

Original Research Article

Sensitivity of IgG ELISA for diagnosing neurocysticercosis in a tertiary care hospital of North India

Samia Kirmani^{1*}, Haris M. Khan², Mohd. Khalid³ and Urfi⁴

¹Department of Microbiology, Jawaharlal Nehru Medical College (JNMC), Aligarh Muslim University (AMU), Aligarh, U.P., India

²Department of Microbiology, Jawaharlal Nehru Medical College (JNMC), Aligarh Muslim University (AMU), Aligarh, U.P., India

³Department of Radiodiagnosis, Jawaharlal Nehru Medical College, Aligarh Muslim University (AMU), Aligarh, U.P., India

⁴Department of Dermatology, Jawaharlal Nehru Medical College, Aligarh Muslim University (AMU), Aligarh, U.P., India

*Corresponding author

ABSTRACT

Keywords

Neuro-cysticercosis, ELISA, *T.solium*, Sensitivity, Seizures.

Neurocysticercosis is one of the most common infections of the nervous system in humans. The disease is endemic in most of the developing world. To study the sensitivity of ELISA for diagnosing neurocysticercosis in patients presenting with signs and symptoms suggestive of neurocysticercosis at J. N. Medical College, Hospital. The study was conducted in the Department of Microbiology and allied departments of JNMCH, Aligarh from January 2012 to June 2013. Study group comprised of 45 patients presenting with symptoms suggestive of neurocysticercosis and were found to have radiological features highly suggestive of neurocysticercosis. NovaTec Taenia solium IgG ELISA was used to detect antibodies against *Taenia solium*. Maximum number of patients (48.9%) belonged to age-group 15-29 years. Majority (68.9%) were males and belonged to Hindu community (68.9%). Seizures was the most common presenting complaint. The sensitivity and specificity of IgG ELISA was found to be 13.3% and 100% respectively. The sensitivity of ELISA for diagnosing neurocysticercosis is 13.3% in patients with clinical and radiological features of neurocysticercosis. Young males form the most common risk group. The disease is not restricted to Hindu community only as Muslims are also commonly affected.

Introduction

Taenia solium is a zoonotic cestode that causes taeniasis and cysticercosis in humans. The parasite is traditionally found in developing countries where undercooked

pork is consumed under poor sanitary conditions or as part of traditional food cultures and conditions favouring the transmission including warm climate, severe

poverty, and illiteracy are present. The disease spreads via the faeco-oral route through contaminated food and water. Symptomatic disease from *Taenia solium* cysts in the brain is referred to as Neurocysticercosis (NCC). Cysticercosis, is a major public health problem, especially in the developing world and NCC is one of the most common infections of the nervous system in humans (Garcia and Del Brutto, 2000; Sciotto et al., 2000).

NCC is identified as the single most common cause of community acquired active epilepsy; accounting for 26.3% to 53.8% cases of active epilepsy in the developing world. It has been estimated that the NCC affects approximately 50 million people world-wide and cause at least 50,000 deaths annually. NCC is responsible for a significant proportion of late-onset seizures in developing countries (Tsang and Wilson, 1995). It is now frequently identified in the United States and other industrialized countries because of increased immigration and improved diagnostic methods (Schantz et al., 1998).

For diagnosis, imaging studies such as computed tomography (CT) and magnetic resonance imaging (MRI) are recommended due to lack of specificity of symptoms (Del Brutto et al., 2001). CT is the best radiological method for the detection of intraparenchymal calcification while MRI is more sensitive for the identification of cysts in the ventricles.

Immunologic assays for the detection of cysticercosis-specific antibodies may be used either alone or in conjunction with brain imaging (Garcia et al., 1994). There is ample evidence for the widespread occurrence of the disease in India but the disease is under reported in India because due attention has not been given to this

neglected disease and systematic population-based studies are lacking. Thus to supplement the previous studies the present study was conducted to study the sensitivity of ELISA for diagnosing neurocysticercosis in patients presenting with clinical and radiological features suggestive of neurocysticercosis at J. N. Medical College, Hospital.

Materials and Methods

The present study was conducted in the Department of Microbiology, Radio-diagnosis and allied departments of J. N. Medical College Hospital, Aligarh over a period of one and a half years from February, 2012 to September, 2013. A total of 45 patients presenting to Department of Radio-diagnosis with seizures, headache, confusion and other non specific symptoms suggestive of neurocysticercosis (NCC) and were found to have radiological features highly suggestive of NCC were included in the study. Apart from study group, 11 age and sex matched patients were included as control.

