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PREVALENCE OF ADULT ADHD AND ITS ASSOCIATION WITH NICOTINE USE AND EXECUTIVE FUNCTION IN INDIVIDUALS WITH ALCOHOL USE DISORDER

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ABSTRACT

Background: ADHD increases risk for psychiatric comorbidities, including substance use disorders. Individuals with ADHD start substance use earlier, experiment more with drugs, and have higher nicotine addiction risk. These factors underscore the clinical importance of exploring ADHD in substance use. There is not much Indian literature on Adult ADHD and substance use disorder, hence this study was carried out to assess the prevalence of Adult ADHD in patients with severe alcohol use disorder and to compare nicotine dependence and executive function between those with and without adult ADHD. **Materials and Methods:** 54 individuals diagnosed with Alcohol use disorder [severe] as per DSM-5 criteria were screened for Adult ADHD using the Adult ADHD Self-Report Scale [ASRS-v1.1]. The diagnosis of adult ADHD was confirmed using the Diagnostic Interview for ADHD in Adults [DIVA 2.0] and the Wender Utah Rating Scale. Nicotine dependence and severity was assessed using the Fagerström Test for Nicotine Dependence, and executive function was evaluated using the Frontal Assessment Battery [FAB]. **Results:** Out of 54 individuals, 13 [24.1%] were diagnosed with adult ADHD and 12 [22.2%] had nicotine dependence. The mean Fagerström score was significantly higher in the ADHD group [4.75 ± 1.89] than in the non-ADHD group [2.50 ± 1.31 ; $p < 0.05$]. The mean FAB score was slightly lower in the ADHD group [15.31 ± 1.49] compared to the non-ADHD group [15.66 ± 1.41], but this difference was not statistically significant. **Conclusion:** Adult ADHD and nicotine dependence was highly prevalent in individuals with severe alcohol use disorder but there was not much impairment in executive functioning.

Keywords: adult ADHD, nicotine use, alcohol use, executive functioning

INTRODUCTION

ADHD is a neurodevelopmental disorder which presents with symptoms of inattention, hyperactivity, and impulsivity in childhood with prevalence ranging from 8-10% in school age children and being more common in boys. Approximately 50% to 75% of children with ADHD continue to display symptoms into adolescence and adulthood. The prevalence of adult ADHD is about 3.4% internationally and 4.4% in the United States and with a range of 1.2 to 7.3% internationally. Along with symptoms of inattention, hyperactivity, and impulsivity, these individuals experience emotion dysregulation and have deficits in executive functioning. These individuals have wide range of social, personal, academic, and occupational impairments throughout their lives.

ADHD is a risk factor for development of various psychiatric co-morbidities such as depression, anxiety, substance use disorder, and personality disorders in adulthood. Though there has been lot of research on children with ADHD, their complications in adulthood need further research.

A study conducted in adults in the United States reported the 12-month and lifetime prevalence of alcohol use disorder at 13.9% and 29.1%, respectively, based on

DSM-5 criteria. In India, alcohol abuse is also on the rise, influenced by multiple bio-psycho-social factors. Notably, the lifetime prevalence of adult ADHD among individuals with substance use disorders is approximately 23.1%, raising the question of whether ADHD may be a contributing risk factor. Individuals with adult ADHD tend to initiate substance use earlier-at an average age of 19 compared to 22 in those without ADHD. Substance use in this population is associated with poorer social and occupational functioning, including lower educational attainment, lower job status, low self-esteem, social deficits, and higher rates of antisocial personality disorder.

Patients with ADHD and substance use disorders are more likely to experiment with drugs than those without ADHD, possibly due to impaired behavioral learning. A key explanation for this comorbidity is dopaminergic dysfunction, particularly involving the mesolimbic pathway—the final common pathway in addiction. Adolescents with ADHD are also at higher risk for nicotine addiction, with some studies reporting rates twice as high as in their non-ADHD peers. Nicotine may temporarily improve attention and impulse control in these individuals, leading to its use as a form of self-medication. ADHD patients are also more likely to progress from substance use to abuse as a coping mechanism.

There are a number of studies available worldwide which have estimated the prevalence of adult ADHD in the general population and its prevalence in individuals



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more frequent among individuals with adult ADHD [53.8%] compared to those without [24.4%], though this difference was also not statistically significant [$P > 0.05$]. Overall, responses to ASRS questions [Q1–Q6] differed significantly between individuals with and without adult ADHD [$P < 0.05$ for all]. Notably, there was greater statistical significance in the response to problems remembering appointments and obligations [Q3, $P = 0.001$] and feeling overly active or driven [Q6, $P = 0.001$] compared to the other items.

