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A COMPARITIVE STUDY OF EXECUTIVE FUNCTIONS IN PATIENTS WITH EARLY AND LATE ONSET ALCOHOL DEPENDENCE

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ABSTRACT

BACKGROUND: Regular alcohol consumption has been linked to notable structural and functional alterations in the brain, particularly in the prefrontal cortex and related networks, which ultimately lead to deficiencies in executive functioning [(1,2)] and need to be compared between individuals having early vs late onset alcohol dependence.

AIM: To estimate and compare the executive functions among patients with early onset versus late onset alcohol dependence syndrome.

METHODS: A cross-sectional observational study was carried out among randomly selected 60 participants who were diagnosed with alcohol dependence syndrome as per ICD-10(DCR) criteria, severity of alcohol dependence was assessed via Severity of alcohol dependence questionnaire(SADQ), executive functions assessed in the study included Attention which was assessed via Digit span test, concentration assessed via Serial subtraction test and working memory assessed via Rey auditory verbal learning test (RAVLT) and comparative analysis of executive functions between early and late onset alcohol dependence groups was done.

RESULTS: A total of 60 participants 30 participants in each group were assessed and results compared that showed no significant association found between the onset of alcohol dependence and attention, as indicated by a Pearson Chi-Square value of 1.714 and a p-value of 0.19.There was no significant association found between the onset of alcohol dependence and concentration, as indicated by a Pearson Chi-Square value of 1.833 and a p-value of 0.4. The early-onset group achieved an average score of 6.1 on the RAVLT (Immediate recall), whereas the late-onset group had a slightly higher average score of 6.47. The p-value was 0.577, suggesting that there is no significant difference. The average scores for the RAVLT (Learning) were almost the same for both groups. The early-onset group scored 5.9, while the late-onset group scored 5.97. The p-value was 0.923, indicating that there is no significant difference.The early-onset group achieved an average score of 5.97 on the RAVLT

(Forgetting), whereas the late-onset group obtained an average score of 6.13. The p-value was 0.826, suggesting that there is no significant difference.
CONCLUSION: The executive functioning does not show significant differences depending on the age of onset. These findings underscore the significance of addressing alcohol use early on and emphasize the necessity of thorough cognitive evaluations and personalized rehabilitation programs for individuals with alcohol dependence, regardless of when it started.

KEYWORDS: Alcohol, Early and Late onset alcohol dependence, Executive functions

Alcoholism, often known as alcohol dependence, is a chronic illness marked by an inability to regulate alcohol usage in spite of negative outcomes. It contributes to a number of social and economic problems, as well as morbidity and mortality, making it a serious public health concern. Millions of people worldwide suffer from alcoholism, which has different beginning and progression patterns. The differential between late-onset alcohol dependence (LOAD) and early-onset alcohol dependence (EOAD), which are dependent on the age at which excessive drinking starts, is one of the most important aspects of alcohol dependency. This distinction is crucial because there is a theory that suggests differing effects on cognitive skills, especially executive functions, depending on when symptoms first appear.

Research so far has demonstrated a connection between alcoholism and deficits in a number of executive processes[3]. Generally speaking, early onset of alcohol dependency (EOAD) is defined as starting to drink excessively before the age of 25, usually in adolescence or the early stages of adulthood. Alcohol consumption during this critical period can have a major impact on the maturation of neural circuitry and cognitive capacities, as the brain is still developing during this time[4].However, LOAD(Late onset alcohol dependence)usually manifests beyond the age of 25, and it is often associated with a range of psychosocial factors, such as stress-related feelings, coping mechanisms, or later-life changes in social interactions. Given that important developmental milestones are reached by this age in LOAD compared to EOAD, it is plausible that the neurodevelopmental impact of alcohol is less pronounced in LOAD. Despite this, LOAD still poses a serious risk to cognitive functions, especially in light of the cumulative neurotoxic effects of alcohol and the associated health problems that may manifest as age advances [5].

Furthermore, despite the differences between these two developmental contexts, there is a paucity of research that specifically analyzes executive function impairments between EOAD and LOAD. The lack of comparative studies prevents a complete understanding of how the onset of alcohol dependence affects cognitive outcomes. A comprehensive comprehension of these characteristics is crucial for the development of tailored therapeutics that address the unique needs of individuals with EOAD and LOAD.

