

**Relationship of Depression and function of Attention, Planning and Verbal Learning
and Memory**

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ABSTRACT

The present study examines the relationship of depression and the neuropsychological function of attention, planning and auditory verbal learning and memory among individuals with HIV/AIDS. 200 subjects who were HIV/AIDS positive (100 males and 100 females) and were within age range of 20 to 50 years and minimum education level of 8th standard were taken. The result indicates that Depression slows down the performance of attention; also depression most likely decreases the function of auditory verbal learning and memory.

Keywords: depression, attention, planning, verbal learning, memory

INTRODUCTION

In the northeastern region of India, Nagaland and Mizoram have HIV cases related to intravenous drug use (IDU), sexually transmitted diseases (STD), and antenatal care attendees (ANC); but most of the cases are related with IDU. In Assam and Tripura, STD is the main Cause of death (NACO, 2001). In Manipur, the single largest mode of HIV infection is IDU. This pattern contrasts with the rest of India and most other countries, where heterosexual contact is the largest mode of HIV transmission. According to NACO, the seropositivity rate in Manipur is 92.89 per 1000 samples screened as against the national rate of 17.3per 1000 (NACO, 1997).

The first HIV positive case was detected in Manipur in February, 1990 (MACS, 2002). Manipur is a small state having a population of 22, 93,896 (2001 Census) in the North East India. The nearness of Manipur to Myanmar (Burma) and therefore to the Golden Triangle drug trade, has made it a major transit route for drug smuggling with drugs easily available. HIV prevalence among injecting drug users is above 20% and the virus is no longer confined to this group but has spread further to the female sex partners of the drug users and their children (NACO, 2007). The latest surveillance report of HIV infection in Manipur indicates that as on January 2011, of the 3, 93,006 individuals screened for HIV infection 31,256 were found to be HIV positive (MACS,2011). In the North-Eastern region, particularly in Manipur, HIV infections are mainly found among injecting drug users. Studies show that the

geographical presence of IDUs correlates clearly with the path of the National Highway 39 in Manipur (Sarkar et al., 1995).

This phenomenon of HIV/AIDS prevalence in Manipur cannot be blamed to a single cause. It essentially needs to be seen within the social, political, economic and cultural context of Manipur. Unlike other States, Manipur has easy access to the transit route of drugs across the border with Myanmar. The supply and demand factor of drug when associated with other factor gave rise to high prevalence of IDU in the late 1980s and the 1990s. The increase in unemployment rate combined with a highly westernised lifestyle of the youth exaggerated the HIV/AIDS epidemic in the State. General frustration, family problems, pleasure seeking, lack of societal control, and IDU as a fashion allowed intravenous drug use to emerge as a refuge for the restless youth. Along with this, poor health services, lack of political will and social unrest led to increase in the prevalence of IDU. In the present scenario it is observed that the spread of the HIV infection may expand beyond the clinic attendees by 1994 onwards. Even though there is no identified red light area in the State, the phenomenon of sex trade has increased dramatically since 1995 (Irengbam Rajeev, 2005).

HIV/AIDS and depression are projected to be the world's two leading causes of disability by 2030 (Mathers & Loncar, 2011). Depression, on the other hand, affects 121 million people globally (World Health Organisation). Importantly, HIV/AIDS and anxiety/depression are interlinked. People suffering from depression are interlinked. People suffering from depression may be more likely to engage in risky sexual behaviour, and they are therefore at greater risk of contracting HIV (Gupta et al., 2010). Conversely, an HIV diagnosis may trigger symptoms of anxiety and depression (Boarts et al., 2009), which could once again lead to risky sexual behavior and the spreading of the virus. In addition, studies have shown that people suffering from depression are less likely to adhere to treatment- treatment for both mental illness and for antiretroviral treatment (ART) (Horberg et al., 2008). Depression may therefore lead to non-adherence to ART and result in poorer health. Unfortunately, more than half of the HIV+ population that suffer from depression have not received an official diagnosis of their depression (Asch et al., 2003).

Cognitive impairment and depression frequently coexist in HIV (Atkinson et al., 2008). Despite this, few neuropsychological studies of HIV positive individuals in developing countries have included adequate measures of depression. Depression can adversely influence performance on cognitive tests due to poor effort, slowed processing speed, psychomotor retardation, or a combination of these factors (Lezak et al., 2004).

