

Visual working memory profile of persons with alcohol dependence syndrome: a hospital base comparative study

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ABSTRACT

Aim: The aim of the study was to explore the visual working memory of the persons with alcohol dependence syndrome in northeast India. Further, it aims at exploring the socio demographic correlates of alcohol dependence in North- East India. **Methodology:** The present study was a cross sectional and comparative in nature. It was conducted at Lokopriya Gopinath Bordoloi Regional Institute of Mental Health, Tezpur, Assam. Patients with ADS were screened both at Outpatient and Inpatient departments of LGBRIMH, Tezpur. At the outpatient level, patients diagnosed with alcohol dependence syndrome (ADS) by a consultant psychiatrist were requested to participate in the study. Those who gave informed consent were further screened on ICD-10 DCR criteria (WHO, 1993). They were also evaluated for the inclusion and exclusion criteria set for the present study. For inpatients diagnosed with ADS, similar procedure was followed; however, they were included in the study after 5-10 days of admission. All the participants gave informed written consent for their participation in the study. Thereafter, the socio demographic datasheet and Modified Kuppuswamy's Socio Economic Scale (2012) were applied, respectively. Finally, the Visual N –Back test was applied. For Group B, matched healthy controls were recruited from community. Those who agreed to participate in the study were first screened on the GHQ-12, and rest of the inclusion and exclusion criteria. Following this, participants gave the written informed consent to participate in the study. These steps were followed by the application of socio demographic datasheet and Modified Kuppuswamy's Socio Economic Scale. Visual N-back test. **Result:** - Persons with alcohol dependence group were low performer in Visual N-Back test. It has significant negative relationship with their Age, socio economic status and duration of alcohol intake. **Conclusion:** Group difference was found in visual working memory. However, the group-A were low performer as compare to group B. Group A has significant negative and positive correlation with visual working memory test. The experimental groups selected variable like age, education, socio economic status and duration of alcohol intake has significant association with visual working memory.

Keywords: Alcohol Dependenc, Visual Working Memory

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Received: March 8, 2020; Revision Received: March 21, 2020; Accepted: March 31, 2020

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Alcohol constitutes a notable public health burden resulting in great costs, affecting the individuals in use and their families. Alcohol (ethanol) is a legal substance (for persons over a certain age), consumed throughout the world mostly for recreational purposes (Hanson, 1995). The behavioral effects of alcohol vary somewhat between individuals but generally are dose-dependent such as low doses produce heightened activity (increased sociability and talkativeness) and disinhibition (release of inhibitions, reduced tension), whereas higher blood alcohol levels produce increased emotional instability and impairment in cognitive, perceptual and motor functions. Magnetic Resonance Imagery (MRI) studies have also been conducted among alcoholics, that shown loss of volume of the grey and white matter, especially in the prefrontal region (Sullivan, 2005). PET imaging has similarly been used to visualize the damage that heavy alcohol consumption has on the living brain. Researchers Wong, Maini, Rousset and Brasic (2003) found deficits in alcoholics, particularly in the frontal lobes, which are responsible for numerous functions associated with learning and memory, as well as in the cerebellum, which controls movement and coordination.

Alcohol dependence is characterized by a neuropsychological profile of extensive impairment in executive functions, visuospatial abilities, socio cognitive, emotional and motivational dysfunctions. Goldman (1983), cognitive deficits in alcoholics is influenced by the patient's age, length of drinking history and lower educational experience. He found that increased age, longer drinking history and lower educational level were associated with greater impairment. Alcohol dependence presents a significant challenge to society and health-care services as alcoholics are not all alike. They experience different subsets of symptoms, and the disease has different origins for different people. Therefore, to understand the effects of alcoholism and it is important to consider the influence of a wide range of variables. Though major research has focused on various aspects of Alcohol dependence syndrome but there has been no conclusive consensus about etiology. It is important to understand the Neuropsychological process, structural and functional aspect of the brain.