The goal of this research is to address these urgent needs and further our knowledge of the intricate relationships between alcohol consumption, cognitive functioning, and developmental trajectories throughout the lifespan by methodically examining executive functions in early and late-onset alcohol dependence populations.

MATERIALS AND METHODS

The study was carried out at two primary healthcare facilities: the psychiatric unit of Government Wenlock Hospital and KMC Attavar in Mangaluru, These settings were chosen due to their accessibility to a diverse population seeking treatment for alcohol dependence syndrome.60 patients participated in the study and sampling method employed was convenience sampling. Participants included in the study were between the age of 18 and 65 years with diagnosis of alcohol dependence syndrome(ADS) which was done according to the International Classification of Diseases-10 (ICD-10) Diagnostic Criteria for Research (DCR)[6].Those included in study were willing to provide informed consent in written had studied uptill 7th standard and had completed detoxification doses of benzodiazepines at least 1 week prior to assessment. Participants who had serious medical comorbidities, subnormal intelligence visual or hearing deficits active delirium comorbid substance

use (except nicotine), Major psychiatric disorders, Alcohol-induced psychosis and Recent detoxification within the preceding 7 days were excluded from the study. The study group included early onset alcohol dependence group, participants in this group were individuals who had onset of alcohol dependence syndrome at or before the age of 25, this group comprised individuals whose alcohol dependence symptoms manifested during adolescence or early adulthood and late onset alcohol dependence group participants in this group were individuals who had onset of alcohol dependence syndrome after the age of 25. This group included individuals whose alcohol dependence symptoms developed later in life, typically during midlife or later adulthood. The main outcome parameter of this study was the association between the age of onset of alcohol dependence syndrome and executive functions. Executive functions were assessed using standardized neuropsychological measures, including the Severity of Alcohol Dependence Questionnaire (SADQ)[14], Rey Auditory Verbal Learning Test (RAVLT)[15], Digit Span Test[16], and Serial Subtraction Test[17]. These outcome parameters were chosen to provide comprehensive insights into the cognitive differences comparing early vs late onset alcohol dependence groups.

STATISTICAL ANALYSIS

Data collected from the assessments were entered into an Excel spreadsheet and analyzed using IBM SPSS Statistics version 25. Comparative analyses between the early onset vs late onset alcohol dependence groups were conducted using appropriate statistical tests, such as the Chi-square test for categorical variables. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were calculated to summarize the data. Additionally, inferential statistics were used to determine associations and differences between groups, with statistical significance set at a predetermined alpha level.

ETHICAL CONSIDERATIONS

Ethical considerations were paramount throughout the planning, implementation, and dissemination of this study. Informed consent was signed by all participants, ensuring that they were informed in full about the study's purpose, procedures, risks, and benefits before agreeing to participate. Confidentiality of participant data was strictly maintained, with all personal information kept confidential and accessible only to authorized personnel involved in the study. Participants were assured that their involvement in the study would not impact their treatment or access to healthcare services. Overall, the study adhered to ethical guidelines and principles to uphold the rights, dignity, and well-being of all participants involved.

RESULTS

All 60 participants were able to complete the required assessment, based on the severity of alcohol dependence 15 out of 60 participants(25%) had mild, 20 out of 60 participants(33.3%) had moderate and remaining 25 participants(41.7%) had severe alcohol dependence assessed by the SADQ questionnaire(Table 4, Figure 1). The data for the variables "ONSET OF DEPENDENCE * ATTENTION" and "ONSET OF DEPENDENCE * CONCENTRATION" show that all 60 cases were valid and there were no missing cases, resulting in 100% completeness for both variables. This indicates that the study had full data for these variables, allowing for a comprehensive analysis of how the onset of alcohol dependence might affect attention and concentration in patients. The absence of missing data ensures that the results and conclusions drawn regarding attention and concentration are based on the complete dataset, thus providing robust and reliable insights. The relationship between the onset of dependence on alcohol and attention reveals that among the early-onset group, 20 out of 30 patients (66.7%) are classified as "aroused," while 10 (33.3%) are "not aroused." in contrast, the late-onset group shows an equal distribution with 15 patients (50%) "aroused" and 15 (50%) "not aroused." this suggests that early-onset patients have a higher tendency to be in an "aroused" state of attention compared to their late-onset counterparts(Table 6, Figure 3). The Chi-Square test results for the relationship between the onset of alcohol dependence and attention show a Pearson Chi-Square value of 1.714 with 1 degree of freedom and a p-value of 0.19. The continuity

