

# Neurological manifestations in human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS)

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**Abstract:** Next to Sub-Saharan Africa, India has the second largest burden of HIV related pathology, essentially caused by HIV-1 class C in both the geographic locals, in contrast to USA and Europe, but the prevalence of HIV related neuro infections and pathology is not available due to inadequate medical facilities, social stigma and ignorance that lead to under diagnosis. All the systems in the body tend to be affected by the HIV virus, but the central nervous systems affection is involved very early in the disease as the virus is neurotropic. There is a wide spectrum of central nervous system diseases occurring in AIDS patients. The purpose of our study was to detect, characterize and compare various MRI findings in central nervous system diseases in PLHIV.

**Index terms-** AIDS: Acquired Immune Deficiency Syndrome, CT: Computed Tomography, MRI: Magnetic Resonance Imaging, PML: Progressive Multifocal Leukoencephalopathy, HIVE: HIV Encephalopathy, ADC: AIDS Dementia Complex, CNS: Central Nervous System.

## AIMS :

To demonstrate the usefulness of cranial magnetic resonance imaging (MRI) in the evaluation of the HIV-infected patients presenting with the neurological symptoms.

## OBJECTIVE:

- 1.To describe the pattern of the cranial magnetic resonance imaging findings in HIV infected patients presenting with neurological symptoms.
- 2.Correlation between neurological symptoms and cranial MRI findings.

## MATERIAL AND METHODS

The study was carried out on 50 patients who were HIV positive and had Central nervous system complaints MRI were performed on all the patients included in the study and the findings were compared.

Relevant history of illness and significant clinical findings of all patients were recorded previous investigations were reviewed while performing MRI, in selective patients sedative were used under the supervision of the anaesthetist. All patients were seen by appointments, except for emergency cases.

### Inclusion criteria:

All patients diagnosed of HIV with neurological symptoms were included in this study.

MRI was performed with 1.5 Tesla and 3 Tesla MR scanner using dedicated head coil. Conventional MR imaging was performed by taking T1W, T2W, T2WI TR and FLAIR sequences in axial, sagittal and coronal planes. Post

gadolinium (dose 0.1 mmol/kg) enhanced MRI was performed in axial, coronal and sagittal planes in selected cases depending on findings on non contrast study or clinical suspicion. When required, DWI study and MR spectroscopy was performed by using point resolved spectroscopy.

**Exclusion Criteria:** Patients who were allergic to contrast media, those who had contra indications for MRI and those who were not willing were excluded from the study.

**Risk involved:** Adverse drug reaction due to contrast agent (gadolinium) used in MRI.

## INTRODUCTION

AIDS was first reported in 1981 and in 1984 human immunodeficiency virus was identified as the causative agent. In India the first case was reported by Christian Medical College, Vellore in 1986. The HIV belongs to a subset of retroviruses called lentiviruses (or slow viruses), which means that there is an interval between the initial infection and the onset of symptoms. Upon entering the bloodstream,

HIV infects the CD4+ T cells and begins to replicate rapidly. In the more advanced stages of HIV infection, acquired immunodeficiency syndrome (AIDS) develops. The total number of people living with HIV (PLHIV) in India is estimated at 21.17 lacs in 2015 as per the NACO report.HIV is a neurotropic virus, so in the early course of infection that enters the central nervous system (CNS). HIV crosses the intact blood-brain barrier, and the virus has been cultured from the brain, nerve, and cerebrospinal fluid of

patients at all stages of disease. This virus infects the cells of the monocyte-macrophage lineage, and the indirect effects on macrophage activation are implicated as a cause of nervous system injury in HIV infection.

In 10%–20% of patients neurologic disease is the first manifestation of symptomatic HIV infection. Diseases occurring in brain in HIV patients are:

**1. Primary effects of HIV:**

- AIDS Dementia complex
- HIV encephalopathy
- HIV meningoencephalitis

**2. Opportunistic infection:**

- Progressive multifocal leukoencephalopathy
- CMV encephalitis
- Herpes encephalitis
- Toxoplasmosis
- Cryptococcosis
- Bacterial and fungal abscesses
- Neurosyphilis
- Meningitis-Tubercular
- HIV meningoencephalitis
- Cryptococcal
- Ventriculitis

**3. Neoplasm**

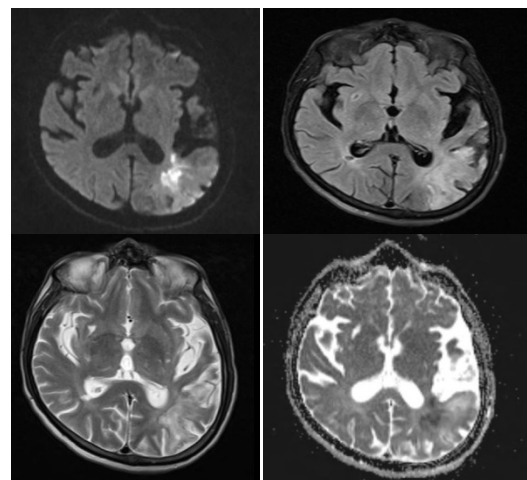
- Primary CNS lymphoma
- CNS glioma
- Kaposi's sarcoma
- Small non cleaved cell lymphoma burkitt type