Hence, the above study was designed to study the effect of alcohol on visual working memory functions of alcohol dependent individuals from North East India. Considering the diversity of Northeast which may vary from village to village, the study also aims at studying the socio demographic correlates of alcohol dependence in this part of the nation.

Objectives

1. To see the difference of visual working memory of the persons with alcohol dependence syndrome and control group.
2. To see the relationship of visual working memory with selected socio demographic variables of persons with alcohol dependence syndrome.
3. To see the association between visual working memory and duration of alcohol intake.

Hypothesis

1. There will be no difference of visual working memory of the persons with alcohol dependence syndrome and control group.
2. There will be no relationship of visual working memory with selected socio demographic variables of persons with alcohol dependence syndrome.
3. There will be no association between visual working memory and duration of alcohol intake.

METHODOLOGY

The present study was cross sectional hospital base study carried out at Lokopriya Gopinath Bordoloi Regional Institute of Mental Health, Tezpur, Assam. The sample was collected from those who were diagnosed a case of Alcohol Dependence as per International Classification of Disease -10 diagnostic criteria for research. For this purpose, 150 experimental samples and 150 control group were chosen using variable such as age, education and socio-economic status. The study was adopted purpose sampling method and design was correlational and comparative. The experimental group included person diagnosed as a case of alcohol dependence according to age 18-50 years, male, primary education, comprehend and understand the instruction and Right handedness were selected. For control group the same inclusion criteria were consider. Their general health questionnaire 12 score would fall below 2. The experimental groups were excluded from the following criteria; persons with multiple substance and other co morbidities (except nicotine), mentally challenged, family history of mental illness, history of head injury, any other major physical disease. The same criteria were excluded from the control group. To assess demographic details self develop socio demographic data was used along with the consent from the both groups. For studying socio economic status, modified Kuppuswamy's Socio economic status scale 2012, assessment of visual working memory visual N- back test was used, diagnostic guide line for alcohol dependence syndrome under the criteria of ICD-10 and for control group GHQ-12 was administered to the respondents, and score of less than 2 was taken. The respondent was assured confidentiality, informed consent was taken from the respondents. The data was used only for research purpose of the study and sample was selected on voluntary basis. An appropriate statistical measure was used for the data analysis with the help of IBM SPSS-20.

Tools for Data collection

- 1. Semi structure socio demographic and clinical datasheet:** To obtain the information about Name, Age, Sex, Education, Handedness, Marital Status, Address, Religion, Duration of Alcohol used.
- 2. Modified Kuppuswamy's Socio Economic Status Scale: Updating Income Range for the year 2012:** The socioeconomic status was assessed through Modified Kuppuswamy's Socio Economic Status Scale (Kumar, N., & Gupta, H.2012). This scale is an updated version of the original Kuppuswamy's (Kuppuswamy. B.1981) scale sensitive to the current socioeconomic conditions of India. It was measure in the following domains educations, occupations and family income. Reliability and validity of the scale is not develop, but it is commonly used tools in urban set ups. Since the practicality of asking for income directly is a point in question and problems of low validity are seen to persist even if the questionnaire is anonymous/self filled (Rahul Sharma, Narendra K. Saini, 2016).
- 3. General health questionnaire -12:** Goldberg & Williams, 1988): GHQ-12 is a 12-item tool used to screen individuals who have recently experienced common symptoms (e.g. depression, anxiety, insomnia etc.). A score of 2 or more on GHQ-12 suggests possible psychological distress. It was used to screen normal controls in the present study. Normal controls had a score of less than 2 on GHQ-12. GHQ-12 is the most widely-used screening instrument to identify common mental disorders (Werneke et al., 2000; Aalto-Setala et al., 2002) and used in a number of countries and languages for different age groups (Goldberg & Williams, 1988; Werneke et al., 2000; Montazeri et al., 2003 & Gao et al., 2004). There are also several publications which refer the utilization of the GHQ. The split half reliability has shown to be 0.95

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and test –retest reliability has been found to be 0.76 Cronbach alpha coefficient is in the range of 0.82 to 0.86.

