IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 18, Issue 2 Ser. 4 (February. 2019), PP 73-78
www.iosrjournals.org

Cognitive Deficits in Alcohol Dependence Syndrome

Dr Deepak R S[1,] Dr Mruthyunjaya Nagaraj[2], Dr Alok Ghanate[3]
1 Assistant Professor, Dept of Psychiatry, Basaveswara Med Coll, Chitradurga
2 Assistant Professor, Dept of Psychiatry, SSIMS & RC, Davangere (Corresponding Author)
3 Professor, Dept of Psychiatry, MRMC, Gulbarga
Corresponding Author: Dr Mruthyunjaya Nagaraj

Abstract:
Introduction*: Apart from physical complications, chronic alcoholism is associated with mild to severe cognitive disturbances. Cognitive disturbances persist even when abstinent up to five years. Thus cognitive disturbance is not only rendering them into ineffective members of society but also poses a burden on the society, due to frequent conflicts with the law.*
Aims & Objectives*: To detect any cognitive deficits in alcoholics in a tertiary care teaching hospital by evaluating their cognitive functions and to identify the causes thereof.*
Materials & Method*: This study included both in-patient and out-patients meeting the inclusion criteria. Detailed case history was taken for all the patients. Each subject was screened by AUDIT, the severity of alcohol addiction was assessed by the SADD. Each patient was screened for color blindness by using Ishihara Test. To evaluate the working memory and executive functions, Wisconsin card sorting test & MMSE were used.*
Results*: The results of the current study showed that individuals with medium and high dependence on alcohol differed in all the categories of WCST. The study also showed significant differences between medium and high dependent individuals in their scores on the WCST and MMSE. This indicates that severity of alcohol dependence is related to the level of cognitive decline in these subjects.*
Conclusion*: From the present study we can conclude that the cognitive deficits have considerable effect on the socio occupational functions of an individual with alcohol dependence. It can be one of the factors affected in patients with alcohol dependence and as a physician we need to address these issues which help in formulating a comprehensive treatment plan for a better outcome.*
Keywords*: Cognition; Alcohol; deficit*

Date of Submission: 26-01-2019 Date of acceptance: 09-02-2019

I. Introduction

In both developed and developing countries alcoholism has become a stigma to the society. Society has to bear the burden for the loss of property with alcohol overuse. [1] The term "multiple losses" is only applicable in alcoholism and not seen in any other diseases.

Alcoholism can be of two types based on the etiological classification and genetics, familial and non-familial types (Cloninger et al) [2]. Apart from physical complications, chronic alcoholism is associated with mild to severe cognitive disturbances. Cognitive disturbances persist even when abstinence is present up to 5 years (Brandt et al) [3]. Thus cognitive disturbance is not only rendering them into ineffective members of society but also pose a burden on the society, due to frequent conflicts with the law and order. If these individuals have to be helped they need efforts from various sources, including physicians, mental health professionals, voluntary workers, and law enforcement agencies in order to tackle the problems of alcoholism. This needs the whole problem be tackled from a scientific perspective (Ray & Pickens) [4]. Hence this study was undertakento detect for any cognitive deficits in alcoholics at a tertiary care teaching hospital by evaluating their cognitive functions.

II. Aims & objectives

The aim of the study was to detect cognitive deficits in patients who are dependent on alcohol by evaluating their cognitive functions and to identify the causes thereof.

III. Materials and methods

Study place: This study was conducted in the Department of Psychiatry, Narayana Medical College, Nellore, Andhra Pradesh.
Subjects source: Outpatients and in-patients of the age 18 years and above of Narayana Hospital diagnosed as ADS on the basis of International Classification of Disease (ICD-10) criteria was the source of the subjects.
Study type: Cross-sectional study

Sample size: 60 patients

Inclusion Criteria: All the Male and female subjects aged 18 years and above diagnosed as ADS on the basis of International Classification of Disease (ICD-10) criteria were included in the study.All the patients who were not in intoxicated state or in withdrawal state were considered in the study. Only the abstinent states after detoxification treatment were included.

Exclusion Criteria:

Patients diagnosed to have depression, psychotic disorder or neurological disorder, all other psychiatric disorders, other substances use; any medical complications which may result in cognitive deficits were excluded from the study.

