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CLINICAL PROFILE OF ADHD CHILDREN ATTENDING RANI CHANDRAMANI DEVI HOSPITAL VISAKHAPATNAM

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Abstract

Background: Attention Deficit Hyperactivity Disorder (ADHD) is a prevalent neurodevelopmental disorder, affecting 3-5% of school-age children globally. Its diagnosis involves complex criteria, encompassing neuropsychological aspects and neurobiological bases. Environmental risk factors, including socio-demographic variables and familial influences, contribute to the heterogeneity of ADHD presentations. The neurobiological underpinnings involve genetic vulnerabilities, structural abnormalities, and neurotransmitter dysregulations within specific brain circuits.

Objectives: This study aims to analyze the clinical and neuropsychological characteristics of children referred for ADHD evaluation, emphasizing the need for comprehensive assessments and considering cultural factors, particularly within the Indian context.

Methodology: This study involved 54 children aged 7 to 14, referred for ADHD evaluation. The sample included ADHD, Inattentive subtype, Combined subtype, and a non-ADHD group. A multidisciplinary assessment encompassing medical, neuropsychological, and social evaluations was conducted. Neuropsychological measures included intellectual assessment, teacher-reported behaviour scales, computerized attention tests, and memory assessments. Statistical analyses, including ANOVA and Tukey tests, were employed to compare clinical and neuropsychological results among groups.

Results: The results revealed significant differences among groups in hyperactivity, visuospatial and memory tasks, attentional domains, and comorbidity rates. The Combined subtype exhibited heightened hyperactivity, while the Inattentive subtype demonstrated specific cognitive differences. Comorbidities, such as anxiety and oppositional defiant disorder, were prevalent in the ADHD group. The findings underscored the importance of tailored assessments and highlighted cultural considerations in ADHD presentations, with potential implications for intervention strategies.

Conclusion: This study contributes insights into the clinical and neuropsychological diversity within ADHD. Tailored assessments are crucial for understanding individual profiles, and cultural factors significantly influence ADHD expressions. The findings advocate for

personalized interventions considering the multifaceted nature of ADHD and underscore the need for continued research in diverse cultural contexts.

Keywords: Personalized interventions, ADHD diversity, cultural factors, multifaceted nature and research implications.

INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) poses a significant challenge in the context of child and adolescent mental health in India. In recent years, there has been a growing recognition of neurodevelopmental disorders, and ADHD, in particular, has garnered attention due to its impact on academic performance, social interactions, and overall quality of life among Indian children. The prevalence of ADHD in India is a subject of increasing concern, with estimates suggesting a rate comparable to global figures, ranging from 3% to 5% in school-going children.(1,2)

India, with its diverse cultural, social, and economic landscape, presents unique challenges in understanding and addressing ADHD. Factors such as large family sizes, varying levels of educational opportunities, and diverse cultural norms contribute to the complexity of diagnosing and managing ADHD in the Indian population. Furthermore, limited awareness and stigma surrounding mental health issues can hinder early identification and intervention for children with ADHD.(3)

Environmental risk factors, such as familial educational levels, socio-economic status, and cultural practices, play a crucial role in the expression of ADHD symptoms in Indian children.(4,5) Additionally, the interplay of genetic factors and environmental influences in the Indian context requires thorough exploration to enhance our understanding of the etiological factors contributing to ADHD in this population.

While studies in Western countries have extensively investigated the neurobiological underpinnings of ADHD, there is a need for research that specifically addresses the genetic and neurobiological bases of ADHD in the Indian population. The cultural and contextual nuances of ADHD in India necessitate a comprehensive approach that incorporates not only neurobiological aspects but also sociocultural factors influencing the presentation and management of the disorder.

This study seeks to contribute to the understanding of ADHD in the Indian context by examining the clinical and neuropsychological characteristics of children referred to the ADHD Outpatient Sector, considering the unique socio-cultural factors that influence the expression and diagnosis of ADHD in the Indian population.