4. **Visual N-back test:** The 1back and 2 back version of N back test (Smith & Jones, 1999) were used. 1 back version would involve the visuo spatial sketchpad in visual modality and 2 back version would involve the central executive in visual modalities. Visual working memory was tested using N back test 1 back and 2 back versions. It consisted of 36 cards each of which had one black dot placed randomly along a circle imagine to be on the card. The dimensions and location of the imaginary circle on each card remained consonant in all cards. Each card was individually presented to the subject. The subject was told to respond whenever the location of the dot repeated itself. In the 1 back test, she /he was tell to respond when the location of dots was consecutively repeated, in the 2 back test she/he was tell to respond whenever the location of the dots was repeated after one intervene card. The number hits and error in each test formed the score.

Ethical issues:

The present study was passed from the scientific advisory committee and ethical committee from Lokopriya Gopinath Bordoloi Regional Institute of Mental Health. The respondent was assured of confidentiality, informed consent was taken from the respondents before the assessment. The participants were clearly explained about the purpose of the study and samples were selected on voluntary basis.

Statistical analysis:

Appropriate statistical analyses were performed using Statistical Package for Social Science Version- 20. Chi square was applied for the Group comparison in various socio demographic variables; Independent t- test was applied to find out the group difference, Spearman correlation was applied to see the relation of N-Back test profile with selected socio demographic variables.

RESULT AND DISCUSSION

Table 1:1 socio demographic variables of persons with alcohol dependence syndrome and control group.

Variable N=300	Numbers participants	Percentage %
<i>Age</i>		
18-28	66	22%
29-39	160	53%
40-50	74	24.7%
<i>Education</i>		
Primary	141	47.6%
Up To 10+2	102	34%
Above 10+2	57	19%
<i>Socio Economic Status</i>		
Upper	61	20.3%
Upper Middle	107	35.7%
Lower Middle	62	20.7%
Upper Lower	57	19.0%
Lower	13	4.0%
<i>Religion</i>		
Hindu	261	87.0%

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Variable N=300	Numbers participants	Percentage %
Muslim	13	4.3%
Christian	19	6.3%
Others	7	2.3%
Types Of Family		
Nuclear	108	36.0%
Joint	191	63.7%
Extended	1	3%
Marital Status		
Married	262	87.3%
Unmarried	38	12.7%

The above table shows the socio demographic variables of persons with alcohol dependence syndrome and control groups. In the socio demographic variables of both groups in terms of age, educational qualification, socio economic status, religion, types of family and marital status. The majority of the participant's age group was from 29-39 years group that is 53%. Nearly by half of them had received education up to primary level (47%), majority of the participants are belonged to upper middle class i.e. 107(35.7%) and 87% participants were followed Hindu religion and majority of participants are from joint family 63%, 87.3% of the participants were married and 12.7% were unmarried. The current finding is closely similar with the finding of the researchers Ghosh. P. 2018, Singh, et al. (2005). Sarkar et al. (2013) Mohan et al. (2000) Bhalla, Hiremath, Bhalla, Godke and Choudhury (2014) Sandra Zinn (2004) Neethi Valsan (2016).

Table1: 2 Group comparisons in Various Socio demographic variables of the both groups.

