

Efficacy of cognitive rehabilitation for patients with alcohol dependence

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ABSTRACT

Patients with alcohol dependence show cognitive impairment of cognitive functions. Cognitive rehabilitation is a behavioral treatment that uses drill and practice, compensatory and adaptive strategies to facilitate improvement in targeted cognitive areas like memory, attention and problem solving, cognitive flexibility, planning, and executive functioning. The main aim of the present study was investigating the efficacy of cognitive rehabilitation program for cognitive impairment, in terms of attention, memory, and executive functioning of chronic alcohol dependence patients. The data was collected from 40 patients of long term alcohol dependence (20 patients in intervention and 20 in control group) and selected using purposive sampling technique from Ranchi Institute of Neuro-Psychiatry and Allied Sciences (RINPAS). They were screened for hand preference and severity of alcohol dependence through Hand Preference Battery and Severity of Alcohol Dependence Questionnaire (SADQ-C). Further, AIIMS Comprehensive Neuropsychological Battery in Hindi was administered before and after intervention. Only intervention group received cognitive rehabilitation. Result shows intervention group improved after cognitive rehabilitation than the control group who did not receive the intervention.

Keywords: Alcohol Dependence, Attention, Memory, Executive Functions, Cognitive Rehabilitation

Drinking alcohol is always a serious problem in our society. There are many reasons to drink alcohol like to be social in a group or in peer pressure, explore and experience the taste and pleasure or removing stress and anxiety and so on. Whatever the reason to drink alcohol when drinking reaches to level of abuse or dependence, it has worsened the life.

Large amount of alcohol consumption has many negative consequences. Its negative impact can be seen directly and indirectly on person's behavior, mood and cognition. Alcohol dependence is also associated with death and disability. In a report by WHO it is anticipated that 3 million Indian, died in 2016 due to alcohol abused (WHO, 2019). It is also estimated

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that alcohol consumption has doubled in male (4.2 litres) and female (1.5 litre) both per capita from 2005 (2.4 liters) to 2016 (5.7 liters) (WHO, 2018).

Alcohol abuse leads to many social and personal problems like; problems of health, disturbance in work life, poor family and social relationships, separation and divorce and emotional hardship in the family. Long term alcohol drinkers are at serious risk of many physical conditions, social problems, psychological problems and cognitive impairments.

Many studies suggest alcohol has harmful effect on cognition such as attention, memory and executive function (Duka et al., 2003; Pihl et al., 2003). Goldstein et al. (2004) found compared to cocaine, alcohol has a more harmful effect on Attention and Executive functioning. Keenan et al. (1997) found severity of alcohol dependence is related to neuropsychological impairment, and subtle neurological deficits. Many studies found cognitive rehabilitation is beneficial to improving cognitive functioning of person with alcohol dependence (Bell, 2009; Roehrich, 1993; Peterson et al., 2002).

There is well known fact that acute alcohol intoxication affects cognitive functioning. Cognitive impairment also precipitates the serious behavioral problems and mood swings as a result of alcohol abuse.

In the early as the 1880s with Wernicke and Korsakoff suggested the deleterious effects of chronic alcoholism on cognitive functioning (Korsakoff, 1887; Wernicke, 1881). Negative effect of alcohol was also found related with brain functions. Alcohol has detrimental effect on brain functions and its structures (Zahr & Pfefferbaum, 2017). Heavy drinking not only affects the brain functions directly but also increases the higher risk of trauma, seizure and stroke which indirectly hampers the brain functions (Alterman & Tarter, 1985; Eyer et al, 2011; de los Rios et al, 2012).

Poor attention and concentration documented in many studies. Alcohol increases impulsive responding in subjects that also impairs attention of the subjects (Dougherty et al., 2000).

Moderate dose of Alcohol has significant worsening effect on accuracy of attention when continuous attention needed over relatively long period. (Talland, 1966; Stormark et al., 2000). There are well documented studies on person with alcohol dependence that they showed deficits in sustained visual attention impaired accuracy of shifting attention, divided attention (Rossello et al., 1999).

Heavy alcohol use clearly damages encoding of information (Sayette (1993; 1999), everyday memory, remembering to complete daily activities function, working memory and retrospective memory. Alcohol has deleterious effects on frontal lobe function which showed impairment of alcohol-dependent patients with regard to attention and executive function (Pihl et al., 2003; Claudia et al., 2006).

