalit group) (n=18; 16.5%) (Figure 3).

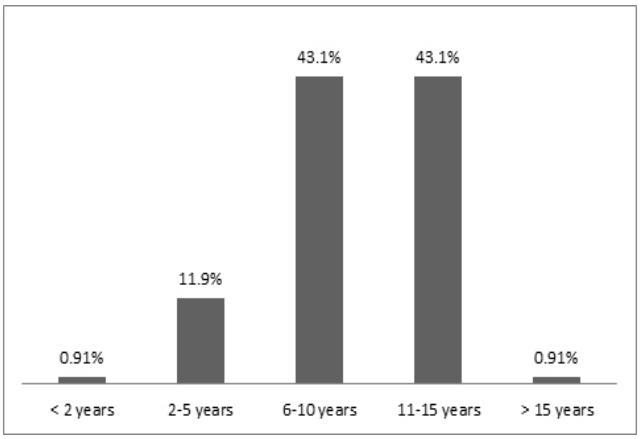

Figure 1. **Age distriution of NCC**

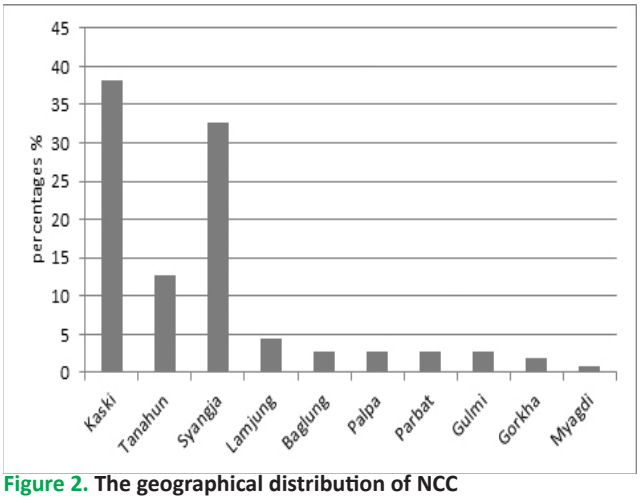

Figure 2. **The geographical distribution of NCC**

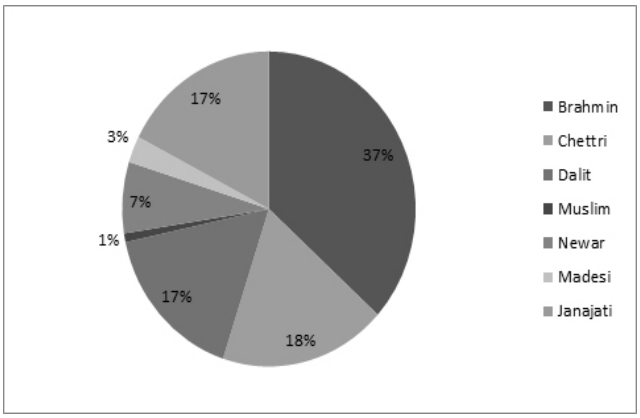

Figure 3. **Occurrence of NCC in different ethnic groups**

The results considering the site of lesion of 109 cases showed that 89 were of single lesions (81.6%); among which 80 were in the active stage (73%). All patients with active lesions (n=89; 81.6 %) were treated with a combination of antiparasitic drug and anticonvulsant. Seventy four patients improved on the medications (67.8%); while 28 patients were lost to follow up. Repeat CT scan was done in 30 patients out of whom 12 patients showed evidence of improvement.

Table 1. **Various presentations of NCC**

Features	No. of patients
Seizures	
Partial	40
Generalized	45
Headache	
Generalised	2
Frontal	2
Occipital	1
Psychiatric manifestations	**3**
Loss of consciousness	**9**
Cranial nerve involvement	**0**
Others	**1**

Table 2. **The site of involvement on CT-scan.**

Location	Number
Frontal	17(15.5%)
Parietal	
Left Parietal	31 (47%)
Right Parietal	34 (52%)
Temporal	
Left Temporal	1 (0.91%)
Right Temporal	1 (0.91%)
Occipital	15 (13.7%)
Others	10 (9.1%)

DISCUSSION

Tapeworm infection (Taeniasis) is one of the most common parasitic infestations in developing countries like Nepal.[1,2] The infection occurs due to poor sanitary conditions with increased risk of spread in the poorer population due to lack of proper hygiene.

The most common CNS manifestation is epilepsy.[7-9,12-13] Epilepsy cases are rising in Nepal and studies show that nearly 7.3 per 1000 cases suffer from epilepsy with around 50 % being due to neurocysticercosis.[4] Partial seizures are more commonly described in the Indian sub-continent although it can also be generalised type.[8,10 11-14] Other manifestations are headache, behavioural changes, loss of consciousness, cranial nerve palsy, etc.[12-13] Diagnosis can be made on the basis of CT scan or MRI scan of brain. The CT scan features ring-enhancing lesions with or without scolex which might be single mostly and sometimes multiple. The lesions vary in size; most of them are around 10 mm in size and are mostly located around the corticomedullary junction in the brain parenchyma. Cysts located in the ventricular system are larger in size around 50 mm or more due to the unrestrained growth in the subarachnoid space and result in features of raised intracranial pressure.[15] If multiple lesions are present they are present commonly in both the cerebral hemispheres followed by the parietal region.