Human Immunodeficiency Virus (HIV) disease is a life threatening condition, which requires psychological and social adjustments. In addition to a reduced life expectancy, the emotional impact of a diagnosis of HIV infection is heightened by social stigma and fear of rejection by partners, family and friends. Psychological reactions such as shock, denial of illness, anger and frustration are common at the time of HIV test disclosure, and psychiatric disturbance such as adjustment and mood disorders can occur according to the severity and rate of physical symptoms. Furthermore current psychopathology in HIV seropositive individuals has been reported to be associated with a past history of substance misuse, deliberate self-harm, mood and personality disorder (Gala et al., 1992).

Neuropsychological impairments are common in HIV infection with major depression although their nature remains partly unclear. Hypothalamic-pituitary-adrenal axis dysfunction is associated with neuropsychological dysfunction in major depressive disorder although evidence of causation is not definitive at present. Appearance of symptoms of depression has been significantly reported in patients with HIV-1 infection (Atkinson et al., 1988). However, the causative co-existence of major depression and neuropsychological impairment has not been reported. Additionally, symptoms of depression and neuropsychological impairment may occur together in many HIV-infected persons. Cysique *et al.*, (2007) reported that neurocognitive impairment and major depression should be considered as two independent processes. Moreover, studies have demonstrated that neuropsychological abnormalities observed in HIV infection are distinct and cannot be attributed to depression (Perkins et al., 1994). It has been shown that depressed patients with HIV-1 infection may exhibit deficits in learning and memory (Claypoole et al., 1998), but the contributions/involvement of depression to the impairment and severity of the neuropsychological functioning appear to be minimal.

METHODS

SAMPLE:

The sample of the present study was collected from different drop-in-centre of Manipur located at Imphal. Based on purposive sampling technique, 200 subjects who were HIV/AIDS positive (100 males and 100 females) and were within age range of 20 to 50 years were taken. The subjects with minimum education level of 8th standard were taken. Subjects with any other co-morbid illness were excluded.

TOOLS:

The following tools were used in the present study:**1) History taking proforma especially designed for present study:**

Semi-structured proforma scale was administered for collecting socio-demographic and economic data of the subjects which was developed by the researcher for the present study. Subjects were asked to provide details of their age, gender, educational qualification, marital status, religion, and monthly income, duration of HIV tested and duration of starting ART.

2) Beck's Depression Inventory-II (BDI-II) (Beck et al., 1996):

The Beck Depression Inventory is a 21 multiple-choice self-report inventory, one of the most widely used instruments for measuring the severity of depression. There are three versions of the BDI-the original BDI, first published in 1961 and later revised in 1978 as the BDI-IA, and the BDI-II, published in 1996. The original BDI, first published in 1961, consisted of 21 items about how the subject has been feeling in the last week. Each question has a set of at least four possible choices, ranging in intensity. When the test is scored, a value of 0 to 3 is assigned for each answer and then the total score is compared to a key to determine the depression's severity. The standard cut-offs are as follows: 0-9: indicates minimal depression, 10-18: indicates mild depression, 19-29: indicates moderate depression and 30-63: indicates severe depression.

3) NIMHANS Neuropsychological Battery (Rao et al., 2004):

The NIMHANS Neurological Battery consists of a series of tests aimed to assess various aspects of cognitive function including motor speed, attention, memory, language, visual-spatial ability and executive functions. The profile of the Neuropsychological assessment will indicate the patient's deficits and adequacies in different area. The factorial validity of this test is 0.4 which indicates the value is high and is suggestive of adequate reliability of the tests.

The tests selected for the present study are:

Digit Cancellation / Vigilance Test (Lezak, 1995):

This test consists of numbers 1 to 9 randomly ordered and placed in rows on a page. There are 30 digits per row and 50 rows on the sheet. The digits are closely packed on the sheet. The same level of mental effort or attention deployment is required over a period of time. The subject has to focus on the target digits i.e.6 and 9 amongst other distracter digits. Inability to sustain and focus attention leads to both increased time to complete the test as well as errors.