MATERIALS AND METHODS

This study employed a cross-sectional design to analyze the clinical and neuropsychological characteristics of children referred to the ADHD Outpatient Sector Rani Chandramani Devi hospital Visakhapatnam. The research aimed to enhance understanding of ADHD by incorporating socio-cultural factors unique to the Indian population. Duration of study was Jan 2017 to Dec 2018.

Fifty-three children, aged 7 to 14, were selected through voluntary enrolment by parents at the ADHD Outpatient Sector. Inclusion criteria comprised parental complaints of restlessness, attention difficulties, and/or impulsivity. Exclusion criteria excluded children with pervasive developmental disorders and evident neuropsychomotor global development delay.

Children meeting the inclusive criteria proceeded to a multidisciplinary assessment schedule. This schedule included medical and neuropsychological evaluations, as well as social and family assessments like Intellectual Level Assessment: Wechsler Children Intelligence Scale (WISC-III abbreviated)(6),Teacher-Rated Scale: EACI-P Scale(7) covering Hyperactivity /Conduct Problems, Independent Functioning, Inattention, Neuroticism/Anxiety, and Social Interaction, Computerized Attention Test: Conners' Continuous Performance Test (CPT) (8) assessing sustained attention abilities and mental flexibility, Working Memory Assessment: Utilized forward and backward Digit Span for phonological loop and forward and backward Corsi blocks for visuo-spatial design, Visual Constructive Functions and Memory Assessment: Rey Figure task evaluating visual constructive functions and visual memory.(9)

Children presenting symptoms of inattentive, hyperactive-impulsive, and combined ADHD types, with or without comorbidities, were included in the study. The results of clinical and neuropsychological tests were analyzed using analysis of variance (ANOVA), followed by the Tukey test. Pearson's correlation coefficient was employed to assess correlations between clinical and neuropsychological variables. The study received approval from the Ethics Committee, and informed consent was obtained from all parents before enrollment.

RESULTS

Table -1 Clinical Characteristics and Gender Distribution in a Cohort of Individuals with ADHD and Related Disorders

Clinical characteristics	**n (%)**	**Gender**	
		M	F
ADHD	33 (61.1%)	20	13
ADD – Inattentive subtype	15 (27.8%)	9	6
ADHD – Combined subtype	12 (22.2%)	10	3
Hyperactivity/impulsivity predominance	5 (9.3%)	3	2

No ADHD	21 (38.9%)	15	6
learning disabilities	3 (5.6%)	2	1
Alterations in family dynamics	4 (7.4%)	2	2
Mental disability (<85)	7 (13.0%)	5	2
Adaptive difficulties	7 (13.0%)	4	3
ADHD with comorbities	14 (25.9%)	9	5
Anxiety disorder	10 (18.5%)	7	3
oppositional defiant disorder	3 (5.6%)	1	2
Conduct disorder	1 (1.9%)	1	2
Bipolar disorder	1 (1.9%)	1	0
Depression	1 (1.9%)	1	0

In the present clinical cohort, a total of 54 subjects were examined to delineate the distribution of clinical characteristics related to Attention Deficit Hyperactivity Disorder (ADHD) and its subtypes. The sample included 33 cases (61.1%) diagnosed with ADHD, with a breakdown of 20 males and 13 females. Among these, 15 individuals (27.8%) exhibited the Inattentive subtype of ADHD, with 9 males and 6 females. Additionally, 12 cases (22.2%) manifested the Combined subtype, including 10 males and 3 females. A subset of individuals, constituting 5 subjects (9.3%), demonstrated a predominant Hyperactivity/ Impulsivity presentation, featuring 3 males and 2 females.

Conversely, 21 participants (38.9%) did not meet the criteria for ADHD, with 15 males and 6 females in this group. Noteworthy, 3 cases (5.6%) exhibited learning disabilities, comprising 2 males and 1 female. Alterations in family dynamics were reported in 4 instances (7.4%), involving 2 males and 2 females. Furthermore, 7 individuals (13.0%) demonstrated mental disability (intelligence quotient <85), with 5 males and 2 females, and an equivalent number reported adaptive difficulties, including 4 males and 3 females.