The neurological manifestations vary according to the site, size and number of lesions in the brain. The most common presentation was seizures (77.9 %); generalised type being more common (52 %) as compared to partial type (47 %). Previous studies have however claimed that partial seizures are more typical presentation of neurocysticercosis.[13,17,20-21] Most likely the reason that generalised seizures were reported commonly here is that the population studied here come from lower socio-economic status with lower levels of education and their observation of partial onset might not have been noted, or maybe the seizures initially started out as partial later on became secondarily generalized which was then observed.

Total nine patients presented with loss of consciousness (8.2%) while five patients (4.51%) came with complaints of headache with or without features of raised intracranial tension. There were three patients (2.7%) who came with psychiatric manifestations. Other studies have similarly reported presentation with features of raised intracranial tension, psychiatric manifestation, cranial nerve palsies, meningoencephalitis.[17-18,20]

In this study, most of the lesions (n=89, 81.6%) were single in number and were mostly located in the parietal region (n=65; 59.6%).52% were found on the right parietal hemisphere as compared to 47% located on the left parietal region. Similar findings were noted in other studies where the lesions were found most commonly affecting the parietal regions and were single in number.[14,21]Frontal lesions were found in 17 cases (15.5%) followed by 15 lesions (13.7%) on the occipital lobe; in ten cases (9.1%) lesions were found in more than one lobe.

Among the 109 lesions, 80 (73%) were in the active stage while 29 (26.6%) were inactive. A lesion was said to be active if it showed a scolex with surrounding edema or if it showed an area of hypodensity with or without surrounding edema size being < 20 mm in diameter. Calcified lesions < 20 mm in diameter were considered to be inactive lesions.

According to present study the mean age of occurrence was 9.77 years. Similar kind of study had been conducted in this same institute previously where mean age of presentation was 10.8 years.[14] A study conducted in Lumbini showed affected age group ranged from 2 to 14 years with pre-school aged children (< 6 years) constituting 10.3% of the total patients.[16] Another study conducted in Peru, Lima showed a mean age of 7.86 years.[19] The main reason why it is common in this age group must be because at this age the children have poor hygiene and are exposed to outside food more. There was just one case in which it occurred at < 2 years (0.91%). The reason here being that at this age the children are fed by the caretaker with food prepared at home and measures are taken to cook and feed the child with properly cooked foods.

There were 66 male patients (60.5%) and 43 (39.4%)

females. The male to female ratio was 1.5:1. Similar finding was noted in a study done in India, Chandigarh where the number of males outnumbered females.[17] The reason why it might be occurring more in male sex could be because they are more outgoing and are more in the habit of consuming food outside the home, especially fast food. However other studies have found that the incidence of NCC is more common in female sex.[18,19]

In our study it is seen that the disease occurs more in Kaski district (37.6%) followed by Syangja (31.1%) then Tanahun (12.8%). Within the district of Kaski, maximum number of cases came from Pokhara city proper (n=30; 73%).The reason for this could be that Pokhara is considered to be the portal of entry to Western region of Nepal and the third largest city of Nepal with an equal mix of people of all ethnic origins. Here there are people of all social strata and the city is developing fast since it is also a tourist area; the culture of consuming fast food and barbecued food and meat is increasing. This could be the reason why the disease was found to be more in this part of the country. A study was conducted in Syangja district where it was seen that out of the total population of 3,17,194; almost 20.3 % are of the Magar community and it is these people who rear pigs for their own consumption or for selling pork meat.[1,4,22] Apart from them, the other ethical groups who breed and consume pork meat are Gurungs, Rais, Limbus, Sarkis and Kasais.[22]It was seen in the study that every house in Syangja district rear 2-3 pigs and each individual farmer rears at least 1-8 pigs.[22] A study done in a rural farm community in Syangja in Western Nepal showed that 60% of the population consumed pork meat, 35% mixed buffalo and pork meat and only 5 % eat chicken or mutton.[22] Out of them 68.2% consume cooked meat and 19% eat fried pork while boiled pork 4.3% and raw pork 8.3%.[4,7] Another study conducted in Vyash municipality in Tanahun district showed that the intestinal helminths prevalence rate was 60% with prevalence rate of taeniasis being 18% among the stool samples studied.[1] Most of the households did not have a proper latrine or sewage disposal system and had a very low level of sanitary practice.[1]

Majority of patients who presented with NCC were Brahmins (37%) followed by Chettris (18%) who are generally assumed to be pork non- eaters; followed by dalits (17%). During the period of 5 years, out of the total admissions of 9064 patients, it was seen that Brahmins comprised of 5195 cases (57.3%) which is a huge majority of the cases followed by dalits (n=1164;12.8%). Since the number of patients of Brahmin origin frequents this hospital more, this could be why the disease was seen more in this community. This study could also prove the fact that NCC occurs not only in pork-eaters but also in those who do not consume meat and hence we have to think that infection occurs through fecal contamination of water. Also in modern days, even those who were considered as higher castes like Brahmins and Chettris are seen to be consuming pork meat more.[22]

Detailed dietary history could not be attained as this was a retrospective study, so the relation to ingestion of pork meat could not be ascertained. All the cases could not be followed up with a repeat CT scan, so we do not know if there was persistence of the lesion on follow-up.