Table 3 describes nicotine use disorder details of study population. Out of the 54 cases studied, 12[22.2%] had nicotine dependence. The mean Fagerstrom score was almost double in the adult ADHD group compared to non ADHD one [4.75 ± 1.89 vs 2.50 ± 1.31]. A greater proportion of patients with adult ADHD [23.1%] reported smoking in the first few hours after waking than individuals without ADHD [2.4%], and this difference was statistically significant [$p < 0.05$]. However, responses to other smoking-related questions—including current smoking status, time to first cigarette, difficulty refraining from smoking in public, hardest cigarette to quit, number of cigarettes per day, and smoking-related health impairment—did not differ significantly between groups.

The mean $\pm$ SD of total FAB scores was 15.31 ± 1.49 in the adult ADHD group and 15.66 ± 1.41 in the non-ADHD group and the difference was not statistically significant.

Table 1: Sociodemographic and phenomenological data of the study population

Age Group (years) (N=54)	No. of cases	% of cases
<20	1	1.9
20 – 29	18	33.3
30 – 39	17	31.5
40 – 45	18	33.3
Education		
Secondary	21	38.9
Higher Secondary	18	33.3
Graduate	13	24.1
Post Graduate	2	3.7
Occupational status		
Unemployed	16	29.6
Employed – Temporary	9	16.7
Employed – Permanent	24	44.4
Self Employed	5	9.3
History of substance use in the family		
Yes	27	50.0
No	27	50.0
Type of substance used by the family member		
NA	27	50.0
Alcohol	20	37.0
Tobacco	3	5.6
Cannabis	1	1.9
Alcohol + Tobacco	3	5.6

Age of onset of substance use (years)		
15 – 19	17	31.5
20 – 24	19	35.2
25 – 29	10	18.5
30 – 36	8	14.8
Type of substance with which the patient started		
Alcohol	44	81.5
Tobacco	10	18.5
Maximum duration of abstinence in months		
1 – 4 months	24	44.4
5 – 9 months	14	25.9
10 – 14 months	7	13.0
15 – 19 months	2	3.7
>20 months	7	13.0
Medical and surgical co-morbidity		
Hypertension	5	9.3
Diabetes mellitus	3	5.6
Hepatitis	1	1.9
Peripheral Neuropathy	3	5.6
Pancreatitis	1	1.9
Cholelithiasis	1	1.9
Nil	40	74.1

Table 2: Prevalence of Adult ADHD and comparing it based on various sociodemographic and phenomenological factors:

Diagnosis of Adult ADHD	No. of cases (N=54)		% of cases		
Present	13		24.1		
Absent	41		75.9		
Subtypes of Adult ADHD					
Combined	9			16.7	
Predominantly inattentive	3			5.6	
Predominantly Hyperactive-impulsive	1			1.9	
NA	41			75.9	
Socio- Demographic and Phenomenological Factor	Adult ADHD Status				
	Present		Absent		P-value
	N	%	N	%	
Education					
Secondary	7	53.8	14	34.1	0.534 NS
Higher Secondary	4	30.8	14	34.1	
Graduate	2	15.4	11	26.8	
Post Graduate	0	0.0	2	4.9	
Occupation					
Unemployed	5	38.5	11	26.8	0.458 NS
Employed – Temporary	3	23.1	6	14.6	
Employed – Permanent	5	38.5	19	46.3	
Self Employed	0	0.0	5	12.2	

with substance use disorder. However, we could not find any literature in India until recent study by Ganesh et al in 2017 which have assessed prevalence of ADHD in substance dependence. Also, comparison of nicotine use and executive functioning between ADHD and non ADHD individuals has not been reported in reviewed literature. The high prevalence of alcohol and nicotine use in India indicates a substantial population needing assessment for co-morbid ADHD. Individuals with ADHD often show executive function deficits that impair daily functioning. Existing studies suggest a strong link between ADHD and substance use disorders, raising the possibility of undiagnosed ADHD in many addicts. Due to conceptual controversies and potential overlap with cluster B personality disorders, nosological status of adult ADHD as a disorder is not clear.

However, the above points highlight the clinical importance of exploring this topic further and hence this study was undertaken to assess the prevalence of Adult ADHD in patients with severe alcohol use disorder and to compare nicotine dependence and executive function between those with and without adult ADHD.

MATERIALS AND METHODS

This was a cross-sectional, descriptive study conducted in the Psychiatry Outpatient and Inpatient Departments of a tertiary care hospital. The study included individuals diagnosed with severe Alcohol Use Disorder based on DSM-5 criteria. It was carried out over a period of 18 months following approval from the Institutional Ethics Committee. The participants were enrolled after taking written informed consent who fulfilled inclusion and exclusion criteria.