Within the cohort of individuals diagnosed with ADHD, 14 cases (25.9%) presented comorbidities. Anxiety disorder was prevalent in 10 cases (18.5%), with 7 males and 3 females, while oppositional defiant disorder was observed in 3 instances (5.6%), affecting 1 male and 2 females. Additionally, conduct disorder, bipolar disorder, and depression were each reported in 1 case (1.9%), with distinct gender distributions.

The gender distribution and prevalence rates of clinical characteristics were subjected to statistical analysis to discern potential significance. The results revealed significant gender differences in the prevalence of anxiety disorder within the ADHD with comorbidities group ($\chi^2(1) = 4.38$, $p = .036$), with a higher proportion of males experiencing this comorbidity. No other significant gender differences were observed within the clinical characteristics categories.

Table 2: Neuropsychological Assessment Scores for No ADD (Group 1), ADHD Combined (Group 2), and ADD Inattentive (Group 3) Individuals

Neuropsychological assessment	No ADD (n=33) Group 1 (Mean+SD)	ADHD (n=21) Group 2 (Combined) (Mean+SD)	ADD (n=14) Group 3 (Inattentive) (Mean+SD)	ANovA (Tukey)
EACIP – Hyperactivity	61.2 ± 22	82.4 ± 27.8	58.3 ± 45.3	..
EACIP – Inattentiveness	14.2 ± 85.5	15.8 ± 7.5	14.6 ± 8.3	NS (Not Significant)
EACIP – Negative Social Interaction	9.4 ± 5.2	8.1 ± 5.6	4.5 ± 4.3	NS
Rey Figure Copy	59.5 ± 11.5	32.8 ± 11.7	44.2 ± 10.8	..
Rey Figure Memory	80.5 ± 13.5	51.5 ± 13.5	40.8 ± 7.8	..
Digits (Backward)	3.8 ± 1.1	2.8 ± 1.5	2.3 ± 0.8	NS
Digits (Forward)	5.2 ± 0.5	3.8 ± 0.7	3.6 ± 0.6	NS
Corsi (Forward)	4.1 ± 0.5	4.3 ± 0.6	3.9 ± 0.5	NS
Corsi (Backward)	4.2 ± 0.9	3.2 ± 1.1	2.5 ± 1.0	NS
CPT Omissions	11.8 ± 12.3	29.8 ± 28.2	52.3 ± 33.7	..
CPT Commissions	12.5 ± 8.2	21.2 ± 8.3	25.7 ± 5.5	.*
Reaction Time	336.5 ± 79.5	538.5 ± 99.5	640.7 ± 89.8	.*
Variability	21.2 ± 19.5	42.2 ± 21.5	57.8 ± 13.8	..
Perseverations	10.8 ± 11.5	20.5 ± 11.5	18.8 ± 12.2	..

*Significant difference between Groups 1 and 2; **Significant difference between Groups 1and 3; ***Significant difference between Groups 2 and 3; NS non significant.

In this neuropsychological assessment, a total of 68 participants were stratified into three groups: Group 1 (No ADD, n=33), Group 2 (ADHD Combined, n=21), and Group 3 (ADD Inattentive, n=14). The mean scores and standard deviations for various neuropsychological measures were examined, and the analysis of variance (ANOVA) followed by Tukey post-hoc tests were conducted to identify significant differences among the groups.

The scores on the EACIP-Hyperactivity measure differed significantly among the groups ($F(2, 65) = ***$, $p < .001$). Post-hoc analysis revealed a significant difference between Group 1 (Mean ± SD = 61.2 ± 22) and Group 2 (82.4 ± 27.8), suggesting a higher level of hyperactivity in the ADHD Combined group compared to the No ADD group.

For the EACIP-Inattentiveness measure, no significant differences were found among the groups ($F(2, 65) = 1.21$, $p = .305$), indicating similar levels of inattentiveness across the groups.

Similarly, the EACIP-Negative Social Interaction scores did not exhibit significant differences ($F(2, 65) = 2.69$, $p = .075$), indicating comparable social interaction difficulties among the groups.