All the cases were subjected to a detailed history and clinical examination. This study was approved by Institutional Ethics Committee of the Faculty of Medicine, A.M.U., Aligarh. Informed consent was obtained from the patients or from parents or guardians of patients less than 18 years of age. 5 ml of venous blood was withdrawn in vacutainer tubes from all patients after obtaining verbal informed consent and observing all sterile precautions. After 30 minutes, the tubes were centrifuged at 2000 rpm for 5 minutes for separation of sera. The sera were aliquoted in labelled vials and stored at -20°C.

Kit used: *Taenia solium* IgG ELISA (Novatec Immunodiagnostica GmbH, Germany)

The qualitative immunoenzymatic determination of antibodies against *Taenia solium* is based on the ELISA technique. Microtiter strip wells are precoated with *Taenia solium* antigens to bind corresponding antibodies. Diluted patient serum samples are added to the wells. IgG specific antibody, if present, binds to the antigen. All unbound materials is washed away and the enzyme conjugate is added to bind to the antibody-antigen complex, if present. The immune complex formed by the bound conjugate is visualized by adding tetramethylbenzidine (TMB) substrate. The intensity of the colored product is proportional to the amount of *Taenia solium* specific antibodies in the specimen.

Results and Discussion

Age and gender distribution of study group is shown in table-1. Maximum number of patients belonged to age-group 15-29 years followed by less than 15 years age-group. Majority of patients were males with male:female ratio of 2.2:1. Males dominated females in all age-groups except in 45 years and above age-group. Mean age of the patients was 19.42+11.23 years. Majority of patients belonged to Hindu community (Table-2). Table-3 shows that 60.0% of patients resided in rural areas while 40.0% patients resided in urban area.

As per Modified Prasad's classification (Dudala and Arlappa, 2013), maximum number of patients belonged to socio-economic class IV with 19 (42.2 %) patients, followed by class III with 15 (33.3%) patients. Class II had least 2 (4.4%) patients (Figure-1). Figure-2 shows 38 (84.4%) patients presented with seizures and only 7 (15.6 %) patients had headache as their chief presenting complaint. Table-4 shows that IgG antibodies against *Taenia*

solium were positive in 13.3% patients. 80.0% of patients tested negative while 6.7% patients were noted in grey zone. Considering all cases diagnosed on MRI as probable cases of NCC, the sensitivity and specificity of the *Taenia solium* IgG ELISA test came out to be 13.3% and 100% respectively.

NCC is one of the major cause of epilepsy in developing countries. It has varied clinical presentations. Hence, rapid and reliable diagnostic techniques need to be evaluated for its accurate diagnosis. We studied the role of ELISA in diagnosis of NCC to determine its sensitivity among suspected patients.

In our study the age distribution of the patients was similar to other global as well as Indian studies. Similar age profile was noted by (Crocker et al., 2012; Patil and Patithankar, 2012; Chakraborty et al., 2011). Males are more commonly affected and become ill in higher proportions probably due to more outdoor eating habits. This is in corroboration with the findings of other studies (Crocker et al., 2012; Patil and Patithankar, 2012; Chakraborty et al., 2011; Gauchan et al., 2011; Rodriguez et al., 2009).

In this study 68.9% of patients were Hindus and rest were Muslims. Agarwal (2012), Goel et al (2011) while studying cysticercosis also noted majority of study population as Hindus. The present study showed a high percentage of rural patients, probably related to poor hygienic conditions and higher amount of faecal contamination of drinking water in rural areas. This is in corroboration with the findings of Patil and Paithankar (2012). Contrary to the current literature, Chaoshuang et al (2008); Benedeti et al (2007) and Rajshankar et al (2006) found that urban population was at more risk

than rural population. The socio-economic factors play important role in the transmission of *T. solium*. Cysticercosis is generally a disease of lower socioeconomic conditions associated with poor hygiene and sanitation. Like the present study Agarwal (2012); Patil and Paithankar, (2012), while studying cysticercosis noted majority of patients belonged to lower socio-economic class. We found that predominant symptom in our patients (84.4%) was seizure followed by headache. In a systematic review among NCC patients in neurology clinics seizure was found to be the most common clinical feature seen in about 79% patients followed by headache in 38% (Carpio, 2013). Seizures as the most common clinical manifestation of the disease was also noted in other studies (Del Brutto, 2012; Chakraborty et al., 2011).

In our study the results of ELISA conducted on sera of patients showed sensitivity and specificity of 13.3% and 100% respectively. Similarly Intapan et al (2008) while studying IgG antibodies against cysticerci by ELISA observed 21.4% seropositivity with HP6-3 antigen. Verastegui et al (2003) noted 20% of cases were seropositive. Mittal et al (2001) found a sensitivity of 10.4%.