IV. Study tools

Patients who were meeting the inclusion criteria, both in-patient and out-patient, were recruited in this study based on random sampling method. A written informed consent was taken from all the patients who participated in this study and ethical clearance was taken from the ethical committee of the institution. A semi-structured proforma was used for recording the socio-demographic data for each subject. Each subject was screened by AUDIT (Alcohol Use Disorder Identification Test). The severity of alcohol addiction was assessed by the SADD (Alcohol Dependence Data Questionnaire). Each Patient was screened for color blindness by using Ishihara Test. To evaluate the working memory and executive functions the Wisconsin card sorting test and MMSE (Mini-Mental State Examination) or HMSE (Hindi Mental State Examination) tests were used in this study.

V. Results

The age distribution of the following study had mean age of 36.85 and the minimum age was 22 years and the maximum age was 50 years (Table 1).

Table I: Age distribution

Mean	Minimum	Maximum
36.85 years	22 years	50 years

The marital status of the individuals participated in the studied showed that eighty five percent were married and fifteen percent were single (Table 2).

Table II: Marital status of the individuals

MARITALSTATUS	FREQUENCY	PERCENT
Married	51	85.0
Single	9	15.0
Total	60	100

The educational status of the individuals showed that thirty three of them had completed secondary followed by twenty eight percent had finished primary education(Table III).

Table III: Educational status of the individuals

EDUCATIONAL STATUS	FREQUENCY	PERCENT
Nil	6	10.0
Primary	17	28.3
Secondary	20	33.3
Intermediate	12	20.0
Diploma	2	3.3
Graduate	3	5.0
Total	60	100.0

The occupational status and the family type are described as in table IV and V.

Table IV: Occupational status of the individuals

OCCUPATIONAL STATUS	FREQUENCY	PERCENT
Nil	1	1.7
Labourer	5	8.3
Farmer	12	20.0

Non-Professional	24	40.0
Professional	18	30.0
Total	60	100.0

Table V: Family Type of the individuals

FAMILY TYPE	FREQUENCY	PERCENT
Nuclear	42	70.0
Extended	18	30.0
Total	60	100

The table VI shows the different types of alcohol consumption with 63.3% consuming all type of beverages, 23.3% consuming only brandy, and 1.7% consuming only rum and 11.7% consumed only whiskey.

Table VI: Type of alcohol used by the individuals

TYPE OF ALCOHOL	*FREQUENCY*	*PERCENT*
All	38	63.3
Brandy	14	23.3
Rum	1	1.7
Whiskey	7	11.7
Total	***60***	***100.0***

The SADD score (Table VII) showed that severity of the alcohol dependence with 85% of the subject highly dependent on the substance (alcohol). And 9% of the subject is medium dependent on the substance.

Table VII: SADD Score: Short Alcohol Dependence Data Questionnaire

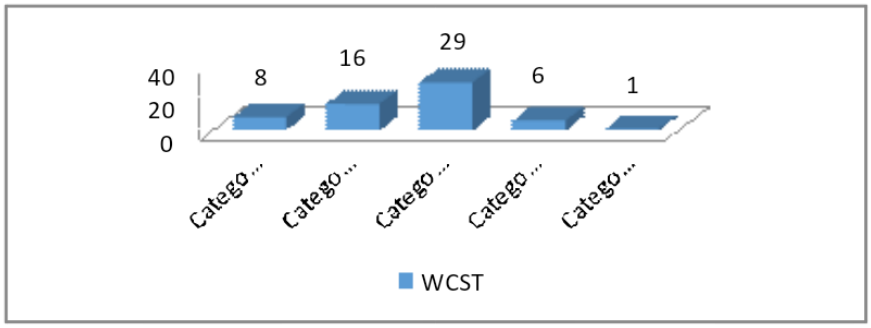
SADD SCORE CODED	FREQUENCY	PERCENT
Medium Dependence	9	15.0
High Dependence	51	85.0
Total	60	100.0

Table VII: Clinical classification levels of cognitive impairment as per WCST Scores

CLINIC CLASS_CODED	FREQUENCY	PERCENT
Below average	17	28.3
Average	10	16.7
Mild	23	38.3
Mild-Moderate	1	1.7
Moderate	4	6.7
Severe	5	8.3
Total	60	100.0