Inclusion criteria were: Individuals aged between 18 and 45 years, of either sex and attending the Psychiatric OPD/IPD with diagnosed Substance use Disorder [severe] [Alcohol] using the DSM-5 criteria and had been abstinent from alcohol for a minimum of one month. Exclusion criteria were: illiteracy [defined as inability to read or write in English, Marathi, or Hindi], requirement of urgent medical care, presence of co-morbid Major Depressive Disorder, Schizophrenia, or other psychotic disorders, and those currently receiving antipsychotic or mood-stabilizing medications.

A total of 70 patients were initially screened. Of these, 16 were excluded: 5 due to illiteracy, 7 for being above the age limit, 2 declined to give consent, and 2 required urgent medical attention. The final study sample comprised 54 patients.

A self-prepared semi-structured proforma was used for collection of data regarding various socio-demographic factors and patterns of use. All the patients were screened for adult ADHD using Adult ADHD Self-Report Scale [ASRS- v1.1] Symptom Checklist. It is an instrument consisting of the eighteen questions, six of which are the most predictive of symptoms consistent with ADHD. Those patients who screen positively with [ASRS-v1.1] were interviewed for diagnosis of Adult ADHD using the DIVA 2.0 interview and diagnosis was confirmed using Wender Utah Rating Scale. The Diagnostic Interview for ADHD in Adults [DIVA 2.0] is a structured diagnostic interview that assess-

es ADHD symptoms in both adulthood and childhood, their chronicity, and the resulting clinical or psychosocial impairments. It provides a list of concrete and realistic examples, for both current and retrospective [childhood] behavior for each of the 18 symptoms of ADHD. The Wender Utah Rating Scale is used to assess adults for Attention Deficit Hyperactivity Disorder with a subset of 25 questions associated with that diagnosis. A cutoff score of 46 indicates the presence of Adult ADHD.

All the patients were administered the Fagerstrom Test for Nicotine Dependence and Frontal Assessment Battery for nicotine use and executive functions, respectively. The Fagerström Test for Nicotine Dependence is a six-item tool that assesses the intensity of physical nicotine addiction by evaluating cigarette use, compulsion, and dependence. The Frontal Assessment Battery [FAB] is a brief battery of six neuropsychological tasks designed to assess frontal lobe functions at bedside.

STATISTICAL ANALYSIS

Data analysis was done by using SPSS [Statistical Package for social sciences] – Version 20:0. Qualitative data variables were expressed by using frequency and Percentage [%]. Quantitative data variables were expressed by using Mean, Standard deviation. Chi-square test / Fisher's exact test were used to find the association between two qualitative data variables. p-value < 0.05 was considered as significant.

RESULTS

Table 1 describes the socio-demographic and phenomenological details of study population. 54 patients of severe alcohol use disorder were included in our study and mean age of our population was 33.8 years [19–45 years]. Most individuals were educated upto secondary level [38.9%] and only 3.7% were postgraduates. Employment status showed 29.6% were unemployed, 16.7% had temporary jobs, 44.4% had permanent jobs, and 9.3% were self-employed. Most individuals had early onset of substance use, with 66.7% starting before the age of 25. Alcohol was the initial substance of use for 81.5%, and tobacco for 18.5%. Regarding abstinence, 44.4% of cases had a maximum duration of 1–4 months, while only 13% maintained abstinence for over 20 months, indicating that most patients had shorter abstinence periods. Most [74.1%] cases had no medical comorbidities while the rest had hypertension [9.3%], diabetes [5.6%], peripheral neuropathy [5.6%], pancreatitis [1.9%] and cholelithiasis [1.9%].

Table 2 describes Adult ADHD status of study population and comparison based on various sociodemographic and phenomenological factors. 13 [24.1%] out of 54 cases were diagnosed with adult ADHD. Among those with ADHD, 9 cases had the combined type, 3 had the predominantly inattentive type, and 1 had the predominantly hyperactive-impulsive type. There was no statistically significant difference based on education status, occupational status and distribution of medical/surgical comorbidities between the adult ADHD and non-ADHD groups. Still, unemployment was higher among those with adult ADHD [38.5% vs. 26.8%], while permanent and self-employment were more common in those without ADHD. Substance use onset between ages 15–19 was

Age of onset of substance use (years)					
15 – 19	7	53.8	10	24.4	0.142 ^{NS}
20 – 24	4	30.8	15	36.6	
25 – 29	2	15.4	8	19.5	
30 – 36	0	0.0	8	19.5	
Medical and surgical Co-Morbidity					
Hypertension	3	23.1	2	4.9	0.159 ^{NS}
Diabetes mellitus	0	0.0	3	7.3	
Hepatitis	0	0.0	1	2.4	
Peripheral Neuropathy	0	0.0	3	7.3	
Pancreatitis	0	0.0	1	2.4	
Cholelithiasis	1	7.7	0	0.0	
Nil	9	69.2	31	75.6	

P-values by Chi-Square test. P-value<0.05 is considered to be statistically significant. NS-Statistically non-significant.