CONCLUSION

Neurocysticercosis is an important cause of epilepsy in children. Any child presenting with a first episode afebrile seizure should be evaluated with a CT-scan especially if presents after one year of age; provided other obvious cause of seizure is ruled out.

ACKNOWLEDGEMENT

I would like to thank Dr. Kalpana K. Malla for her guidance in writing this article.

REFERENCES

1. Joshi DD, Maharjan M, Johnson MV et al. Taeniasis/cysticercosis situation in Nepal. *Southeast Asian J Trop Med Public Health* 2004; 35 (1): 252-8.
2. Roman G et al. A proposal to declare neurocysticercosis an international reportable disease. *Bulletin of World Health Organization* 2000; 78(3): 399-406.
3. Joshi DD, Poudyal PM, Jimba M et al. Controlling Taenia solium in Nepal using the PRECEDE-PROCEED model. Southeast *Asian J Trop Med Public Health* 2001; 32 (2):94-7.
4. Joshi DD, Bista PR, Ito A, Yamasaki H. Present situation of porcine taeniasis and human cysticercosis in Nepal. *Southeast Asian J Trop Med Public Health* 2007;38(1): 144-50.
5. Joshi DD,Maharjan M,Johansen MV et al. Improving meat inspection and control in resource-poor communities: the Nepal example. *Acta Tropica* 2003;87 119-27.
6. Rajshekhar V, Joshi DD, Doanh NQ et al. Taenia solium taeniosis/ cysticercosis in Asia: epidemiology, impact and issues. *Acta Tropica* 2003; 87: 53-60.
7. Del Brutto OH, Santibañez R, Noboa CA et al. Epilepsy due to neurocysticercosis: analysis of 203 patients. *Neurology* 1992 42:389–92.
8. Pal DK, Carpio A, Sander J. Neurocysticercosis and epilepsy in developing countries. *J Neurol Neurosurg Psychiatry* 2000;68:137-43.
9. Kotokey RK, Lynrah KG, De A. A Clinico-serological Study of Neurocysticercosis in Patients with Ring Enhancing Lesions in CT Scan of Brain. *J Assoc Physicians India* 2006; 54:366-70.
10. Medina MT, Rosas E, Rubio-Donnadieu F et al. Neurocysticercosis as the main cause of late-onset epilepsy in Mexico. *Arch Intern Med* 1990;150:325–7.
11. Talukdar B, Saxena A, Popli VK, Choudhury V. Neurocysticercosis in children: clinical characteristics and outcome. *Ann Trop Paediatr* 2002; 22(4):333-9.
12. Singhi P, Singhi S. Neurocysticercosis in children. *J Child Neurol* 2004; 19(7) 482-92.
13. Singhi P, Singhi S. Neurocysticercosis in children. *Indian J Pediatr* 2009;76 (5):537-45.

14. Basu S, Ramchandran U, Thapliya A. Clinical profile and outcome of pediatric neuro-cysticercosis: A study from Western Nepal. *J Pediatr Neurol* 2007; 5:45–52.

15. Martinz A. Anatomia pathlogicadelacisticercosis cerebral. *Neurocirugia* 1961;19:191-201.

16. Shrestha BM. Childhood Neurocysticercosis: Clinico-Radiological Profile and Outcome. *J Nepal Paedtr Soc* 2008;28(1):14-6.

17. Singhi P, Ray M, Singhi S, Khandelwal N. Clinical spectrum of 500 children with neurocysticercosis and response to albendazole therapy. *J Child Neurol* 2000;15 (4):207-13.

18. Ruiz-García M, González-Astiazarán A, Rueda-Franco F. Neurocysticercosis in children.Clinical experience in 122 patients. *Child Nerv Syst* 1997; 13 (11-12): 608-12.

19. Pozo-García MP, Campos-Olazabál P, Burneo J. Neurocysticercosis in a pediatric population in Lima: an epidemiological and clinical analysis. *Rev Neurol* 2003; 36 (3): 205-8.

20. Puri V, Sharma DK, Kumar S, et al. Neurocysticercosis in children. *Indian Pediatr* 1991; 28(11): 1309-17.

21. Gogia S, Talukdar B, Choudhury V, Arora BS. Neurocysticercosis in children: clinical findings and response to albendazole therapy in a randomized, double-blind, placebo-controlled trial in newly diagnosed cases. *Trans R Soc Trop Med Hyg* 2003; 97(4): 416-21.

22. Sharma M. Sociodemographic factors of pig farmers associated in transmission of taeniasis/ cysticercosis .*J Inst of Med* 2006;28(1): 57-60.