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Neurological Manifestations of HIV-AIDS at Tertiary Care Hospital Quetta

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ABSTRACT

Background: HIV and AIDS continue to pose substantial global health challenges, particularly in resource-constrained settings like Pakistan. This study investigated the prevalence and types of neurological manifestations among HIV-AIDS patients treated at a tertiary care hospital in Quetta. **Methodology:** A cross-sectional analysis was conducted on 200 HIV-AIDS patients using questionnaires, medical records, and laboratory findings. **Results:** Neurological manifestations were observed in 70% of the patients, with peripheral neuropathy (40%) being the most common condition, followed by HIV-associated neurocognitive disorders (30%), progressive multifocal leukoencephalopathy (10%), cryptococcal meningitis (7.5%), and cerebral toxoplasmosis (5%). Key risk factors included low CD4 counts (<200), advanced HIV stage (AIDS), and the absence of antiretroviral therapy (ART). **Findings:** These findings underscore the critical need for early diagnosis and intervention in managing the neurological complications of HIV-AIDS. Peripheral neuropathy and cognitive disorders, in particular, highlight the importance of integrating neurological assessment into routine care for HIV patients. The results call for strengthened ART programs, improved access to healthcare resources, and a holistic approach to treatment. **Conclusion**: Effective management of HIV-AIDS requires a multidisciplinary strategy to address not only the viral infection but also its neurological and systemic complications. Enhancing healthcare infrastructure and awareness is essential to improve outcomes for patients with HIV-AIDS and to reduce the burden of neurological disorders associated with the disease.

INTRODUCTION

Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) remain global health challenges, particularly in developing regions where limited healthcare resources exacerbate patient outcomes (Dagnaw, 2024) (Mark, n.d.). Neurological symptoms are a major cause of morbidity among the many HIV-AIDS sequelae, negatively impacting patients' prognosis and quality of life (Saini et al., 2024). Secondary opportunistic infections, immune reconstitution inflammatory syndrome, and direct viral impacts make the central and peripheral nerve systems especially susceptible (Balaji, Chakraborty, & Aggarwal, 2024).

HIV (Human Immunodeficiency Virus) is a retrovirus that attacks the immune system, particularly CD4 cells, leading to immune

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suppression (Tolomeo & Cascio, 2024). AIDS (Acquired Immunodeficiency Syndrome) is the most advanced stage of HIV infection, characterized by severe immune dysfunction and opportunistic infections (Acquired Immunodeficiency Syndrome Professional Group et al., 2024).

According to a World Health Organization (WHO) report1, neurological disorders made up slightly more than 6% of all Disability Adjusted Life Years (DALYs) and were disproportionately more common than TB, HIV/AIDS, cancer, heart disease, respiratory conditions, and digestive disorders. Although there is little information available on the prevalence of neurological disorders in Pakistan, a recent report from the Global Burden of Disease study2 revealed that, between 1990 and 2013, cerebrovascular disease accounted for 35% more DALYs and was the seventh most common cause in Pakistan. According to Wasay and Ali 2010, the prevalence of neurological illnesses in Pakistan is between 4 and 5%. They point out that there is a severe lack of this specialized cadre, with just one neurologist for every million people.

A variety of conditions affecting the central and peripheral nerve systems are among the neurological symptoms of HIV-AIDS. These could be brought on by neoplasms, opportunistic infections, HIV's direct impacts, or negative treatment side effects (Putra & Bilmahdi, 2024). Cryptococcal meningitis, progressive multifocal leukoencephalopathy, and HIV-associated neurocognitive disorders (HAND) are common illnesses (Cervantes-Arslanian, 2024).