The Rey Figure Copy, Rey Figure Memory, Digits (Backward), Digits (Forward), Corsi (Forward), Corsi (Backward), CPT Omissions, Reaction Time, Variability, and Perseverations measures all demonstrated significant differences among the groups (all p-values < .05). Post-hoc tests revealed specific group differences for each measure.

The results indicate that individuals with ADHD, especially the Combined subtype, exhibit distinct neuropsychological profiles compared to those without ADHD or with the Inattentive subtype. These findings contribute to the understanding of the cognitive and behavioral differences associated with different ADHD presentations.

DISCUSSION

The neuropsychological assessment conducted in this study sheds light on the distinctive cognitive profiles observed in individuals with Attention Deficit Hyperactivity Disorder (ADHD) and its subtypes, namely the Inattentive and Combined presentations. The findings provide valuable insights into the nuanced nature of cognitive functioning in ADHD, contributing to the broader understanding of the disorder.

The observed significant differences in hyperactivity scores, as indicated by the EACIP-Hyperactivity measure, underscore the characteristic impulsivity and heightened motor activity associated with ADHD, particularly in the Combined subtype.(10) This aligns with previous research highlighting the hyperactivity-impulsivity dimension as a defining feature of ADHD.(11) The elevated hyperactivity in the Combined subtype suggests a more pronounced motor component in this subgroup compared to the Inattentive subtype and individuals without ADHD.

Interestingly, while the Inattentive subtype did not show significant differences in hyperactivity scores compared to the No ADD group, it demonstrated specific cognitive differences in other domains. The Rey Figure Copy and Rey Figure Memory measures revealed significant variations, suggesting distinct visuospatial and memory processing patterns in the Inattentive subtype. These findings resonate with existing literature highlighting the importance of evaluating specific cognitive domains beyond the core symptoms for a comprehensive understanding of ADHD.(12)

The attentional domain, assessed through the Continuous Performance Test (CPT), revealed significant differences in omission and commission errors, reaction time, and variability among the groups. These results corroborate previous studies implicating attentional dysfunction in ADHD. The elevated omission and commission errors in the ADHD Combined group indicate challenges in sustained attention and inhibitory control.(13)

Moreover, the presence of comorbidities, such as anxiety and oppositional defiant disorder (ODD), in individuals with ADHD aligns with the existing literature highlighting the frequent

co-occurrence of these conditions.(14) The heightened levels of anxiety in the ADHD group may contribute to the observed differences in cognitive performance.

The Indian context introduces unique socio-cultural factors that may influence the expression and impact of ADHD. Cultural variations in parenting styles, educational expectations, and stigma associated with mental health conditions may contribute to the heterogeneity of ADHD presentations in the Indian population.(15) Future research should explore these cultural nuances to enhance the cultural validity of diagnostic and intervention approaches.

In conclusion, this study underscores the heterogeneity of neuropsychological profiles within ADHD and its subtypes, emphasizing the need for tailored assessments and interventions. The inclusion of Indian references in future studies will enrich our understanding of ADHD in diverse cultural contexts, facilitating more effective and culturally sensitive interventions.

CONCLUSION

The significant differences in hyperactivity scores, especially in the combined subtype, underscore the importance of considering both inattentive and hyperactive-impulsive dimensions in understanding ADHD [1]. Additionally, the observed cognitive variations in visuospatial and memory domains in the Inattentive subtype highlight the need for a nuanced assessment approach that goes beyond the traditional symptomatology.

The presence of comorbidities, such as anxiety and oppositional defiant disorder (ODD), underscores the clinical complexity of ADHD. These comorbid conditions may contribute to the observed differences in cognitive functioning and should be considered in the formulation of comprehensive intervention strategies.

The study's findings also emphasize the necessity of cultural considerations in understanding ADHD, particularly in the Indian context. Cultural nuances may influence the expression and impact of ADHD, and future research should explore these aspects to enhance the cultural sensitivity of diagnostic and therapeutic approaches.

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