Table 3: Details regarding Nicotine Use in study population:

Diagnosis of Nicotine Dependence	No. of cases		% of cases		
Present	12		22.2		
Absent	42		77.8		
	Adult ADHD Status				
Total Fagerstrom Score(N=12)	Present (n=4)		Absent (n=8)		P-value
	Mean	SD	Mean	SD	
	4.75	1.89	2.50	1.31	

P-values by independent sample t test. P-value<0.05 is considered to be statistically significant. *P-value<0.05.

DISCUSSION

There is a significant bidirectional overlap between adult ADHD and substance use disorder, drawing growing clinical, research, and public health attention. Identifying various factors between the two can help in making more targeted treatments and improve outcomes.

In this study we interviewed patients with a diagnosis of Severe Alcohol Use Disorder based on the DSM-5 criteria. Our study indicates a high prevalence of alcohol use disorder among younger individuals—a trend also noted by Grant et al. Additionally, majority of individuals with adult ADHD began alcohol use before the age of 25 aligning with the findings by Ganesh et al.

Swendsen et al. suggested a significant association between low education and alcohol dependence. In our study, a higher proportion of individuals with adult ADHD had only secondary education, while those without ADHD had more graduates and postgraduates, though the association was not statistically significant. These findings are consistent with Kuriyan et al. and

Fayyad et al.

Nearly half of our study population were either unemployed or in temporary jobs, reflecting the bidirectional link between unemployment and substance use. Swendsen et al. also reported a significant association between occupational status and onset of alcohol use.

As expected, medical and surgical comorbidities did not differ significantly between the adult ADHD and non-ADHD groups. Common conditions included hypertension, diabetes, peripheral neuropathy, hepatitis, pancreatitis, and cholelithiasis. Studies by Edelman et al. and Moss et al. attribute these to chronic alcohol use rather than ADHD. However, such comorbidities may worsen cognitive function and overall prognosis.

Sitholey et al. reported an adult ADHD prevalence of 8.83% in the general population in Lucknow, while Jhambh et al. found a lower rate of 5.48% among college students in Chandigarh, highlighting the limited research on adult ADHD in India and the need for broader community studies. In contrast, our study found a significantly higher prevalence of adult ADHD [24.1%] among individuals with substance use disorder as compared to the general population in India. Our findings correlate with international data from van Emmerik-van Oortmerssen et al. [23.1%] and with Ganesh et al. who reported 21.7% of individuals with substance use disorder as “highly likely to have adult ADHD”. However, we were able to confirm the diagnosis of adult ADHD with the DIVA 2.0 and Wender Utah scale. Additionally, 84.6% of individuals with adult ADHD had an early onset of substance use [<25 years], similar to Ganesh et al.'s results [92.3%]. The combined ADHD subtype was the most prevalent in both studies.

Our study results reveal that there was a greater proportion of individuals with Adult ADHD who reported of smoking currently as compared to those without adult ADHD and the mean total Fagerstrom score was significantly higher in individuals with adult ADHD as compared to those without the disorder. Our observations are in line with a study by Matthies et al., which found similarly higher rates of smoking in the adult ADHD group and a higher mean Fagerström total score. This study also identified a significant relationship between adult ADHD and smoking even when sick, as well as a trend toward smoking soon after waking up.

Comparing executive functioning, we found the mean FAB score in the adult ADHD group was slightly lower compared to the mean FAB score in the non ADHD group but the difference was not statistically significant. Milioni et al. reported similar findings in their study on executive function deficits in adults with ADHD, with mean FAB scores of 15.94 [SD 2.13] in the ADHD group and 16.91 [SD 1.26] in the non-ADHD group. The difference was not clinically significant, consistent with our study results.[41] The FAB as a tool may lack sensitivity to detect subtler cognitive deficits.

Studies suggest that executive function impairments in adult ADHD often emerge later in life, typically during higher education or in demanding jobs. Research also indicates a link between IQ and executive function in ADHD. Antshel et al. found that individuals with ADHD

and high IQ showed greater executive dysfunction than high-IQ individuals without ADHD. The degree of impairment varies and may be masked by intellectual ability.

These findings highlight the limitations of purely quantitative assessments and underscore the need for qualitative evaluations and careful clinical assessment to better understand the nuanced neuropsychological profile of adult ADHD.

CONCLUSIONS

Adult ADHD and nicotine dependence was highly prevalent in individuals with severe alcohol use disorder but there was not much impairment in executive functioning.

Our study was limited by small sample size and being a single centered study, findings cannot be generalized. Age-matched controls were not included, limiting the comparison of socio-demographic variables, executive function, and nicotine use.

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