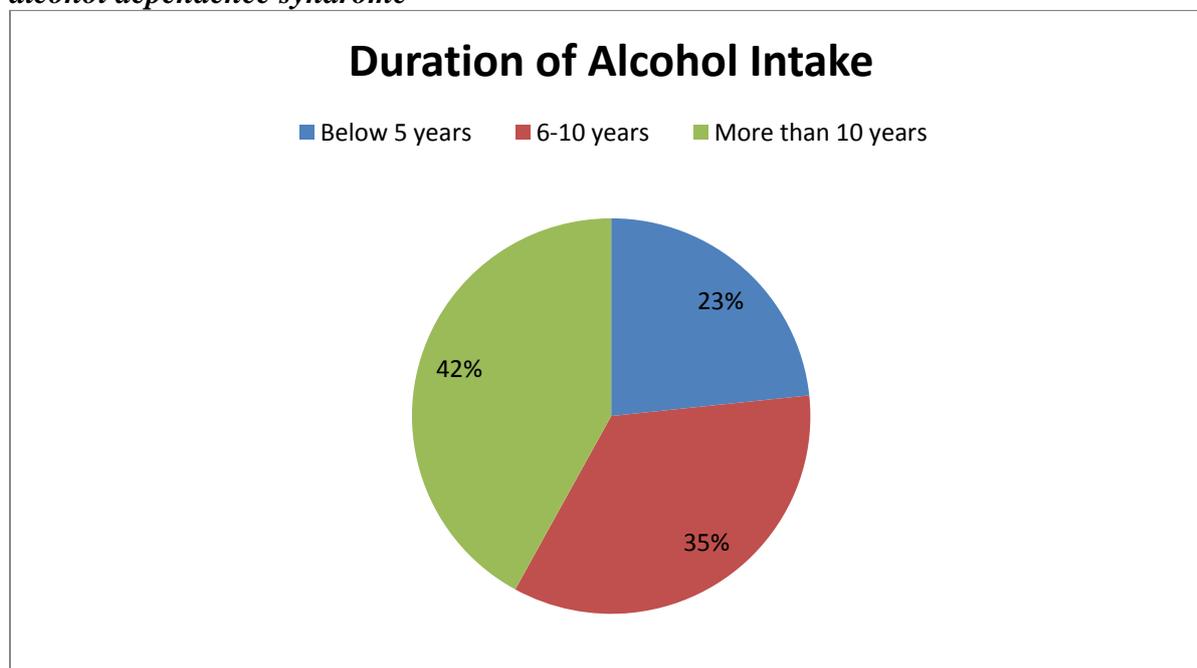
Variables N=300		Group-A (experimental group) N=150	Group-B (control group) N=150	df	χ^2	p
Age	18-28 years	34 (22.66%)	32(21.33%)	2	.115	.944
	29-39 years	80(53.33%)	80(53.33%)			
	40-50 years	36(24%)	38(25.33%)			
Education	Up to primary	71(47.33%)	70(46.6%)	2	.903	.204
	Up to 10+2	52(34.66%)	50(33.33%)			
	Above 10+2	27(18%)	30(20%)			
Marital Status	Married	126(84%)	136(90.66%)	2	.381	.997
	Unmarried	24(16%)	14(9.33%)			
	Separated	0(0%)	0(0%)			
Family Type	Nuclear	59(39.33%)	48(32%)	2	.083	.117
	Joint	91(60.66%)	102(68%)			
	Extended	0(0%)	0(0%)			
Religion	Hindu	137(91.33%)	124(82.66%)	3	8.8	.032
	Muslim	5(3.33%)	8(5.33%)			
	Christian	8(5.33%)	11(7.33%)			
	Others	0(0%)	7(4.66%)			
Socio Economic Status	Upper 26-29	30(20%)	31(20.66%)	4	.716	2.10
	Upper middle 16-25	53(35.33%)	54(36%)			
	Lower middle 11-16	31(20.66%)	31(20.66%)			
	Upper Lower 5-10	27(18%)	30(20%)			
	Lower ≤5	9(6%)	4(2.66%)			

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The above table shows group comparisons in socio demographic variables both group. Chi square was applied to see the group difference in selected socio demographic variables. Significant group difference was not found among the groups. However, in the variable like age, education and socio economic status of the participants have been matched with the control group so the group difference was not likely to occur from the above mention three variables.