**4. Vasculitis**

**5. Immune reconstitution inflammatory syndrome.**

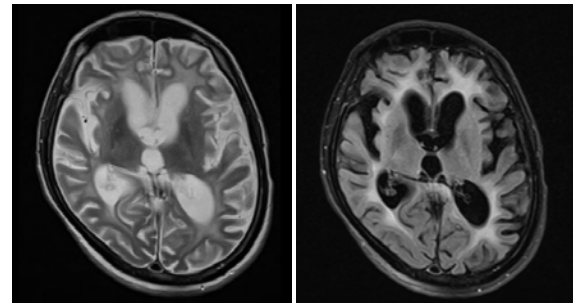
Differential diagnosis of neurological disease processes in PLHIV patients is difficult as the clinical symptoms are often non specific. Hence CT and MRI are often used. The purpose of our study was to detect, characterize and compare various

MRI findings in central nervous system diseases in PLHIV.



**Figure-1:**

Subacute hemorrhagic infarct: Patchy area of restricted diffusion with corresponding low ADC values in left parieto-occipital region which appear hypointense on T1WI, hyperintense on T2WI and FLAIR images and shows patchy areas of blooming on gradient images.



**Figure-2:** HIV encephalopathy. Bilateral symmetric confluent T2/ FLAIR hyperintensities in bilateral frontotemporo-parietal white matter.

**STATISTICAL ANALYSIS**

The final diagnosis was made after considering clinical features, and radiological findings.

**Comparative evaluation of sex distribution in cases of HIV**

	Our study(%)
Male	70
Female	30

**Frequency of neuroimaging findings in pattern**

	% in our study
Diffuse white matter	54
Contrast enhancement	72
Periventricular white matter	8
Cerebral cortical atrophy	20

**Presenting symptoms in cases of HIV with neurological complications**

Fever	32
Altered sensorium	34
Headache	20
convulsion	38
Stroke	12
Vomiting	8

In our study most common neurological symptom in HIV patients was convulsion followed by altered consciousness and fever.

### Comparative evaluation of radiological diagnosis in HIV infection

	% in our study
Neurotuberculosis	26
Progressive multifocal leukoencephalopathy	16
Isolated infarct	10
Toxoplasmosis	10
HIV encephalitis	8
Cerebral atrophy	6
AIDS dementia complex	4
Fungal infection	4
Internal carotid artery thrombosis	2
Lymphoma	0

In our study, most common pathology in HIV cases was neurotuberculosis. Other common pathologies were Progressive multifocal leukoencephalopathy, isolated infarct and toxoplasmosis.

### SUMMARY

This study represents the first step of a multiphase study directed toward developing decision rules for the use of neuroimaging in HIV positive patients with suspected CNS disease. The present study was carried out to describe the various patterns magnetic resonance imaging findings in HIV infected patient presenting with neurological symptoms, to correlate between neurological symptoms and cranial MRI findings and to assess the significance of CD4 count in HIV positive patients having neurological symptoms.

In our study, all patients were subjected to detailed clinical history, examination, certain relevant investigation and MRI scan head.

- Most common age group was found to be 21-40 years. mean age was 40.56 years for male and 37.19 years for female.
- Males were more common than females. Male : female ratio was found to be 2.3 : 1.
- Most common neurological symptoms was convulsion followed by altered status.
- Most of the focal lesions were infectious in origin.
- Tuberculosis was the most common finding in the present study.
- Tuberculous meningitis was the most common type of meningitis.

- Cerebrovascular accident was the most common non infectious lesion.
- Fever only was found to have significant negative association with the lesion. Fever with other neurological symptoms and altered mental status with other neurological symptoms were also statistically significant symptoms.

### CONCLUSION

Our study offers a guideline that might be used to identify all HIV infected patients with intracranial lesions necessitating early intervention, while limiting the number of necessary 'stat' and comparatively expensive head MRI performed by using a more selective guidelines. Our data indicates that all patients with CD4 count <200cells/mm<sup>3</sup> should be subjected to MRI scan head. Headache and altered status be in combination or in combination with other neurological symptoms is to be evaluated. Further evaluation of this larger numbers of patients may reveal that other clinical parameters should be included in the guidelines.

CT and MRI are both excellent means of detection of cerebral lesion in AIDS patients useful in initial diagnosis and in therapeutic follow up evaluation. MRI has a higher sensitivity. Imaging findings of the lesion in HIV infected patients may overlap, and differential diagnosis may be difficult ; however, certain imaging characteristics and localizations are lesions may favour the diagnosis. Adjunctive imaging tools such as proton MRS, perfusion weighted MRI or MR angiography may help to identify certain pathologic abnormalities to highlight the diagnosis.

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