Cognitive rehabilitation is a therapy which tries to restore and compensate the lost cognitive functions such as memory, attention and problem solving, cognitive flexibility, planning, and executive functioning of the individual. It restores the cognitive functions with behavioral methods like repetitive drill and practices of neural circuitry to learning of new skills or previously learned skills. Compensatory methods use the adaptive techniques and alternative techniques such as personal or environmental structuring and support which help the individual to do his daily functions.

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Alcohol abuse for long time can impair attention, memory and executive skills. Cognitive rehabilitation has specific techniques which help the individual with cognitive impairments. For improving attentional impairments, patients can use notebook regularly, environment can be restructured to reduce distractibility (e.g., noises, other people, high traffic and activity areas and studying in a quiet environment, using earplugs etc.).

There are many techniques of restore and strengthening the memory functions like internal memory aid and external memory aid. Internal memory aids include word list learning with rehearsal, first letter cue, association method, visual imagery and peg system and so on which restore the memory functions (Parente & Hermann, 1996; Tate, 1997; Incagnoli & Newman, 1985). Some of the simplest behavioral strategies to improve memory to use of portable external memory aids, including post-it notes, “to do” lists, alarm clocks, and timers (Wilson, 1995).

The Patients with executive impairments are given task to complete which can be basic to complex. Hierarchy of tasks should be made to improve their stamina or work tolerance. There are other strategies like modification of environment, reducing failure, daily activities and time and performance pressure should be made.

Long term use of alcohol can result in slow but measurable cognitive decline which worsens the life. There are few studies exist that investigate the efficacy of integrating cognitive rehabilitation strategies into more traditional treatment programs. Empirical investigations conducted to date indicate that some cognitive deficiencies secondary to alcoholism are amenable to cognitive rehabilitation and this remediation is generalizable. Studies are lacking on effectiveness of cognitive rehabilitation on alcohol dependence in Indian population which is the motivating factor of the present study.

Aim of the study

The aim of the present study was to investigate the efficacy of cognitive rehabilitation program for cognitive impairment, in terms of attention, memory, and executive functioning of chronic alcohol dependence patients.

METHODOLOGY

Sample design

The study was center based study using the pre-post treatment with control group design.

Sample

The data was collected from 40 persons of long-term alcohol dependence (20 persons in intervention and 20 in control group) who were fulfilling the exclusion and inclusion criteria. Person whose age ranges 25-50 years, educated upto matric, abstinent from at least 2 weeks were included in the study and whose have comorbid condition of other mental illness, neurological disorders, physical illness, intellectual disability were excluded from the study. Sample selected from Ranchi Institute of Neuro-Psychiatry and Allied Sciences (RINPAS) which is tertiary psychiatry institute of Jharkhand government, imparting training of MD Psychiatry, M. phil. and Ph.D. course of Clinical psychology and Psychiatric Social Work. Both groups were matched on socio-demographic, clinical variables and neuropsychological functioning.

Tools for the study

The following tools were administered in the study

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1. **Socio- Demographic and Clinical Data Sheet (Self prepared)** It was a semi-structured Performa especially designed for the study. It contains information about the socio-demographic variables like age, sex, marital status, education, occupation, domicile, religion and monthly family income of the subjects etc.
2. **Hand Preference Battery (Annet, 1970)**-This scale was constructed by Annet (1970). It has 7 items which determine dominant handedness.
3. **Severity of Alcohol Dependence Questionnaire (SADQ-C) (Stockwell et al, 1994)**- The SADQ-C is a 20-item questionnaire designed to measure the severity of alcohol dependence. It is most useful assessment tool and widely used measure of severity of dependence. It is relatively quick to complete and easy to score.
4. **AIIMS Comprehensive Neuropsychological Battery in Hindi (Adult Form) (Gupta et al, 2000)**- The AIIMS comprehensive neuropsychological battery is potentially useful for both diagnosis and rehabilitation. It is a standardized neuropsychological battery for a wide variety of patients with varying deficits. The 160 items in Hindi of the test are spread over 10 primary scales. It is a 5-point rating scale from 0-4 where 0 shows no brain damage, scores 1, 2, and 3 suggest intermediate performance and score 4 indicating brain damaged performance. Test-Retest reliability coefficients for the 10 basic scales range from 0.792 to 0.984 with an average of 0.896 which was very high suggest high reliability and scores on the battery are stable over time.
5. **Brain wave- R programme:** The Brain wave- R programme is designed by Malia et al. (2002) to assist in the cognitive rehabilitation of individuals with brain injuries. It consists of a large array of exercises (mainly pen and paper based), which are organized into five modules addressing the areas of cognitive deficit which are Attention, Visual Processing, Information Processing, Memory and Executive Functions. There are three modules, Attention, Memory and Executive Functions have been selected which were more appropriate to the patients for the rehabilitation of the cognitive functioning. Each module is divided into four weeks.