correction, which adjusts for small sample sizes, yields a value of 1.097 with a p-value of 0.295. The likelihood ratio test provides a value of 1.724 with a p-value of 0.189. Fisher's Exact Test results give an exact two-sided significance of 0.295 and a one-sided significance of 0.147. Since all p-values are above the 0.05 threshold, there is no statistically significant association between the onset of alcohol dependence and the attention status of the patients. This suggests that the observed differences in attention arousal between early vs late-onset alcohol dependence patients are not statistically significant.

The relationship between the onset of dependence on alcohol and concentration indicates that, in the early-onset group, 12 out of 30 patients (40%) have "ill-sustained" concentration, while 18 (60%) have "sustained" concentration. In the late-onset group, 15 out of 30 patients (50%) exhibit "ill-sustained" concentration, and 14 (50%) show "sustained" concentration(Table 7,Figure 4). Overall, early-onset patients appear to have a slightly better concentration with a higher proportion of "sustained" concentration in comparison with the late-onset group. However, the differences between the two groups are not large, and further statistical analysis would be needed to determine if these differences are statistically significant. The Chi-Square test results for the relationship between the onset of alcohol dependence and concentration reveal a Pearson Chi-Square value of 1.833 with 2 degrees of freedom and a p-value of 0.4. The likelihood ratio test provides a value of 2.222 with a p-value of 0.329. Given that both p-values are above the 0.05 threshold, there is no statistically significant association between the onset of alcohol dependence and the concentration levels of the patients.

The ranks for the immediate recall, learning, and forgetting variables indicate minor differences between early and late onset alcohol dependence patients. For immediate recall, the late onset group has a mean rank of 30.65 compared to 30.35 for the early onset group. In learning, the late onset group has a mean rank of 29.93, while the early onset group has 31.07. For forgetting, the late-onset group has a mean rank of 29.58, slightly lower than the early-onset group's 31.42. These minor differences suggest similar performance levels in these cognitive tasks between the two groups, indicating no significant divergence in immediate recall, learning, and forgetting abilities based on the onset of alcohol dependence. The Mann-Whitney U test results for immediate recall, learning, and forgetting provide further evidence of no significant differences between early and late-onset alcohol dependence patients. The p-values for immediate recall (0.947), learning (0.799), and forgetting (0.667) are all well above the 0.05 threshold, indicating no statistically significant differences between the two groups in these cognitive domains. The Z-scores, being close to zero, also support this conclusion. Thus, the study results suggest that the onset of alcohol dependence (early vs. late) does not significantly impact immediate recall, learning, or forgetting abilities.(Table 5, Figure 2).

DISCUSSION

The study's statistical analysis shows that, contrary to what would be predicted given the results, the distribution of executive function measures among those with early and late onset alcohol dependent differs from the expected pattern. It was decided that using non-parametric statistical techniques was necessary to ensure the study's accuracy. This was because a number of variables did not show a normal distribution ($p < 0.05$), including the average amount of alcohol ingested and RAVLT (Immediate memory, Learning, and Forgetting). According to earlier research, people with EOAD had notable deficits in their executive and cognitive functions in comparison to people LOAD. This finding supports the earlier research. Recently, Kar et al. (2021)[7] conducted a study in which they found that patients diagnosed with EOAD had significantly higher externalizing psychopathology scores and more pronounced cognitive dysfunction than patients diagnosed with LOAD. EOAD was found to be associated with lower scores on the Wisconsin Card Sorting Test (WCST)[18] and more errors on the Continuous Performance Test (CPT)[19] in a study done by Kar et al. in 2021[7]. These results corroborate the current investigation's findings regarding early-onset alcohol dependency, which emphasized the significant cognitive deficits linked to the illness. The results of Kist et al.