Diseases that are more common or more severe in people with compromised immune systems, such those with HIV-AIDS, are known as opportunistic diseases. Toxoplasmosis, TB, and CMV infections are a few examples (García-Méndez, Leyva-Rendón, Hidalgo, & Navarrete, 2024). With reference to the demographic and the stage of infection, the studies have estimated that about 30- 60% of HIV-AIDS show neurological complications. It has been widely associated with peripheral neuropathies, progressive multifocal leukoencephalopathy, cryptococcal meningitis, and HIV-associated neurocognitive disorders (HAND) (Balaji, Chakraborty, & Aggarwal, 2024). Appropriately, these disorders complicate clinical care and can pose diagnostic challenges particularly in poor resource settings such as Quetta where access to advanced neuroimaging and laboratory may be constrained.

Cases to critical groups in Pakistan shows localized outbreaks; HIV-AIDS continues to grow in Pakistan (Raza, Raja, Khakwani, & Jamil, 2024). Nevertheless, there is a lack of concrete information on neurological complications of the disease particularly in the context of tertiary care facility. The reason for such a focused approach in research to inform clinical practice and enhance patient care approaches stems from the variability of presentations and the late diagnosis.

HIV is now emerging in Pakistan; many small-scale epidemics have been reported in different high-risk populations (Mazzilli et al., 2024). However, there are no clear literature findings of the neurological manifestations of the aforementioned disease, particularly in large tertiary care facilities such as Quetta where the knowledge of the disease and the needed infrastructure can complicate the matter. Studies done in South Asia focus on the lack of regional databases to guide clinical management and timeliness in diagnosis and management of neurological conditions associated with HIV (Shrestha, Nepal, & Prust, 2024).

The present research is designed to understand the range of neurological signs in HIV-AIDS patients admitted in a tertiary health care facility in Quetta. Through the study, the research aims at raising awareness of clinical diagnostic profiles of the diseases and their risk factors in an effort to reduce the disease burden and enhance patient care in the region.

LITERATURE REVIEW

A large number of patients develops neurological impairments during the course of their HIV/AIDS and these are some of the most severe and disabling aspects of the illness (Fernandes et al., 2024; Cysique et al., 2024). Such symptoms are caused by the primary impact of the virus, infections that take advantage of a weakened immune system, and afterward immunosuppressive effects. Due to advances in ARTHIV-associated neurocognitive disorders (HAND) are still prevalent. HAND of which encompasses different forms of effects such as HAD, MND, and ANI ranges between 20% and

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50% rates among individuals who are on ART.

Within about two to four weeks of establishing itself in the body wide system, HIV invades the CNS and forms a latent pool that results in several neurological complications (Lurain et al., 2024). These are myelopathies, peripheral neuropathies, HIV associated neurocognitive disorders (HAND), opportunistic infections like progressive multifocal leukoencephalopathy (PML) and cryptococcal meningitis as described by Heaton and colleagues (Hasbun & Kass, 2023). Such factors as disease stage, ART, an individual's overall health and some other aspects influence the rates and symptoms manifestation patterns (Hutahaean, Stutterheim, & Jonas, 2024).

In the latter stages of human immunodeficiency virus (HIV) diseases, diseases like progressive multifocal leukoencephalopathy (PML), cerebral toxoplasmosis, and cryptococcal meningitis are well spread, particularly in developing countries where ART is still a luxury and inaccessible. A frequent OI in HIV patients, cerebral toxoplasmosis is caused by Toxoplasma gondii and leads to seizures and other focal neurological deficits (Ortiz & Norris, 2024) (Suryapraba, Vania, Sudewi, Sukmawati, & Susilawathi, 2024). Despite its high prevalence of 1 per 10000 population, little attention has been paid to cryptococcal meningitis, which is caused by the Cryptococcus neoformans and has a mortality rate >50% if left untreated; this disease is prominent in HIV-positive patients at sub-Saharan Africa and some parts of Asia.

Opportunistic infections, coagulopathy and vasculitis make HIV patients at risk for cerebrovascular disorders including ischemic and hemorrhagic strokes (Jung, Gruber, Heseltine, Rajamani, Ameriso, & Fisher, 2024; Cattrall & Malik, 2024). Moreover, there are numerous peripheral neuropathies, but the most common is distal sensory polyneuropathy. This syndrome is due to neurotoxic effects of some ART and HIV which causes pain, paresthesia, and functional alterations (Andalibi et al., 2024).