Procedure

The diagnosis was made by trained psychiatrist (MD psychiatry) those who were fulfilling the DSM IV- TR criteria. The person with alcohol dependence they admitted in the de-addiction unit of RINPAS were selected purposively and explained about the purpose of the study. After that informed consent form was signed from them. The socio-demographic and clinical data sheet information was gathered from the drawn sample. Hand Preference Battery and Severity of Alcohol Dependence Questionnaire were administered to decide patient's handedness and severity of the alcohol intake respectively. Baseline assessment was done using AIIMS Comprehensive Neuropsychological Battery in Hindi to assess patients' varying neuropsychological deficits. After completing baseline assessment; sample was subdivided into two groups (intervention group and control group), 20 patients assigned in each. The intervention group received the cognitive rehabilitation program in adjunct to routine therapeutic intervention continuously for twelve weeks. This training program was tailored according to the need of the subjects. Family members of patients were counseled about the intervention program. Control group did not receive cognitive rehabilitation program. However, both the groups underwent their routine therapeutic intervention (pharmacotherapy and group meeting). Both groups were assessed again after completion of training.

Statistical Analysis: Appropriate statistical analysis was used, including chi-square and Mann Whitney U test.

RESULTS

Table-1: Shows Socio-Demographic Characteristics of the Intervention Group and Control Group

S. No.	VARIABLES		Intervention Group	Control Group	Chi Value (df)
1	Education	High School	7 (43.8 %)	9 (56.2)	0.65 NS
		Intermediate	6 (60.0 %)	4 (40.0)	
		Graduation	7 (50.0)	7 (50.0)	
2	Marital Status	Married	16 (51.6 %)	15(48.4 %)	.705 NS
		Single	4 (44.4%)	5 (55.6 %)	
3	Religion	Hindu	14(51.9)	13(48.1)	1.37 NS
		Muslim	1(100)	0(0)	
		Christian	5(41.7)	7(58.3)	
4	Community	Tribal	5 (41.7)	7 (58.3)	0.476 NS
		Non-Tribal	15 (53.6)	13 (46.4)	
5	Occupation	Service	4(44.4)	5(55.6)	0.742 NS
		Unemployed	7(46.7)	8(53.3)	
		Agriculture	1(100)	0(0)	
		Business	8(53.3)	7(46.7)	
6	Residence	Rural	4(40.4)	6(60.0)	0.97 NS
		Semi Urban	5(45.5)	6(54.5)	
		Urban	11(57.9)	8(42.1)	
7	SES	Middle	18(54.5)	15(45.5)	1.94 NS
		Lower	2(33.3)	4(66.7)	
		Upper	0(0.0)	1(100)	
8	Income	>5000	2 (33.3)	4(66.7)	0.376 NS
		<5000	18 (52.9)	16 (47.1)	

NS-Not significant

Table-2: Showing Clinical Characteristics of Intervention Group and Control Group

SN	Variables	Intervention Group	Control Group	mann whitney U test			
				Mean Rank		U Value	Z Value
				Intervention Group	Control Group		
		M+SD	M+SD				
1.	Age (in years)	33.85 ± 5.09	31.75± 4.45	23.40	17.60	142.0	1.58 NS
2.	Age of Onset (in years)	16.15 ±2.46	17.60± 3.33	18.35	22.65	157.0	1.18 NS
3.	Severity of alcohol dependence	26.80 ±3.76	27.15± 4.64	19.55	21.45	181.00	0.52 NS

Table-3: Showing Comparison of AIIMS Neuropsychological Battery between Intervention and Control Group at Baseline

Areas of Assessment	Intervention Group Mean ± SD	Control Group Mean ± SD	MANN WHITNEY U TEST			
			Mean Rank		U value	Z-score
			Intervention Group	Control Group		
Motor scale	70.80± 16.06	78.55 ± 14.45	18.78	22.22	165.50	0.94 NS
Tactile Scale	68.15 ±9.55	67.15 ±	22.28	18.72	165.50	0.96NS