(2014)[8] —a study that was relatively similar to this one—found that individuals with different start timings did not significantly differ in their cognitive performance. However, when compared to those without alcohol dependence, the results showed that all of the groups had cognitive abilities that were below average. The results of this investigation show a correlation between general cognitive impairment and alcohol use (Kist et al., 2014)[8] . The results of this study show that alcohol dependence is one of the factors that can influence the age at which cognitive deficits appear. This specific case highlights the need of recognizing alcoholism as a significant contributor to cognitive impairment. The results of a study conducted by Joos and colleagues (2012)[9] showed that impulsivity and antisocial traits were more prevalent in people with early-onset alcohol dependency (EOAD). These patients performed significantly better on measures assessing their capacity to plan and retrieve visual information than individuals with late-onset alcohol dependency (LOAD). According to Joos et al. (2012), patients with EOAD may exhibit greater impulsivity, but they may also have reasonable cognitive abilities[9].Peshkovskaya et al[20] conducted a recent study with the aim of investigating the effects of alcohol use on executive functioning. While there were no discernible changes in the outcomes according to the age of onset, the data showed considerable impairments in those with alcohol dependence. These results coincide with what we found in our study.

A study on the development of executive function in teens with alcohol use disorders was conducted by Boelema et al. (2016) [10]. Their study's findings demonstrated that there were no appreciable differences in executive function between those with alcohol use disorders and those without them. These results are consistent with our own, which also showed that there were no appreciable differences between people with early-onset alcohol dependent and those with late-onset alcohol dependency (Boelema et al., 2016: 45)(10). Chen et al. (2011)[11] concluded by highlighting the variations in symptoms and genetic predispositions found in individuals with alcohol dependence. They distinguished between cases that started later and those that started earlier. The research revealed that those with an early onset tended to exhibit more severe symptoms. Despite this, there were no appreciable changes in cognitive function, which is in line with what Chen et al. (2011)[11] found. In summary, the results of previous studies support our findings from the Mann-Whitney U test, which show that individuals with early-onset alcohol dependency differ significantly from those with late-onset alcohol dependency in terms of their clinical and behavioral traits. On the other hand, there is only a minor degree of variation observed in the executive functions between the two groups. Regardless of the moment at which the symptoms first appeared, it is critical to apply thorough and individualized procedures in order to address cognitive deficiencies in alcohol-dependent persons. According to our study's findings, people with early-onset and late-onset alcohol dependence do not significantly differ in terms of immediate recall (T1-T5), learning (T5-T1), or forgetting (T5-LDR). The p-values for forgetting (0.667), learning (0.799), and immediate recall (0.947) all surpass the significance level of 0.05, indicating the absence of any statistically significant variations between the two groups. These results align with the outcomes of other recent investigations. Researchers Saikia and Tripathi (2023)[12] in a recent study, looked into how age affects executive functioning and memory. The results showed that age was a significant factor in predicting cognitive deterioration. Remarkably, the age at which people began drinking did not appear to have any significant effects on the study's findings (Saikia & Tripathi, 2023)[12]. According to our research, there is no discernible difference in the early and late-onset groups' executive function performance. Regarding attention and concentration, the Chi-Square test findings in our study show no statistically significant differences between the early and late-onset groups when it comes to alcohol dependence. The p-values for concentration (0.4) and attention (0.19) in the statistical analysis show that the observed differences are not statistically significant. These results align with recent research that looked at executive and cognitive functioning in alcohol-dependent people. Researchers explored the intriguing world of personality traits in people with early and late-onset alcohol dependence in a recent study by Gupta et al. (2023)[13]. Their results revealed substantial differences in personality traits, but not in cognitive abilities such as concentration and attention. As confirmed by Gupta et al. (2023)[13], our

research results show that alcohol dependence does not significantly impact attention or concentration.

