Neuro-Cognitive Dysfunction In Substance Abusers – A Hospital Based Study

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ABSTRACT

Background: The brain region and neural processes that underlie addiction overlap extensively with those that support cognitive functioning, including learning, memory and reasoning. Cocaine and opioids cause deficit in cognitive flexibility, amphetamines causes deficits in attention and impulse control; alcohol and nicotine causes deficit in working memory and attention. The present study was planned to understand harmful effects of substance use on neuropsychological functioning of the patients with substance dependence.

Methodology: The study was conducted at Dayanand Medical College and Hospital, Ludhiana, India. A total of 30 known substance dependent patients (diagnosed as per ICD 10 criteria), both indoor as well as outdoor were evaluated for their intellectual and memory functioning using Wechsler intelligence test (verbal, Indian version which has 4 subtests ie information, digit span, arithmetic and comprehension), Alexander's Pass Along Test (to see executive function) and PGI memory test (Indian version of Wechsler memory test) and then the results were compared with the control group. Patients with any other medical disorder, head injury, seizure disorder and any pre-morbid psychiatric problem were excluded from the study.

Results: The protocol shows that majority of patients show significant deficit in comprehension parameters of verbal intelligence and arithmetic ability. The protocol also reflects that the patients have impairment in delayed recall and recognition of visual stimuli.

Conclusion: The study found that drug related cognitive changes may bias patients towards response and action that contributes to the cycle of addiction and also hinder patient's ability to benefit from counseling.

Key Words: Substance abuse, Neuro-cognitive dysfunction, opioids, cannabis.

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INTRODUCTION

Chronic use of psychoactive substances is associated with widespread deficits in neuropsychological function [1-2]. These deficits are pronounced in the executive domains including decision making, response inhibition, verbal learning and memory [3-4]. These deficits may be associated with prefrontal cortex dysfunction and their extent and nature is likely to depend upon the substance of abuse. The prevalence of cognitive impairments in substance abusers varies from 30-80 % [5-6]. Cognitive impairment in such patients leads to poorer treatment outcomes including decreased treatment retention [7-8]., lower self efficacy, decreased insight into the illness, greater reflection impulsivity [9]. In addition, cognitive

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impairment among alcoholics has a negative impact on drink refusal skill acquisition and aftercare treatment attendance [10].

Unfortunately, neuropsychological assessment is typically not an aspect of patient evaluation in substance abuse treatment programme because it is time and resource consuming. Secondly, the cognitive impairment cannot be adequately identified by drug counsellors in a clinical impression or through self respect. The present study was planned to understand harmful effects of substance use on neuropsychological functioning of the patients with substance dependence.

METHODOLOGY

The study was conducted at Dayanand Medical College and Hospital, Ludhiana, India. A total of 30 known substance dependent patients (diagnosed as per ICD 10 criteria) were taken for the study after obtaining an informed consent for the same. Both indoor as well as outdoor patients were evaluated for their intellectual and memory functioning using Wechsler intelligence test [11] (verbal, Indian version which has 4 subtests ie information, digit span, arithmetic and comprehension), Alexander's Pass Along Test [12] (to see executive function) and PGI memory test [13] (Indian version of Wechsler memory test) and then the results were compared with the control group. Patients with any other medical disorder, head injury, seizure disorder and any premorbid psychiatric problem were excluded from the study.

STATISTICAL ANALYSIS

Basic descriptive statistics and percentages were used in the summation and analysis of results.

RESULTS

Table 1 shows the sample of the present study with most of the patients were in the age group of 21-40 and were mostly educated up to matriculate level.

Table 1

Factor	(N=30)					
Age (In years)						
<20 years	06					
21-40 years	20					
>41 years	04					
Education level						
10 th standard	20					
Graduation	06					
Post Graduation	04					

Table 2 shows verbal and non verbal intellectual functioning of subjects on verbal intelligence test and Alexander pass along test. 80% of the subjects on comprehension and 66.67% of the subjects on arithmetic subscales were showing deficit. On attention and concentration parameters i.e. digit span test 66.67% of subjects were showing significant deficit. On executive function parameter (Alexander pass along test) significant deficit (93.33%) was noticed among the subjects.