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Areas of Assessment	Intervention Group Mean \pm SD	Control Group Mean \pm SD	MANN WHITNEY U TEST			
			Mean Rank		U value	Z-score
			Intervention Group	Control Group		
		11.01				
Visual Scale	67.35 \pm 7.92	68.25 \pm 8.26	20.02	20.98	190.5	0.26NS
Expressive Scale	68.00 \pm 11.57	71.10 \pm 13.63	19.60	21.40	182.00	0.49NS
Reading Scale	64.05 \pm 13.34	57.85 \pm 8.26	23.18	17.82	146.50	1.46NS
Writing Scale	59.45 \pm 14.14	55.40 \pm 15.11	22.48	18.52	160.50	1.07NS
Arithmetic Scale	67.25 \pm 10.57	61.95 \pm 11.28	23.45	17.55	141.00	1.60NS
Memory Scale	72.60 \pm 4.24	70.45 \pm 4.44	23.60	17.40	138.00	1.69NS
Intellectual Scale	60.70 \pm 9.00	56.10 \pm 8.94	23.70	17.30	136.00	1.73NS
Left Hemisphere	70.75 \pm 9.22	68.70 \pm 9.06	22.38	18.62	162.50	1.01NS
Right Hemisphere	90.55 \pm 9.57	86.30 \pm 14.13	22.02	18.98	169.50	0.82NS
Pathagnomic Scale	61.20 \pm 15.33	61.40 \pm 12.53	19.98	21.02	189.50	0.28NS
Total Scale	75.50 \pm 5.05	72.15 \pm 9.82	22.72	18.28	155.50	1.20NS

Table 4: Showing Comparison of Differences in Neuropsychological Performance between Intervention and Control Group due to Intervention

Areas of Assessment	Intervention Group Mean \pm SD			Control Group Mean \pm SD			Mann Whitney Test			
	Pre	Post	Difference (Pre-Post)	Pre	Post	Difference (Pre-Post)	Mean Rank		U value	z-score
							Intervention Group	Control Group		
Motor scale	70.80 \pm 16.06	71.00 \pm 5.24	2.95 \pm 1.47	78.55 \pm 14.45	77.50 \pm 14.09	0.85 \pm 0.88	28.20	12.80	46.00	4.25**
Tactile Scale	68.15 \pm 9.55	67.30 \pm 9.36	0.85 \pm 2.85	67.15 \pm 11.01	66.20 \pm 11.27	0.95 \pm 1.28	20.68	20.32	196.50	0.10 NS
Visual Scale	67.35 \pm 7.92	67.00 \pm 7.82	0.35 \pm 1.87	68.25 \pm 8.26	68.00 \pm 8.05	0.25 \pm 1.52	20.90	20.10	192.00	0.25NS
Expressive Scale	68.00 \pm 11.57	67.15 \pm 11.15	0.85 \pm 2.68	71.10 \pm 13.63	69.90 \pm 13.25	1.20 \pm 1.19	19.72	21.28	184.5	0.45 NS
Reading Scale	64.05 \pm 13.34	57.10 \pm 9.03	6.95 \pm 7.84	57.85 \pm 8.26	55.55 \pm 7.39	2.30 \pm 3.15	23.70	17.30	136.00	1.84 NS
Writing Scale	59.45 \pm 14.14	51.30 \pm 11.27	8.15 \pm 7.18	55.40 \pm 15.11	53.50 \pm 14.55	1.90 \pm 2.07	25.08	15.92	108.5	2.54 **
Arithmetic Scale	67.25 \pm 10.57	57.80 \pm 10.78	9.54 \pm 8.26	61.95 \pm 11.28	60.15 \pm 10.80	1.80 \pm 1.39	26.42	14.58	81.50	3.24 **
Memory Scale	72.60 \pm 4.24	62.85 \pm 5.07	9.75 \pm 4.89	70.45 \pm 4.44	69.60 \pm 4.76	0.85 \pm 0.88	29.72	11.28	15.56	5.05 **
Intellectual Scale	60.70 \pm 9.00	56.10 \pm 10.35	5.60 \pm 6.00	56.10 \pm 8.94	55.50 \pm 8.94	0.60 \pm 0.68	26.30	14.70	84.00	3.19 **
Left Hemisphere	70.75 \pm 9.22	67.40 \pm 8.15	3.35 \pm 2.89	68.70 \pm 9.06	67.75 \pm 8.49	0.95 \pm 1.39	26.32	14.68	83.50	3.22 **
Right Hemisphere	90.55 \pm 9.57	84.65 \pm 7.71	5.90 \pm 4.05	86.30 \pm 14.13	84.00 \pm 12.12	2.30 \pm 4.41	26.35	14.65	83.00	3.21 **
Pathagnomic Scale	61.20 \pm 15.33	50.40 \pm 10.77	10.80 \pm 10.06	61.40 \pm 12.53	58.20 \pm 10.74	3.20 \pm 3.07	25.40	15.60	10.20	2.74**
Total Scale	75.50 \pm 5.05	68.25 \pm 6.65	7.25 \pm 4.73	72.15 \pm 9.82	69.75 \pm 7.78	2.40 \pm 3.33	27.42	13.58	61.50	3.77**