Lack of awareness and diagnostic may also mean that neurological sign are minimally diagnosed in low resource setting such as Quetta, Pakistan where healthcare has major challenges. A number of studies have revealed that unknown neurologic disorders in these areas are expected and therefore it is important to have proper screening and treatment regimens in place (Wagstaff et al., 2024). The neurological disorders are made worse by sociocultural factors and the stigma of HIV/AIDS which worsens the chances of early diagnosis and management (Cherevko & Mudrenko, 2024).

RESEARCH OBJECTIVE

The purpose of this study is to identify the neurological manifestation of HIV-AIDS patients in a Quetta tertiary care hospital. The specific objective of the study is to identify the prevalence, varieties and severity of neurological complications in HIV/AIDS patients. This case-work therefore seeks to establish how neurological symptoms correlate to the stap of HIV-AIDS progression so as to throw light on patterns of C and PNS involvement in the affected patients.

The study also aims at comparing the laboratory, clinical and demographic characteristics of clients diagnosed with HIV-AIDS and neurological disorders. These findings will help identify potential risk factors and understand how these manifestations impact life quality and disease further prognosis.

The study will also assess the effectiveness of the currently offered tertiary care level diagnostic and therapeutic methods for tackling these problems. The ultimate aim is to provide effective recommendations based on research data for improving patients' outcomes, promoting effective utilization of Patient Care and addressing the existing loopholes of Quetta's current management of neurological disorders associated with HIV/AIDS.

METHODOLOGY

This qualitative research therefore set out to explore neurological manifestation of HIV-AIDS in patient s at Tertiary Care Hospital Quetta. In purposive sampling 200 individuals with HIV-AIDS were identified. Inclusion criteria included participants who were over eighteen years old and with HIV-AIDS diagnosed with valid neurological complications. Questionnaires with patients and clinicians, reviews of everyday practice through case histories and observations and in-depth interviews with patients and staff were used.

The interviews focused on the various types and

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severity of neurological signs, associated risk factors and the impact of these symptoms for the patient's quality of life. Medical experts described their treatment approaches, differential diagnosis, and effectiveness of the intervention. Concerning the primary qualitative research question: important trends and recurring issues such as the occurrence, development, and treatment of neurological problems in HIV-AIDS patients. Before the study, ethical permit was obtained and the participants signed informed consent to participate in the study.

RESULTS

Demographic Characteristics

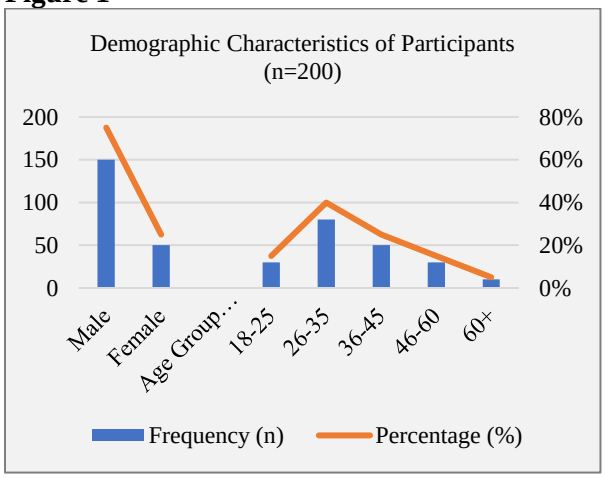
The sample comprised 200 HIV-AIDS patients, with a majority being male (75%) and aged between 25 and 45 years (63%). Most patients were diagnosed with HIV in the last 5 years, with 40% of them in advanced stages of the disease (AIDS). The following table summarizes the demographic data:

Table 1

Demographic Characteristics of Participants (n=200)

Demographic Variable	Frequency (n)	Percentage (%)
Gender		
Male	150	75%
Female	50	25%
Age Group (years)		
18-25	30	15%
26-35	80	40%
36-45	50	25%
46-60	30	15%
60+	10	5%