The WCST graph (Graph I) showed that 48.3% of the subjects completed only 3 categories followed by 6.3% subjects in 2 categories and 13.3% of subjects only 1 category. The Clinical classification levels of cognitive impairment as per WCST Scores shows the executive functions of prefrontal cortex, as elicited by neuropsychological battery. This study showed that 8% of the population showed severely cognitive impairment, 7% showed moderate cognitive impairment, 2% showed mild to moderate cognitive impairment, and 28% showed below average cognitive impairment, 38% showed mild cognitive impairment and 17% of population showed average cognitive impairment.

Graph I: Number of categories completed in Wisconsin Card Sorting Test (WCST)



The table VIII showed mean, median and standard deviation of Mini Mental Status Examination, WCST Score (total no of correct, total no of errors, perseverative responses, perseverative errors, non-perseverative errors, conceptual level responses.

Table VIII: Assessment of Mean, Median and Standard Deviation of MMSE and WCST

	MEAN	***MEDIAN***	***STD. DEVIATION***	***MINIMUM***	***MAXIMUM***
MMSEorHMSE	20.8167	21.0000	2.61347	15.00	25.00
correct.WCST	44.2333	46.0000	5.76479	30.00	56.00
errors.WCST	87.1667	89.0000	13.62596	33.00	110.00
per.res.WCST	81.3833	82.5000	11.79786	55.00	104.00
pers.err.WCST	81.1333	81.5000	10.93969	55.00	104.00
nonpers.err.WCST	114.2667	114.0000	11.59027	89.00	139.00
con.level.res.WCST	86.1000	88.0000	9.27307	65.00	108.00
err.WCSTT	42.5500	43.0000	6.09091	29.00	57.00
per.resp.WCSTT	37.8000	39.0000	7.67739	20.00	52.00
per.err.WCSTT	36.7333	37.0000	8.68833	.00	52.00
non.per.WCSTT	58.5000	59.0000	11.14238	.00	76.00
con.level.WSCTT	41.0667	42.0000	6.94742	27.00	66.00

The table IX showed significantly greater cognitive impairment in high dependent alcoholics compared to medium dependent alcoholics on WCST scores.

Table IX: Comparison of scores with medium dependent and high dependent alcohol dependent patients

PARAMETERS	**SADD**		**p-value**
	Medium (n=9)	**High (n=51)**	
	Mean ± SD		
Duration	9.44 ± 4.00	14.76 ± 8.33	0.056
MMSE / HMSE	22.56 ± 2.30	20.51 ± 2.56	0.026 *
Category completed WCST	2.44 ± 1.24	2.63 ± 0.85	0.075
Correct WCST	47.89 ± 5.09	43.59 ± 5.68	0.018*
Errors WCST	95.89 ± 8.95	85.63 ± 13.79	0.008*
per.res.WCST	92.11 ± 6.29	79.49 ± 11.56	0.001*
pers.err.WCST	90.89 ± 7.27	79.41 ± 10.61	0.002*
nonpers.err.WCST	122.33 ±13.44	112.84 ± 10.76	0.038*
con.level.res.WCST	94.67 ± 8.38	84.59 ± 8.64	0.002*
err.WCSTT	47.11 ± 5.93	41.75 ± 5.81	0.010*
per.resp.WCSTT	44.67 ± 4.03	36.59 ± 7.55	0.001*
per.err.WCSTT	43.67 ± 4.64	35.51 ± 8.69	0.002*
non.per.WCSTT	65.22 ± 9.19	57.31 ± 11.11	0.028*
con.level.WSCTT	46.56 ± 5.55	40.10 ± 6.76	0.002*

***** $p < 0.05$ Significant

VI. Discussion

Decision-making, one of the executive functions, is a complex process in which a choice is made after reflecting on the consequences of that choice. Many factors such as sex, age, education, etc play an important role in this process.[19]Besides the involvement of emotional processing, there are several other mechanisms which play a significant role in decision making such as response inhibition, perseveration, concept formation, and planning, set-shifting and working memory. Executive functions are associated with activation of the orbital and dorsolateral prefrontal cortex, the anterior cingulate, the insula, the inferior prefrontal cortex, Thalamus as well as cerebellum (Ernst et al) [,20].

