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Research Article

Prevalence of Neurocysticercosis Infection Among HIV Individuals from a Tertiary Neurocare Center India

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Abstract

Neurocysticercosis (NCC) is the infection of central nervous system (CNS) caused by the cysticercal larvae of the parasite *Taenia solium*. NCC Accounts for 30% of all treatable epilepsy cases among endemic countries. Worldwide increase in the cases of HIV infections, has led to increase in the coinfection by various pathogens. The interactions between HIV and *Taenia solium* are not well defined. The present retrospective study has a total 92 cerebrospinal fluid (CSF) samples from HIV reactive patients which were subjected for anti cysticercal antibody assay by indigenously developed indirect ELISA. Twelve CSF samples showed reactivity for cysticercal antigens by ELISA. The overall prevalence of Neurocysticercal infection among HIV infected individuals was 13.04% which is higher in comparison to other studies. Middle aged males were predominantly affected. There are very limited studies available in literature which focusses on the epidemiological, diagnostic and management guidelines on HIV/NCC coinfection. Further studies are needed to generate data from different centers on this neglected and co-infection group.

Keywords: Central Nervous System; Enzyme Linked Immunosorbent Assay; Human Immunodeficiency Virus; Neurocysticercosis; *Taenia Solium*

Introduction

Central nervous system (CNS) infections are potentially life-threatening conditions which are frequently associated with high morbidity and mortality [1]. Since 1980s CNS infections have become more frequent, this could be linked to the surge in Human immunodeficiency virus infection. Other risk factors are use of immunosuppressive and immunomodulatory drugs among transplant and cancer patients [2].

Neurocysticercosis (NCC) is the infection of central nervous system (CNS) caused by the cysticercal larvae of the parasite *Taenia solium*. NCC Accounts for 30% of all treatable epilepsy cases among endemic countries [3]. It has worldwide distribution, but predominantly occurs in southeast Asian, African and Latin American countries [4].

In the year 2015 the global prevalence of NCC was 2.5-8.30 million. This parasitic infestation was recognised as neglected tropical disease by World health Organization (WHO) in the year

2010 [3]. It is usually observed in countries with poor sanitation, where there is a high risk of faecal oral contamination of *Taenia solium* eggs. Cysticercal larvae can develop in muscles, eye, skin, CNS and other parts of the body. Involvement of CNS is seen among 60% -90% of patients posing a great threat to human life. It usually presents with symptoms such as head ache, convulsions and epileptic seizures, which at times mimics TBM Garcia., *et al.* (2005) [3,4].

By end of year 2021, globally there were 38.4 million people living with HIV *(Human immunodeficiency Virus)* infection [5]. The HIV reduces cell immunity and CD4+ T cell count, by which it accelerates the pathogen transfer from one compartment to other effortlessly. Worldwide increase in the cases of HIV infections, has led to increase in the coinfection by various pathogens [6].

The most common pathogens associated with CNS infection are *Mycobacterium tuberculosis, Taenia solium, toxoplasma, Malarial parasite* and many others [6]. The interactions between HIV and *Taenia solium* are not well defined. The following study was undertaken to study the prevalence of HIV/NCC coinfection.

Materials and Methods

Overview: The present retrospective study was undertaken in the department of neuromicrobiology, tertiary Neuro care center, Bangalore, India, for a period of 6 months from September 2016 to February 2017. A total of 92 cerebrospinal fluid (CSF) samples from HIV reactive patients were subjected for anti cysticercal antibody testing by indigenous indirect ELISA. The CSF samples were tested in duplicates by ELISA. Demographic details and HIV seropositivity status of the patients were collected from the medical records. The following study was conducted on the CSF samples after performing the routine laboratory examination of chronic meningitis, hence institutional ethical approval was not applicable.

Immunological procedure

Cysticercus cellulosae antigen preparation

The cysticercal cyst was collected from the pig meat infested with *Taenia solium* parasite into sterile phosphate buffer solution (PBS) with thiomersal preservative. The NCC antigen is prepared by grinding cysticercal cyst with PBS under aseptic precautions with homogeniser. The preparation was cold centrifuged at 5000 rpm, later supernatant was subjected for protein strength measurement by Lowry's method. This supernatant was used as cysticercal antigen [7].