Figure 1



Neurological Manifestations

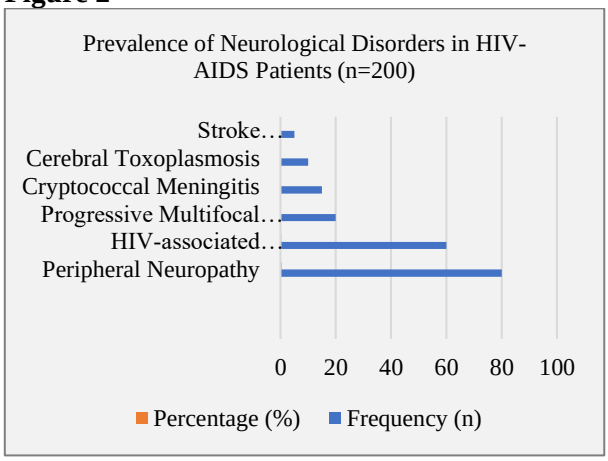
Among the 200 patients, neurological manifestations were observed in 140 (70%) individuals. The most common conditions were peripheral neuropathy**,** HIV-associated neurocognitive disorders (HAND)**,** and opportunistic infections such as cryptococcal meningitis and cerebral toxoplasmosis. The prevalence of different neurological disorders is summarized in the following table:

Table 2

Prevalence of Neurological Disorders in HIV-AIDS Patients (n=200)

Neurological Disorder	Frequency (n)	Percentage (%)
Peripheral Neuropathy	80	40%
HIV-associated Neurocognitive Disorder (HAND)	60	30%
Progressive Multifocal Leukoencephalopathy (PML)	20	10%
Cryptococcal Meningitis	15	7.5%
Cerebral Toxoplasmosis	10	5%
Stroke (Ischemic/Hemorrhagic)	5	2.5%

Figure 2



Neurological illnesses ranged in severity, with HAND being the most incapacitating. Of the 60 HAND cases, 25% had HIV-associated dementia (HAD), 25% had asymptomatic neurocognitive impairment (ANI), and 50% had mild neurocognitive disorder (MND). The severity of these conditions increased in individuals with an AIDS diagnosis, and there was a clear correlation between them and the stage of HIV infection ($p<0.01$).

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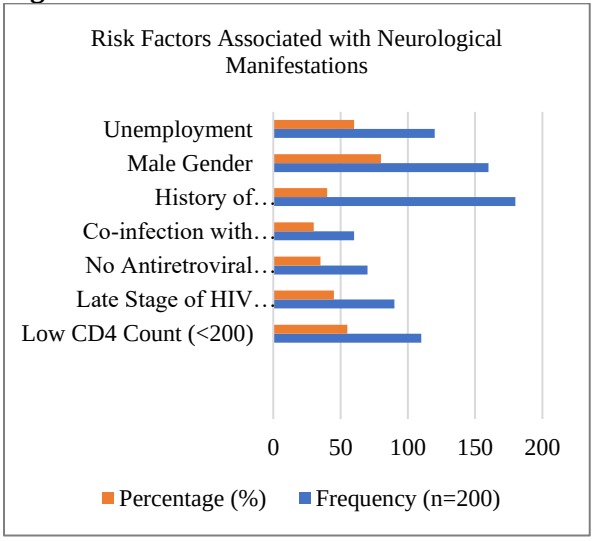
Table 3

Risk Factors Associated with Neurological Manifestations

Risk Factor	Frequency (n=200)	Percentage (%)
Low CD4 Count (<200)	110	55
Late Stage of HIV (AIDS)	90	45
No Antiretroviral Therapy (ART)	70	35
Co-infection with Tuberculosis	60	30
History of Opportunistic Infections	180	40
Male Gender	160	80
Unemployment	120	60