Whereas unmatched variables like marital status of the participants, majority of the participants was married 87.33% followed by unmarried participants 12.66 %, when we talk about the two groups, the group difference was not found in a significant level in this variable. When we discussed about the type of family the majority of the participants family types were belonging to Joint family 63.6% and followed by Nuclear family were 36%, extended family 0.33% and both the groups didn't shows any significant difference in statistics. In religion the majority of the respondents were followed Hindu religion, 87%, followed by Christian religion 6.33% and Muslim 4.33% and others were 2.33%, in this variable score group difference was found in significant level ($\chi=8.8, p=.032$).

Figure 1.1: Shows the Pie chart of duration of alcohol Intake among the persons with alcohol dependence syndrome



The above figure shows that the durations of alcohol intake of the experimental group's. The duration of alcohol intake was divided in three groups below 5 years, 6-10 years and more than 10 years duration of alcohol intake. The majority of the alcohol dependent (group –A), their duration of alcohol intake were fallen in the category of more than 10 years i.e. 42% , and it has been followed by 6-10 years i.e. 34.66% and Below 5 years 23.33%. The findings of present study corroborated with the findings of previous study s of Siri Gowri etal. (2008) in her study mean duration of drinking was found 14.07 years. In the studies of Sandra Zinn (2004) & Manisha Jha (2015). The mean years of dependency was found 29.9 and 9.43+5.98 years.

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Table 1:3 Group difference in visual working memory ability between the experimental group and control group.

Group Difference In Working Memory							
Variable (visual working memory)	Experimental Group (N=150)		Control Group(N=150)		df	t	P
	Mean	Std.	Mean	Std.			
Visual N Back 1 Hit	7.42	1.19	8.53	.68	298	-9.91	.000
Visual N Back 1 Omission	1.59	1.18	.52	.75		9.36	.000
Visual N Back 1 Comission	2.28	1,86	.74	.64		9.55	.000
Visual N Back 1 Error	3.87	2.49	1.26	1.06		11.8	.000
Visual N Back 2 Hit	4.26	1.46	6.20	.86		-13.9	.000
Visual N Back 2 Omission	4.72	1.46	2.80	.86		13.9	.000
Visual N Back 2 Comission	3.52	3.38	.90	.70		9.29	.000
Visual N Back 2 Error	7.98	3.41	3.67	1.23		14.54	.000

**p<0.01, *p<0.05

Table shows the group difference in visual working memory an independent sample t-test indicate that the visual working memory 1 back hit score was higher in control group (M=8.53, SD.68) than experimental group (M=7.42, SD=1.19).The visual working memory 1 back omission score was lower in control group (M=.52, SD.75) than experimental group (M=1.59, SD=1.18). The visual working memory 1 back commission score was higher in experimental group (M=2.28, SD1.86) than control group (M=.74, SD=.64). The visual working memory 1 back error score was lower in control group (M=1.26, SD=1.06) than experimental group (M=3.87, SD=2.49).

The visual working memory 2 back hit score was higher in control group (M=6.20, SD .86) than experimental group (M=4.26, SD=1.46). The visual working memory 2 back omission score was lower in control group (M=2.80, SD .86) than experimental group (M=4.72, SD=1.46). The visual working memory 2 back commission score was higher in experimental group (M=3.52, SD 3.38) than control group (M=.90, SD=.70). The visual working memory 2 back error score was lower in control group (M=3.67, SD1.23) than experimental group (M=7.98, SD=3.41).

The findings of the present study corroborate the previous research finding of Siri Gowri et al. (2008). Visual N –back 2 hit 29.40%, Visual N –back 2 Number of errors 29, 40 %, verbal N-back 1 number of error 26.50%, visual N-Back test 1 number of error 26.50% and visual N back 1 hit 23.50%, impairment were found in the alcohol dependent as compare to control group.

Table 1:4 Correlation between the neuropsychological domain of working memory function with variables age, education, socio economic status and duration of alcohol intake.