However higher seropositivity is noted by many authors. Ocana et al (2009) noted seropositivity of 37.2%. Shukla et al (2008) found a sensitivity of 92% and specificity of 84% of ELISA while studying immunodiagnosis of NCC in definitive cases. Kotokey et al (2006) found 78.43% sensitivity of ELISA test with a specificity of 100%. Low sensitivity observed in our study can also be attributed to false negative serology because of immune tolerance, inactive disease or localised antibody production in the CSF. It can also be attributed to the inclusion of probable cases and not definitive cases as included in other studies showing higher seropositivity.

Young males are predisposed to NCC especially in the poor socioeconomic group. The disease is not restricted to Hindu community only. Rural population and lower socioeconomic strata are more commonly affected. Seizures and headache are the most common presentation of NCC and sometimes may be the only indicator of the disease. Though highly specific, ELISA cannot be used alone for diagnosis of NCC but diagnosis should be based on combination of clinical, radiological and immunological ground.

Table.1 Age and gender distribution of study group

Age (years)	Male (%)	Female (%)	Total (%)
Less than 15	10(22.2)	7(15.6)	17(37.8)
15-29	18(40.0)	4(8.9)	22(48.9)
30-44	2(4.4)	1(2.2)	3(6.7)
45 and above	1(2.2)	2(4.4)	3(6.7)
Total	31(68.9)	14(31.1)	45(100)

Table.2 Distribution of patients according to their religion.

Religion	N(%)
Hindu	31(68.9)
Muslim	14(31.1)
Total	45(100)

Table.3 Distribution of patients according to their residence.

Residence	N(%)
Rural	27(60.0)
Urban	18(40.0)
Total	45(100)

Table.4 Distribution of patients according to the results observed in IgG ELISA test

IgG ELISA	N(%)
Positive	6 (13.3)
Negative	36 (80.0)
Grey zone	3 (6.7)
Total	45(100)

Figure.1 Distribution of patients according to socio-economic status

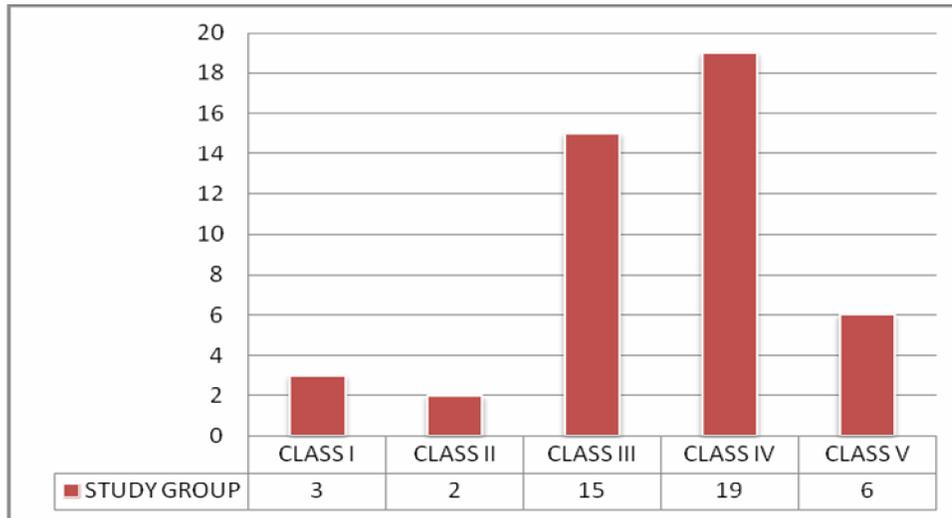
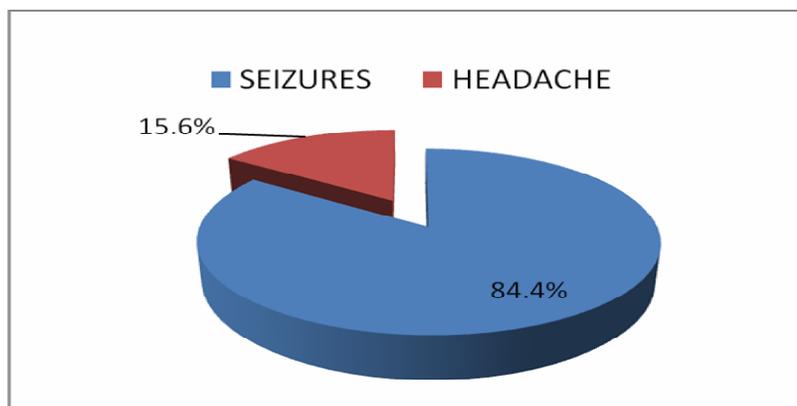


Figure.2 Distribution of patients according to their presenting complaints



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