In the present study, there were significant impairments in WCST – perseverative response, non-perseverative response, non-perseverative errors, perseverative errors, concept formation, and category completion. It indicates that individuals with alcohol dependence have poor performance on the test suggesting towards the disruption or delayed maturation in the DLPFC and superior medial frontal regions. Struss and Levine et al suggested that WCST is linked to the intact functioning of the dorsolateral prefrontal and superior medial frontal regions. [21] Katarzyna Nowakowski et al also supports the present study findings as it showed adults with lesions in DorsoLateral Pre-Frontal Cortex (DLPFC) performed poorly on working memory task and their level of performance was also consistently low on Wisconsin card sorting test [19] suggesting greater involvement of the right than left dorsolateral prefrontal cortex as seen in tasks involving response selection and inhibition. It was in accordance with the present study.

A study done by Lyvers & Yakimof et al in 2003 showed that the individuals during the test had difficulty to switch from a rewarding response to a new response leading to a perseverative response, which

indicated deficits in orbitofrontal cortex. These deficits manifest as individual's inability to learn from feedback and in turn affect his decision-making. But here the culprit was heroin and other stimulant substance which showed significant impairment in the decision-making and working memory. Similar results were observed in the present study but on alcohol-dependent individuals. This shows that most of the substances abused, either stimulants or depressants of a central nervous system which lead to dependence invariably result in cognitive deficits.

The studies conducted by the Bechara & Damasio; Bolla et al; Finnet al.; Grant et al [22, 23, 24] showed that cognitive functions (executive functions and working memory) are significantly impaired with the substance used by the population. The current study yielded similar results making the evaluation of cognitive deficits across various domains.

The study conducted by Mukundan et al [25] in NIMHANS with the sample size of 312 with follow up of 2 years showed significant changes in the cognitive functions in alcohol-dependent subjects compared to individuals without substance dependence. The present study also shows significant impairment of cognitive functions in alcohol-dependent individuals, but the results did not show much difference in the WCST and MMSE scores according to the duration of consumption of alcohol. This could be due to an influence of various other factors like education, sex, and age on the mental status of an individual or might be because of smaller sample size to draw conclusions.

The Present study enabled us to know about the working memory and executive functions like decision-making, concept formation, abstract reasoning and ability to shift strategies in individuals with alcohol dependence syndrome and was also useful in exploring the cognitive flexibility maintenance of an appropriate problem-solving strategy across changing stimulus conditions in order to achieve a future goal.

VII. Conclusion

Alcoholism is a problem both in developed and in the developing countries. Apart from physical complications chronic alcoholism is associated with mild to severe cognitive disturbances. The current study showed very promising results in support of the previous literature suggesting that significant cognitive deficits were noticed in individuals with alcohol dependence (ADS) mainly in working memory and executive functions like decision-making, concept formation, abstract reasoning and ability to shift cognitive strategies in response to changing an environment. Impairment in cognitive flexibility and maintenance of an appropriate problem-solving strategy across changing stimulus conditions in order to achieve a future goal was also noticed. So as a psychiatrist, we play very important role in motivating the patients and creating awareness about alcohol dependence not only physically but its ill-effects mentally also.

References

[1]. Jellineck, E.M. The Disease Concept of Alcoholism. New Haven, CT: Hillhouse Press. 1957

[2]. Cloninger, C.R.; et al. A new, semi-structured psychiatric interview for use in genetic linkage studies: A report on the reliability of the SSAGA. *Journal of Studies on Alcohol*.. **1987;55:149-58.**

[3]. Brandt.J, Butter.**N**,Rayn.**C**and Bayog.R . Cognitive loss processing of the Indo-US Symposium on Alcohol and Drug abuse1983, 1-9.

[4]. Ray R, R W Pickens. Proceedings Of The Indo – US symposium on alcohol and drug abuse.1989:1-9

[5]. Wilkinson D A, Carlen P L**.** Relationship of neuropsychological test performance to brain morphology in amnesic and nonamnesic chronic alcoholics, Acta Psychiatrica Scandinavia (Supl).**1980;**286: 89-101.