CONCLUSION

The study sought to compare executive functions in individuals with early-onset and late-onset alcohol dependence syndrome. Our research reveals a notable disparity in the length of time individuals have been using alcohol. Those who started using alcohol at an early age tend to have a longer average duration of alcohol use compared to those who started later in life. Nevertheless, there were no notable disparities found in cognitive performance, particularly on the RAVLT immediate recall, learning, and forgetting tests, among the two groups. In the same way, the Chi-Square tests for attention and concentration did not show any notable connections with the age at which alcohol dependence begins. Based on these findings, it appears that the length of alcohol use is notably longer in individuals who start drinking at an early age. However, it seems that cognitive performance does not show significant differences depending on the age of onset. These findings underscore the significance of addressing alcohol use early on and emphasize the necessity of thorough cognitive evaluations and personalized rehabilitation programs for individuals with alcohol dependence, regardless of when it started.

FINANCIAL SUPPORT AND SPONSORSHIP

Nil

CONFLICT OF INTEREST

There are no conflict of interest

AGE(yrs)		Frequency	Percent
	31 - 40	29	48.3
	41 - 50	18	30.0
	51 - 60	8	13.3
	Less than or Equal to 30	5	8.3
	Total	60	100.0
SEX		Frequency	Percent
Valid	FEMALE	1	1.7
	MALE	59	98.3
	Total	60	100.0
ONSET OF DEPENDENCE		Frequency	Percent
Valid	EARLY	30	50.0
	LATE	30	50.0
	Total	60	100.0

Table 1: Age, sex and onset of dependence in participants

TABLE 2: Comparison of alcohol dependence severity in participants among early vs late onset alcohol dependence group

In the early onset group 6(10%) participants had mild, 10(16.66%) had moderate and 14(23.37%) had severe dependence.

In the late onset group 9(15%) participants had mild, 10(16.67%) had moderate and 11(18.33%) had severe dependence.

		ONSET OF DEPENDENCE		Total
		EARLY	LATE	
SEVERITY OF DEPENDENCE	MILD	6	9	15
	MODERATE	10	10	20
	SEVERE	14	11	25
Total		30	30	60

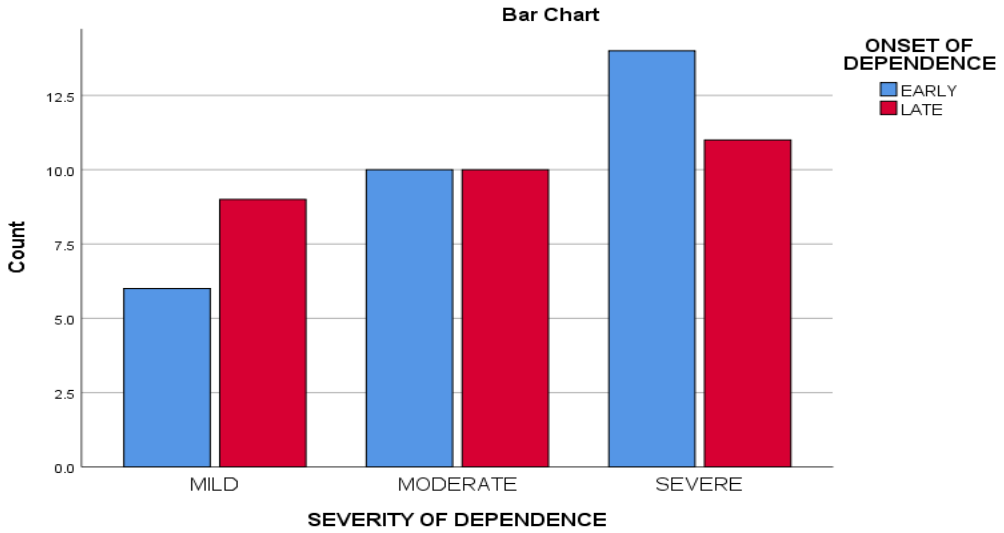

Fig.1 Comparison alcohol dependence severity in participants among early vs late onset alcohol dependence group

Ranks				
Variable	ONSET OF DEPENDENCE	N	Mean Rank	Sum of Ranks
IMMEDIATE RECALL	LATE	30	30.65	919.5
	EARLY	30	30.35	910.5
	Total	60		
LEARNING	LATE	30	29.93	898
	EARLY	30	31.07	932
	Total	60		
FORGETTING	LATE	30	29.58	887.5
	EARLY	30	31.42	942.5
	Total	60		