Table 3 shows the memory functioning of the subjects. Remote memory (73.33%) and recent memory (86.67%) appear highly affected areas. Delayed recall (76.6%) and immediate recall (80%) are the other areas significantly affected in the subjects.

Table 2 – Performance of subjects on Wechsler intelligence test & Alexander's Pass Along Test

	Mild (50 – 70)	Moderate (35 - 49)	Severe (20 - 34)	Normal	Total (%)
Information	10	02	02	16	46.67
Comprehension	12	10	02	06	80
Arithmetic	12	04	04	10	66.67
Digit Span	10	06	04	10	66.67
Performance IQ	26	00	02	02	93.33

Table 3 – Performance of participants on the PGI Memory Test

Items	Normal	Mild	Severe	Total (%)
Remote Memory	08	16	06	73.33
Recent Memory	04	18	08	86.67
Mental Balance	15	10	05	50
Attention and Concentration	10	15	05	66.67
Delayed Recall	07	20	03	76.66
Immediate Recall	06	14	10	80
Verbal Retention (Similar Pairs)	10	15	05	66.66
Verbal Retention (Dissimilar Pairs)	12	10	08	60
Visual Retention	08	17	05	73.3
Recognition	22	07	01	26.67

DISCUSSION

The protocol shows that majority of patients show significant deficit in comprehension and arithmetic ability parameters of verbal intelligence. This is in accordance with the findings of the research which have also concluded that chronic abuse of substances like cocaine, opioids & alcohol result in excessive cognitive alteration in many individuals [14-15]. Long-term cannabis users have impaired learning, retention, and retrieval of dictated words, and both long-term and short-term users show deficits in time estimation [16]. The present study reflects that the patients were showing difficulty in new learning and recall as well as they fail to apply new skills, difficulty in abstract thinking, inflexible cognition and difficulty in changing the mental set. These findings were reported in the literature [17]. Chronic amphetamine and heroin users show a deficits in a range of cognitive skills, including verbal fluency, pattern recognition, planning, and the ability to shift attention from one frame of reference to another [18]. Studies have shown that morphine slightly impaired both sexes' performance on a test of working memory in which they were asked to repeat a set of digits in reverse order [19] which is in concordance with the results of our study.

The protocol also reflects that the patients have impairments in all the parameters of memory testing as remote, recent & immediate recall. There is marked impairment of visual retention (73.3%) & verbal retention of similar pairs (66.6%). Studies have shown that Cognitive functions including decision making, attention, working memory, inhibitory control, planning, fluency, reasoning, and processing speed are all

negatively impacted with drug use [20-23]. This is in concordance with the present study which has shows the deficits in executive functions of substance abusers. The similar findings were generated in the present study when PGI memory test & Wechsler's tests were applied.

Drug related cognitive changes may bias patients towards response and action that contributes to the cycle of addiction and also hinder patient's ability to benefit from counselling. More sessions and reminders may be necessary for these patients in incorporating abstinence – sustaining strategies into their daily routine. Developing and testing a modified treatment to match the abilities of impaired patients. Developing a cognitively friendly treatment for drug abuse patients to be offered broadly with the flexibility for quick advancement is also deemed helpful. This level approach to treatment would be useful in bypassing the problems associated with neuropsychological testing in treatment settings, and developing a brief screening measure with sensitivity to aid in identification of cognitive deficits [24]. Testing if and how treatments for cognitively impaired drug abusers can be transported to the community, including how to train treatment providers. Examining mediation and moderation relationships between impairment and intrapersonal capabilities such as psychopathology and medical status, change processes such as self-efficacy and motivation, and environmental factors such as social support. Improving coping skills strategies for adolescents with poor neurocognitive abilities would also benefit. Understanding how these abnormalities are related and their role in drug abuse could potentially contribute to the development of more appropriately targeted treatment interventions [25].

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