Enzyme linked immunosorbent assay

The microtiter plate for the assay was prepared by coating 50 µl/well of cysticercal antigen dissolved in phosphate buffer solution (PBS) and incubating overnight at 4^0C in a moist chamber. Then these plates were washed with freshly prepared 1% phosphate buffer Tween 20 solution (PBST) to remove any unbound antigen. Later freshly prepared 1% PBST milk was added (100 µl/well) to block free binding sites. Plates were dried by tapping and stored at -70^0C until further use. Dilute CSF samples at 1:10 in 1% PBST milk prior to use. Diluted sample of 50µl per well is dispensed in duplicates into the antigen precoated ELISA plates. Positive control and negative controls were included in each run of the samples. For 90 minutes the plates were incubated at 37^0C, which was followed by 5 times washing with PBST and tap drying. Conjugate [Horse radish peroxidase enzyme conjugate with polyclonal rabbit anti-human IgG (Dako, Denmark), 1:3000 dilution with PBST milk] 50 µl/well was then added to each well and again incubated for 60 minutes at 37^0C. Plates were washed 5 times with PBST and dried. Substrate (O-phenylene diamine chromogen) 75 µl/well was dispensed into each well. Plates were again incubated roughly for10 minutes in dark till the color is developed. Stop solution (50 ul)containing 2N sulphuric acid was dispensed to each well to stop the reaction. ELISA plates were measured for absorbance values (OD) by reading in ELISA reader (Sunrise Magellan, Tecan-AG, Austria Gmbh) at 492 nm [7].

Results

In the following study we have looked into the prevalence of NCC/HIV coinfection. Out of the 92 CSF samples analysed, 12 were reactive for cysticercal antigens by ELISA. So, the overall prevalence of Neurocysticercal infection among HIV infected individuals was 13.04%. Study group majorly belonged to the age group between 20-50 years. Male gender was predominantly affected. There were no other comorbidities.

Discussion

Neurocysticercosis and tuberculosis are the important cause of chronic meningitis in India. Clinical data regarding the Coinfection

of HIV and TB are well available. Coinfection of Neurocysticercosis and HIV is less available. The prevalence of HIV/Neurocysticercosis in the present study was 13.04%. Middle aged males were predominantly affected. In the past very few studies have been performed to envisage the prevalence of HIV/NCC coinfection. Among them, some studies have considered post mortem autopsy findings to diagnose, in some CT findings or serological tests. The studies which included autopsy findings were Jessuren., *et al.* from Mexico (1992) and Moskowitz et al (1984) from USA. In Jessuren., *et al.* study the prevalence NCC was higher among HIV negative (2.4%) in comparison to HIV positive (1.1%) patient [8]. Moshowitz et observed the prevalence of 1.9% in his study [9]. In both these studies the prevalence was very less in comparison to our study. CT scan findings were considered for diagnosis of NCC among HIV positive patients in the studies by Benner., *et al.* (2011) from south Africa and Kumwenda., *et al.* (2005) from Blantyre [10,11]. South African study showed very high prevalence of NCC among both HIV seropositive (38.2%) and negative patients (21.2%). The high prevalence observed in South African study was because of the fact that the country is endemic to both HIV and NCC [1]. Kumwenda., *et al.* (2005) observed 4.2% of patients with NCC/HIV coinfection. Our Indian study from Puducherry by Parija et al by immunological study showed sero-positivity to be around 5% among HIV positive subjects [12]. Schmidt., *et al.* from Tanzania showed equal distribution of NCC 2.4%, irrespective of HIV seropositivity status [13]. Noormahomed., *et al.* (2014) from Mozambique showed NCC coinfection among HIV positive patients to be 10.2 % [14]. A study conducted at our center in the year 2006 and 2011, where more than 3000 serum samples from healthy donors were screened for anti-cysticercal antibodies revealed 2% positivity rate (unpublished data). Most of the above studies are from developing countries. Sanitation plays important role in the prevalence of NCC. The poorest populations that live in close proximity to domestic animals are frequently found to have neglected zoonotic infections [15]. Among the People living with HIV(PLHIV) there is a remarkable reduction in the rate of infection and death following successful antiretroviral therapy (ART). However, there still exists a 1.5 million deaths annually [16].

Conclusion

Central nervous system (CNS) infections are potentially life-threatening conditions which are frequently associated with high morbidity and mortality. Infections can be caused by numerous pathogens [1]. The present study showed the overall prevalence of Neurocysticercal infection among HIV infected individuals to be 13.04% which is higher in comparison to other studies. Middle aged males were predominantly affected. There are very limited studies available which focusses on the epidemiological, diagnostic and management guidelines on HIV/NCC coinfection. Further studies are needed to generate data from different centers on this neglected and co-infection group.

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Authors contributions

- **Shripad A Patil:** Study design, Data collection, Experiment conduction, Analysis of results, Manuscript preparation
- **Kruthika P:** Study design, Data collection, Analysis of results, Manuscript preparation
- **Abhishek P:** Manuscript preparation and discussion.
- **Netra M:** Clinical input.

Conflict of Interest

None.

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