TABLE 3: Ranks of RAVLT test for Immediate Recall, Learning and Forgetting

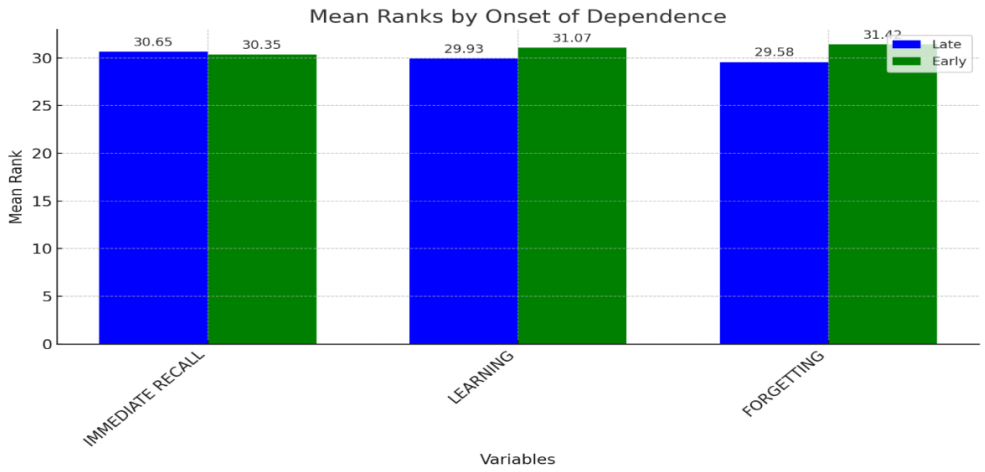

Figure 2: Comparing the mean ranks for different variables (IMMEDIATE RECALL, LEARNING, FORGETTING) by the onset of dependence (late and early)

ONSET OF DEPENDENCE IN RELATION TO ATTENTION				
		ATTENTION		
		AROUSED	NOT AROUSED	Total
ONSET OF DEPENDENCE	EARLY	20	10	30
	LATE	15	15	30
Total		35	25	60
ONSET OF DEPENDENCE IN RELATION TO CONCENTRATION				
		CONCENTRATION		Total
		ILL SUSTAINED	SUSTAINED	
ONSET OF DEPENDENCE	EARLY	12	18	30
	LATE	15	14	30
Total		27	32	60

Table 4: Onset of dependence in relation to Attention and Concentration

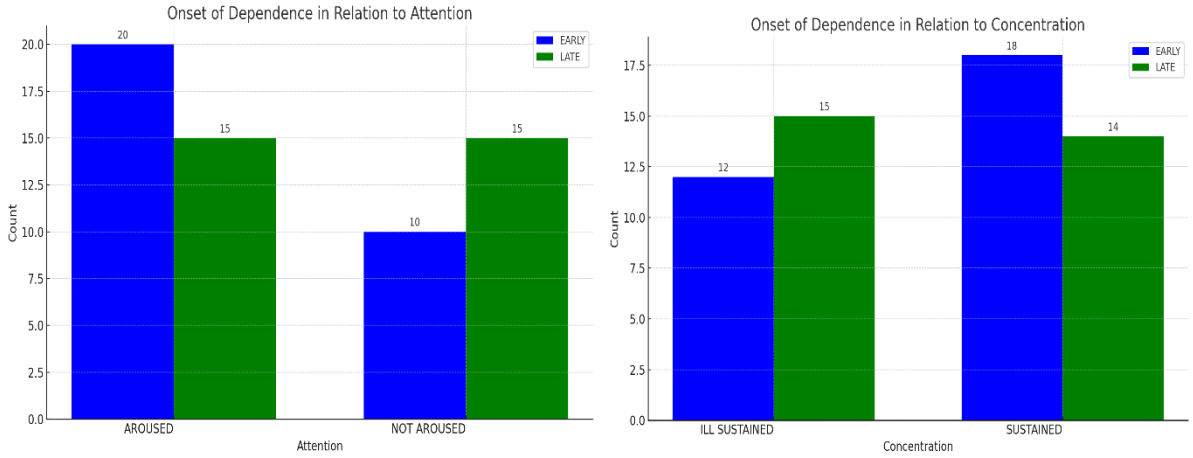

Figure 3: Onset of dependence in relation to Attention and Concentration

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