[6]. Rayn. C and Butters. N**.** Further Evidence for the continuum of Impairment Encompassing male alcoholic Korsakoff's patients and chronic alcoholic men, Alcoholism Clinical and Experimental Research. **1980;** 4: **190-198 190-98.**

[7]. Rayn.C and Butters.N**.** Cognitive Deficits in alcoholics, The Biology of alcoholism Vol 7, Plenum Press. **1983**;4:**190-98.**

[8]. Miller,N.R., Orr. J. Nature and sequence of neuropsychological deficits in alcoholics, Journal of studies on alcohol. **1980;41:325**.

[9]. Teyler T J, Perkins A T and Harris K M. The development of long-term potentiation in Hippocampus and Neo cortex, Neuropsychologia.1989; 27(1):**31-7**.

[10]. Berg, E, A**.** A simple objective test for measuring flexibility in thinking. Journal of General Psychology.**1948;39:15-22.**

[11]. Luria, A. R. (1973). The working brain. New York: Basic Books.

[12]. Shallice, T**.** Specific impairments in planning. In D.E. Broadbent & L. Weiskrantz (Eds.), The neuropsychology of cognitive function (pp. 199-209). London: The Royal Society. **1982:199-209.**

[13]. Chelune, G.J., & Baer, R. L**.** Developmental norms for the Wisconsin Card Sorting Test. Journal of Clin and Experimental Neuropsychology.**1983;8:219-28**.

[14]. Guys, J. A., & Willis, W.G**.** Validation of executive function tasks with young children. Developmental Neuropsychology. **1991;7: 487-501.**

[15]. Lezak, M. D. **(1983).** Neuropsychological assessment (2nd Ed.). New York: Oxford University Press. **1983.**

[16]. Drewe,E. A**.** The effect of type and area of brain lesion on Wisconsin Card Sorting Test performance. Cortex. **1974;10:159-70.**

[17]. Robinson,A. L., Heaton, R.K., Lehman, R.A., & Stilton, D. The utility of Wisconsin Card Sorting Test in detecting and localizing frontal brain lesions. Journal of Consulting and Clinical Psychology. **1980;48:605-14**.

[18]. Heaton,R.K., Chelune, G.J., Tally., Key, GG., Curtiss, G.**(1993).** Wisconsin Card Sorting Test Manual: Revised and Expanded. Psychological Assessment Resources. 1983.

[19]. Katarzyna Nowakowska, Karolina Jablkowska, Alina Borkowska**.** Cognitive dysfunctions in patients with alcohol dependence. Archives of Psychiatry and Psychotherapy**. 2008.3;29-35.**

[20]. Ernst,M., Grants, S.J., London, E.D., Contoreggi, C.S., Kimes, A.S., Spurgeon, L**.** Decision-Making in adolescents with behavior disorders and adults with substance abuse. American Journal of Psychiatry**.2003;160:33-40.**
[21]. Stout,J.C., Busemeyer, J.R., Grant, s.j., Bonson, K.R**.** Cognitive modeling analysis of decision-making processes in cocaine abusers. Psychonomic Bulletin and Review.**2004;4:742-5.**
[22]. Bechara,A., Damasio, H**:** Decision-making and addiction (part1): Impaired activation of the somatic status of the substance dependent individuals when pondering decisions with negative future consequences. Neuropsychologia. **2002;40:1675-89.**
[23]. Fellows,L.K., and Farah, M.J.**(2005).** Different underlying impairments in decision making following ventromedial and dorsolateral frontal lobe damage in humans. Cerebral Cortex.**2005;15:58-63.**
[24]. Finn,P.R**.** Early-onset alcoholism with conduct disorder. Go/no-go learning deficits, working memory capacity, and personality. Brain growth and grey matter density reduction in dorsal frontal cortex: Inverse relationships during postadolescent brain maturation. Journal of Neurology. **2002.**
[25]. Muralidharan, K., Venkatasubramanyam G., Pal, P.K., Benegal, V.**(2008).** Abnormalities in cortical and transcallosal inhibitory mechanisms in subjects at high risk for alcohol dependence: a TMS study. Addictive biology, **13(3) .**

Dr Deepak R S. "Cognitive Deficits in Alcohol Dependence Syndrome" IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 18, no. 2, 2019, pp 73-78.