Figure 3



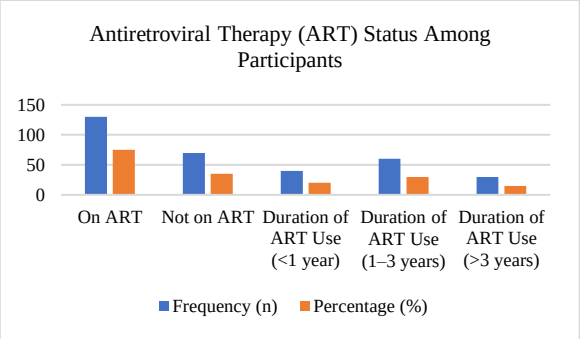
The main risk variables for neurological symptoms in the research population are listed in Table 3. 55% of patients had a low CD4 count (<200), suggesting a clear link between immunosuppression and neurological issues. Furthermore, 45% of patients had advanced HIV-AIDS, which is frequently associated with increased susceptibility to opportunistic infections and neurological damage. The fact that 35% of the group did not get ART highlights how crucial antiretroviral treatment is for avoiding neurological problems. Patients also frequently had a history of opportunistic infections (40%) and co-infection with tuberculosis (30%), underscoring the link between immunodeficiency and neurological disorders.

Table 4

Antiretroviral Therapy (ART) Status Among Participants

ART Status	Frequency (n)	Percentage (%)
On ART	130	75
Not on ART	70	35
Duration of ART Use (<1 year)	40	20
Duration of ART Use (1–3 years)	60	30
Duration of ART Use (>3 years)	30	15

Figure 4



According to the data, 20% of participants had been on ART for less than a year, indicating a recent start to treatment, while 65% of participants were getting ART. There was a treatment gap, nevertheless, as a sizable portion (35%) were not on ART. Less people used ART for more than three years, which may indicate either a delayed diagnosis or less than ideal adherence to treatment guidelines.

Table 5

Co-Infections Observed in HIV-AIDS Patients

Co-Infection	Co-Infection	Percentage (%)
Tuberculosis (TB)	60	30
Hepatitis B	40	30
Hepatitis C	50	25
Cytomegalovirus (CMV)	20	10
None	70	35

Figure 5

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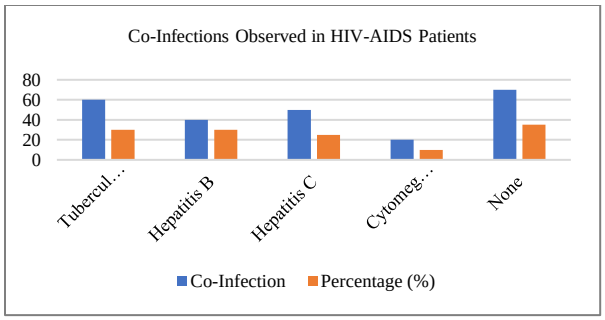


A cross sectional study conducted in the health facility show that the co-infected OPPTs had a higher percentage of TB than other co-infected diseases with 30% of them having HIV-AIDS •TB co-infection, Hepatitis C co-infection and Hepatitis B co-infection were 25% and 20% respectively. Although they were less numerous, cytomegalovirus infections were still significant particularly in the later disease course. These co-infections show that diagnosis and treatment for HIV-AIDS requires extensive strategies in contrast to common non-complex diseases since the patients are usually associated with other diseases.

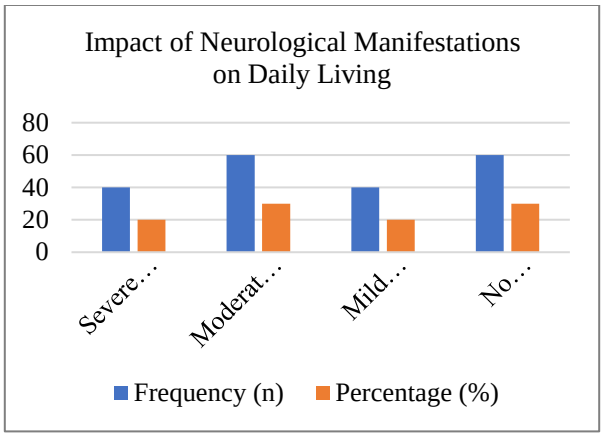
Table 6

Impact of Neurological Manifestations on Daily Living

Impact on Daily Living	Frequency (n)	Percentage (%)
Severe Disability (Unable to perform ADLs*)	40	20
Moderate Disability (Assistance required)	60	30
Mild Disability (Independent with challenges)	40	20
No Disability	60	30