NS-Not significant; *p<.05; ** p<.01

DISCUSSION

The purpose of the present study was to investigate the efficacy of cognitive rehabilitation program for cognitive impairment, in terms of attention, memory, and executive functioning of the person with chronic alcohol dependence. It has found that cognitive rehabilitation program was effective to improve cognitive impairments for intervention group as compare to control group of alcohol dependence. The present study has been supported by the previous findings of Bell (2009), Godfrey et al. (1985) and Rupp et al. (2012).

On baseline assessment both the groups (intervention and control group) having generalized impairment across most of the cognitive domains assessed. Similar findings have been reported by in overabundance of other studies assessing cognitive functioning in patients

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with alcohol dependence. Keenan, et al (1997) severity of alcohol dependence is related to neuropsychological impairment, and subtle neurological deficits. Many studies found attentional impairment (Portnoff & Dougan, 1983; Dougherty et al., 2000). Findings of the present study regarding memory functions (Donat, 1986) and impairment of executive functions (Pihl et al., 2003; Claudia et al., 2006; Kumari et al., 2012) are also consistent with previous studies.

Result of the present study suggests that intervention group differed significantly with control group after cognitive rehabilitation from the baseline assessment. Cognitive impairment in intervention group was improved that is the reason scores of intervention group was significantly improved than the control group. Significant improvement was seen on most of the domains of AIIMS Neuropsychological Battery.

Many studies on cognitive rehabilitation suggest that patients with alcohol dependence improved their cognitive impairments after cognitive rehabilitation treatment. However contradictory result was found on the group of alcohol dependence patients who was receiving memory training but did not improve more than the other groups of alcohol dependence on memory or perceptual-motor tests (Yohman et al., 1988).

Result showed that intervention group improved significantly on intellectual scale. Improvement in intellectual function could be improved by improving reasoning, memory and problem-solving strategies etc. Study on problem solving training showed that the group of patients of alcohol dependence who were receiving problem solving training improved significantly more than the other group of patients with alcohol dependence who were not receiving the training (Yohman et al., 1988). Forsberg (1987) found that remediation induces enhanced information processing.

Result also suggests significant improvement on Writing Scale, Arithmetic Scale and Memory Scale in intervention group than the control group. On Left Hemisphere, Right Hemisphere, Pathagnomic Scale and Total Scale intervention group was significantly improved than control group. Grattan-Miscio and Vogel-Sprott (2005) showed in their results that moderate rising of blood alcohol concentrations impaired immediate Working Memory (increased errors, slowed rate of mental scanning, slowed reaction time (RT)).

Therefore, cognitive rehabilitation program has been shown its' efficacy to bring improvement in these core skills as well as improvement in other functions and that is what being observed in the results of the present study.

Many studies on cognitive rehabilitation suggest that patients with alcohol dependence improved on their cognitive impairments after cognitive rehabilitation treatment (Bell, 2009; Roehrich, 1993; Peterson et al., 2002; Goldman & Goldman, 1988. A study finding by Rupp et al (2012) also supported the present study. They found CBT supplemented with cognitive rehabilitation intervention using a computer-assisted training program helped to significantly improve alertness, divided attention and working memory, delayed recall, visual-spatial construction, and a global measure of cognitive functioning, in patients with alcohol dependence in the comparison of the patients who were only received intensive outpatient CBT focused treatment. In another study by Goldstein et al (2005) showed that cognitive training also enhances the attention and cognitive flexibility in the patients with alcohol dependence who were in their detoxification phase as compare to control group.

CONCLUSION

Person with long term alcohol dependence have shown cognitive impairments in most of the areas like attention, memory and executive functioning. Abstinent patients comprised in cognitive rehabilitation program for twelve week and specific behavioral techniques were practiced. These behavioral techniques made them improved in contrast to other group. Their attention turned focused and sustained, able to remember and execute daily functions which were hampered due to alcohol. So lastly it can be said that Cognitive rehabilitation is helpful in eliminating and retarding of cognitive deficits, especially for person with alcohol dependence.

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Conflict of Interest

The author declared no conflict of interest.

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