Tower of London Test (Shallice, 1982):

The test evaluates the subject's ability to plan and anticipate the results of their actions to achieve a predetermined goal. The test consists of two identical wooden boards. Each board is fitted with 3 round pegs of different sizes. The first peg is 18cms in height, the second is 11cms in height and the third is 7cms in height. There are three wooden balls, painted red, green and blue respectively. Each ball has a bore in the middle. The tallest peg can hold 3 balls. The second tallest can hold two balls, while the shortest can hold one ball. Time and number of moves form the score.

Auditory Verbal Learning Test (Schmidt, 1996):

Auditory Verbal Learning Test measures verbal learning and memory. It consists of words designating familiar objects like vehicles, tools, animals and body parts. There are two Lists A and B, with 15 different words in each List. Words in List A are presented at the rate of one word per second during 5 successive trials. The words are presented in the same order in every trial. Each trial consists of the presentation of all 15 words, immediately followed by recall of the same. After the completion of all the five trials of List A, words in List B are presented once and an immediate recall is taken for the same. The presentation of List B serves as interference and prevents the subject from recalling the words from List A subsequently from immediate memory. This is followed by the immediate recall of words from List A. After a delay of 20 minutes, words from List A are again recalled to form the delayed recall score. List A is not read out again for immediate and delayed recall. Following delayed recall, recognition of the words in list A is tested. The words in List A are randomly mixed with 15 new words. The new words are either phonemically or semantically similar to words in List A. The words are called out one at a time and the subject indicates whether each word belonged to List A or not. Hits and errors are recorded. Scores measures learning, immediate and delayed memory.

Process

To proceed with the study, necessary permission was sought from the concerned authorities of different NGO's. They were thoroughly explained about the research programme and the concerned subjects were also informed about the nature of the research study and informed consent is also taken from them to undergo the research. They were also informed that confidentiality will be maintain regarding their HIV status and identification like name will not be appeared in any part of the study. A prepared script was read out providing an overview of the study aims and risks and benefits to each subject approached for participation. After this all the subjects were asked to sign the informed consent form if they agree to participate in the study. They have the rights to seek clarification and information

about the aspect of the research work. They have the freedom to refuse answer to any particular question and can withdraw the test at any point of time. Once the consent is obtained, brief history of socio-demographic, socio-economic and other relevant data of each subject was elicited on proforma made for the study. The subjects were instructed beforehand regarding the assessment tool.

RESULTS

Table-1 Correlation between Digit Vigilance Test and Depression of Individuals with HIV/AIDS

VARIABLES	Correlation Co-efficient
Time Taken	0.154*
Error	0.080

* 0.05 levels

Table 1: It is observed from this table that there is a significant correlation between the scores of Time Taken and Depression (0.030). This indicates that when depression is high scores of time taken will increase. Depression slows down the performance of attention.

Table-2 Correlation between Tower of London Test and Depression of Individuals with HIV/AIDS

VARIABLES	Correlation Co-efficient
Mean Time for 2 Moves	0.052
Mean Moves for 2 Moves	0.096
Mean Time for 3 Moves	0.023
Mean Moves for 3 Moves	0.109
Mean Time for 4 Moves	-0.164*
Mean Moves for 4 Moves	-0.217**
Mean Time for 5 Moves	0.050
Mean Moves for 5 Moves	0.055
Number of Problems solve with minimum move for 2 Move	-0.099
Number of Problems solve with minimum move for 3 Move	0.197**
Number of Problems solve with minimum move for 4 Move	0.287**
Number of Problems solve with minimum move for 5 Move	-0.107
Total number of Problems solve with minimum move	0.127

** 0.01 levels * 0.05 levels

Table 2: It is observed from this table that there are negative correlation between Mean Time for 4 moves and Depression ($r=-0.164$, $p\text{-value}=0.020$) and Mean Moves for 4 Moves ($r=-0.217$, $p\text{-value}=0.002$). Positive correlation are found in Number of problems solve with minimum move for 3 move ($r=0.197$, $p\text{-value}=0.005$) and Number of problems solved with Minimum Move for 4 move ($r=0.197$, $p\text{-value}=0.000$).more depression lesser move and higher the depression the more will be the number of problems solved with minimum moves. An unexpected result has been found where depression enhances performance of planning.