N=150 Variables/Domain (Executive Functions Working Memory)	Age	Education	Socio Economic Status	Duration of Alcohol Intake
Visu N1-Back Test Hit	-.194*	.049	-.162*	-.210**
Visu N1- Back Test Omm	.193*	-.020	.151	.226**
Visun 1– Back Test Com	.009	.105	-.003	-.223**
Visu N1 –Back Test Error	-.092	.024	.134	.032
Visu N2-Back Test Hit	.009	.068	-.060	-.243**

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N=150 Variables/Domain (Executive Functions Working Memory)	Age	Education	Socio Economic Status	Duration of Alcohol Intake
Visu N2- Back Test Omm	-.015	.079	.050	.231**
Visu N2 – Back Test Com	-.171*	-.051	.195*	-.334**
Visu N 2 –Back Test Error	-.014	-.121	.212**	-.090

The above table shows that the experimental groups visual working memory and its relationship with various socio demographic variables and visual working memory N back test I Hit score has negative correlation ship with age ($r=-.194^*$, $p=0.5$), with Socio economic status ($r=-.162^*$, $p=0.01$) and with duration of alcohol intake ($r=-.210^{**}$, $p=0.01$), where as in the Visual N-Back 1 omission score has a positive correlation ship with age ($r=.193^*$, $p=0.05$) and duration of intake ($r=.226^{**}$, $p= 0.01$), whereas commission error has significant negative correlation with duration of alcohol intake ($r=-.223^{**}$, $p=0.01$), in the visual working memory N Back II hit score has significant negative correlation with duration of alcohol intake ($r=-.243^{**}$, $P=0.01$), and visual working memory omission score has significant positive correlation ship with duration of alcohol intake ($r=.231^{**}$, $p=0.01$), and visual working memory N-back 2 commission error score has a significant negative relationship with age ($r=-.171^*$, $p=0.05$) and duration of alcohol intake ($r=-.334^{**}$, $p=0.01$) and it has a positive significant relationship with Socio economic status ($r=.195^*$, $p=0.05$). Whereas Visual working memory N-Back test 2 Error score has a significant positive correlation ship with socio economic status ($r=.212^{**}$, $P=0.01$). The findings of the study indicate that the verbal working memory and visual working memory of the experimental groups has association with their demographic variables. Since the experimental group's age increase the working memory capacity to hold and manipulate information for ongoing process was reduce in both modalities. The variable like educations level, socio economic status of experimental groups doesn't have association with working memory. The duration of alcohol intake may affect the visual working memory of the experimental groups.

Implication

The findings have implications as working memory significantly associated with the self-regulation of drinking behavior. Working memory also taking vital role in integrating knowledge with visual modalities. Impairment on this area leads to difficulty in holding and manipulating information for ongoing process. So, the relevant cases can be referred for treatment and intervention for cognitive retraining and motivational enhancement therapy for relinquish alcohol and better cognitive functioning and leading productive life both professionally and socially.

Limitation

Findings of the present study cannot be generalized to a large population of persons with alcohol dependence syndrome because of following reasons purposive sampling technique, study is limited to one setting, cross sectional study; no follow up was done and it was purely quantities study. Beyond this age group 15-50 years was the limitation of the study. And the frequency of alcohol intake, quantity is also considered for the limitation of the study.

CONCLUSION

Group difference was found in the domain of working memory between the experimental and control groups. The experimental groups are worse performance in visual working memory.

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And persons with alcohol dependence have significant negative and positive correlation with age, education, socio economic status and duration of alcohol intake.

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Acknowledgements

The author appreciates all those who participated in the study and helped to facilitate the research process.

Conflict of Interest

The author declared no conflict of interest.

How to cite this article: B S Sharma & D Bhagabati (2020). Visual working memory profile of persons with alcohol dependence syndrome: a hospital base comparative study. *International Journal of Indian Psychology*, 8(1), 979-987. DIP:18.01.123/20200801, DOI:10.25215/0801.123