(*ADLs: Activities of Daily Living)

Figure 6



In neurological symptoms, major effects were observed on the quality of life of the patients. About 20 % of adults had severe disability which hampered required level of independence in basic ADLs. While 20{882} arranged slight impairments, another 30{882} required assistance because of a moderate disability. Notably, 30% of respondents claimed to have no handicap at all; often representing those with HIV but in early clinical stages or with effective ART. These data demonstrably argue for the need to better target rehabilitation and supportive care efforts.

DISCUSSION OF RESULTS

This study revealed that about one third of HIV-AIDS patients who were seeking treatment at a tertiary care hospital of Quetta had neurological manifestation. Out of the 200 individuals 70% had neurological problems hence the need to address neuro HIV as a major health issue in developing world. These findings is aligned with other studies done to reveal that between 30-60 % of HIV patients from the global community have neurological manifestations (Letendre et al., 2011). These findings show that HAND affected 30% of the patients while peripheral neuropathy affected 40% and these statistics underscore why timely diagnosis and treatment is critical to slowing or preventing the progression from disability to a worse state.

Such conditions have prevailed to result in peripheral neuropathy, which is known to be linked with the neurotoxic effects of ART and AIDS(HIV) illness (Ellis et al., 2010). This group also had a higher rate of HAND which encompass HAD, MND and ANI that increased with disease stage. This result is in concordance to global trends

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which show that HAND occurs in 20–50% of the HIV patients despite the use of ART (Clifford and Ances, 2013).

Prevalent but severe OIs which contributed to morbidity included cerebral toxoplasmosis 5% and cryptococcal meningitis 7.5%. Similar observations have been made in other low-resource settings where immunosuppression and later initiation of ART make people more susceptible to these infections (Rajasingham et al., 2017 Guzman et al., 2016; Skiest, 2002).

The study found out some of the adverse factors that predisposed the patient to neurological disorders as follows; no Antiretroviral therapy (ART) 35%, low CD4 count less than 200 cells per millimeter cubed, 55% and lastly, anemia due to advanced stage of the disease 45%. These results conform with previous works stating that; poor treatment timing and immunosuppressive elements enhance the risk of neuro HIV outcomes (Benjamin et al., 2012). This is because, as was pointed out earlier, the high prevalence rates of TB-HIV co-infection mean any co-infection is even more pronounced: TB being at 30% according to Nair et al., 2014.

Most of the patients, 50%, reported impaired functional status that could be categorized as moderate to severe using the self-administered comob questionnaire. Central to this comprehensive treatment models that requires neurological assessment, early initiation of ART and rehabilitation services as proposed in this study by Khan et al.

CONCLUSION

This study has pointed directly to clinically relevant neurological disorders in HIV-AIDS patients in a Quetta tertiary care hospital. In particular, the peripheral neuropathies, cerebral toxoplasmosis, cryptococcal meningitis, and HIV-associated neurocognitive problems are major symptoms that raise considerable morbidity and disability. They identified some factors which included: no ART, co-infection, low CD4 count, and higher HIV stages.

The challenges include restricted diagnostic tests, delayed care and treatment and insufficient ART accessibility among others are compounded by social prejudices and barriers. These problems require enhancing diagnostic and treatment capabilities, raising ART availability, and strengthening the healthcare system.

To ensure early diagnosis and prompt management the targeted preventive intervention by education and provider targeted training is critical. Combined, targeted approaches to the health of HIV-AIDS patients occurring in countries like Pakistan –presented by the inhospitable and resource-limited city of Quetta– integrated and holistic treatment methods that may help to mitigate the neurological burden of illness and improve the living conditions of patients diagnosed with this disease.

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