Table-3 Correlation between Auditory Verbal Learning Test and Depression of Individuals with HIV/AIDS

VARIABLES	Correlation Co-efficient
Number of Correct in Trial 1	-0.044
Number of Correct in Trial 2	-0.042
Number of Correct in Trial 3	-0.079
Number of Correct in Trial 4	0.097
Number of Correct in Trial 5	0.054
Total number of Correct	0.007
Number of Correct in List B	-0.038
Number of Correct in Immediate Recall	0.056
Number of Correct in Delayed Recall	0.052
Long Term Percent Retention	-0.005
Number of Correct in Recognition	-0.132
Number of misses in Recognition	0.150*
Number of false alarm in Recognition	0.038

* 0.05 levels

Table 3: It is observed from this table that there is significant relationship between depression and the score of Number of misses in Recognition ($r=0.150$, $p\text{-value}=0.062$) of Auditory Verbal Learning Test. This indicates that higher depression will increase number of misses in recognition which shows that depression most likely hinders auditory verbal learning and memory.

DISCUSSION

In the finding of Digit Vigilance Test a positive correlation has been found between the score of time taken and depression indicating when depression increases the time taken also will increase which shows that depression slows the attention of individuals. In Tower of London, an unexpected finding is found highlighting that higher the depression lower the mean time and mean move and lower the depression, lesser will be the score of problems solved with minimum move which shows that depression helps in better planning. In Auditory verbal learning test significant positive correlation between depression and number of misses in recognition is found which indicates as depression increases the lesser ability to recall the right words. The present study shows that depression has a negative impact on attention and auditory verbal learning and memory which is found to be slightly in line with finding of Poutanen (1995), where impaired visual memory showed an association with depressive mood and with psychiatric disorders preceding the diagnosis of seropositive which suggests that factors other than HIV may explain these subjects poor visual memory. Van Groenou *et al.*, (1991) suggested the presence of depressed mood, independent of serostatus on actual neuropsychological impairment is associated with increase cognitive complaint. This definitely affirms an association of depression and neuropsychological function among HIV infected individuals. However other studies have found contradictory results where Cysique *et al.*, (2007) and Goggin *et al.*, (1997) reported that depression did not affect neuropsychological function in HIV infected individuals. Studies of Lawler *et al.*, (2010) also shows that depression did not affect the total score or any of the three subscales of the International HIV Dementia Scale (IHDS) which reveals that neurocognitive impairment and depression are independent complications of HIV. According to Robert *et al.*, (2014), Information processing speed fully age on learning, memory, and executive functioning, and partially mediated the effects of major depressive disorder on learning and memory. The effect of motor dysfunction on learning and memory was fully mediated by processing speed. Similarly Perkins *et al.*, (1994) and Cysique *et al.*, (2007) shows that depression and cognitive impairment are independent in HIV where depression was not significantly associated with Auditory verbal learning test (AVLT) or processing speed in Digit symbol coding subtest (DS Coding). Moore *et al.*, (1997) shows that no relationship was found between subjective complaints and cognitive functioning, yet a significant relationship was found between self-reported difficulties and formal measures of affect and mood. Failure to show a relationship between self-reported cognitive status and actual neuropsychological functioning in the cohort suggests that complaints of cognitive decline may be attributed to emotional factors. But, psychological distress does not account completely for neurocognitive

impairment among HIV+ individuals (Bornstein et al., 1993). However the result of the present study shows that depression has a negative relation with the function of Attention and Auditory Verbal Learning and Memory of individuals with HIV/AIDS which should be noted

Assessment and management of mental disorders is integral to an effective HIV/AIDS intervention program. Mental health professionals will increasingly be called upon to assist the management of people living with HIV/AIDS. Thus it is necessary to be familiar with disorders that are prevalent in HIV infection and also the interface of treatment, including HAART with mental health. Emotional problems are among the most common symptoms in HIV patients with up to 98.6% prevalence (Mathew & Bhat, 2008). Depression is a prevalent comorbidity in HIV infection and may also be the first presenting symptom in an HIV case (Bannerjee & Arya, 1992). It is essential to discriminate between normal response to a life threatening illness, clinical manifestation of HIV and depressive episode while recognizing that all three can coexist. As in other serious medical illness, anhedonia may be the most reliable indicator of severe depression. HIV infected individuals are recognized to be at high risk of suicide in the period immediately after coming to know of seropositive status, especially if they have a past psychiatric history (Chandra et al., 1999).

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