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DEVELOPMENTAL AND PSYCHIATRIC COMORBIDITIES ACROSS ADHD SUBTYPES IN CHILDREN: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Attention-deficit/hyperactivity disorder (ADHD) is frequently accompanied by developmental delays and psychiatric comorbidities that vary across clinical subtypes. Understanding these subtype-specific associations is essential for early identification and individualized care.

Materials and Methods: This cross-sectional study was conducted in the psychiatry outpatient department of a tertiary care hospital and included 50 children aged 5–17 years diagnosed with ADHD and normal intellectual functioning. Diagnostic classification was based on DSM-IV-TR criteria and ADHD Rating Scale IV. Developmental delays across motor, language, and social domains were assessed through clinical evaluation. Comorbid psychiatric disorders were identified using DSM-IV-TR diagnostic guidelines. Data were analyzed using SPSS version 11.5, with descriptive statistics and chi-square tests applied where appropriate.

Results: Developmental delays were observed in 50% of participants, with language delays being the most prevalent (47.1%). Delays in gross motor development were noted in 8.8%, while fine motor delay was absent. Social developmental delay was seen in 2.9% of cases. Among ADHD subtypes, the combined type was most frequent (66%), followed by inattentive (24%) and hyperactive-impulsive (10%) subtypes. Patterns of psychiatric comorbidities varied significantly across subtypes. The inattentive group exhibited higher rates of anxiety and depressive disorders, while the combined type had greater frequency of externalizing disorders such as oppositional defiant disorder and conduct disorder, as well as neurodevelopmental conditions including intellectual disability, seizure disorders, and autistic traits.

Conclusion: Children with ADHD, even those with normal cognitive functioning, frequently exhibit developmental and psychiatric comorbidities. The distribution of these comorbid conditions varies by ADHD subtype, underscoring the need for comprehensive, subtype-specific assessment. Early recognition and tailored interventions are vital for improving outcomes in this population.

Keywords: ADHD, developmental delay, psychiatric comorbidity, ADHD subtypes, children.

INTRODUCTION

Attention-deficit/hyperactivity disorder (ADHD) is one of the most frequent neurodevelopmental disorders in childhood, characterized by persistent inattention, hyperactivity, and impulsivity.[1] Epidemiological data estimate its prevalence at approximately 5–7% in school-aged children globally.[2] Children with ADHD often demonstrate delays in language acquisition and motor development, even when their overall intelligence is preserved, underscoring the broader neurodevelopmental impact of the disorder.[3,4]

Motor coordination deficits in ADHD are well documented. Nearly half of the affected children exhibit impairments in gross and fine motor skills,

with evidence suggesting a 2–3 year lag in motor maturation compared to neurotypical peers.[5] In particular, language delays are reported in up to 50% of the ADHD population, reflecting difficulties across both expressive and receptive modalities.[3] Such developmental deficits can complicate everyday functioning and exacerbate academic and social challenges.

ADHD presents clinically in three distinct subtypes: inattentive (IA), hyperactive-impulsive (HI), and combined (CT).[1] The combined subtype is typically the most prevalent in clinical practice. Children with the inattentive subtype are more likely to present with internalizing disorders such as anxiety or depression, whereas those with externalizing features, such as aggression and conduct issues, are more frequently associated with HI or CT presentations. Empirical studies reveal that comorbidities like oppositional defiant disorder (ODD) and conduct disorder (CD) are especially common in children with combined-type ADHD.[6]

Beyond behavioral comorbidities, other neurodevelopmental and psychiatric conditions frequently coincide with ADHD. Anxiety disorders affect about 18–25% of children with ADHD, while mood disorders, learning disorders, autism spectrum disorder (ASD), intellectual disability, and seizure disorders are also disproportionately represented in this population.[7,8] Meta-analytic data indicate that approximately two-thirds of pediatric ADHD patients have at least one additional psychiatric diagnosis, highlighting the heterogeneity of clinical presentations.[8]

Given the complexity of ADHD and its frequent comorbidity with other developmental delays and psychiatric disorders, thorough evaluation across multiple domains is crucial. This study aims to delineate the prevalence of developmental delays among children with ADHD and normal intellectual capacity, characterize subtype distribution, and examine the pattern of comorbid conditions across ADHD subtypes. By elucidating these associations, the study seeks to inform multidisciplinary assessment and guide personalized intervention strategies in routine clinical care.

MATERIALS AND METHODS

This cross-sectional observational study was conducted at the psychiatry outpatient department of a government-affiliated tertiary care hospital in Pune, which serves as a referral center for pediatric neurodevelopmental disorders. The study population consisted of 50 children diagnosed with Attention-Deficit/Hyperactivity Disorder (ADHD) over a one-year period from February 2013 to January 2014.

Children between the ages of 5 and 17 years who fulfilled the diagnostic criteria for ADHD, as per the DSM-IV-TR, were included in the study. Diagnostic confirmation was made using the ADHD Rating Scale IV, followed by a structured clinical interview. Written informed consent was obtained from parents or guardians prior to inclusion. Children with acute physical illnesses or whose caregivers declined consent were excluded.

A detailed evaluation was performed using a semi-structured proforma which collected demographic data, developmental history, and information on family environment. Socioeconomic classification was conducted using the Modified Kuppuswamy Scale (2012 version). Intelligence was assessed through the Binet Kamat Test (BKT).

Each child underwent comprehensive clinical and neurological examination, including assessment of developmental milestones across motor, language, and social domains. The DSM-IV-TR guidelines were used to classify ADHD into three subtypes: inattentive (IA), hyperactive-impulsive (HI), and combined (CT). Comorbid psychiatric conditions were also diagnosed based on DSM-IV-TR criteria.

All data were systematically recorded and analyzed using SPSS version 11.5. Descriptive statistics were used to summarize the distribution of ADHD subtypes and associated comorbidities. Chi-square tests and t-tests were applied to evaluate associations between categorical and continuous variables, respectively. A p-value < 0.05 was considered statistically significant.

RESULTS

Our study was a little different from the previous studies in India in including the children with intellectual disability with ADHD in the sample. Thus a total of 32% of sample size having intellectual disability (n=16) as comorbidity with the ADHD diagnosis, showed a significant delay in milestone achievement.To compare with the previous studies in India and to remove the confound of milestone delay in intellectual disability we are considering only the developmental delays seen in ADHD children without intellectual disability. Among the 68% of ADHD children without intellectual disability (n=34), 50% showed a delay in achievement of various milestones (n=17). Language milestone was seen to be delayed in maximum cases, accounting for 47.1%.

Table 1: Developmental Delay among ADHD Children with Normal Intelligence (n=34)

Developmental Domain	%
Any Developmental Delay (DD)	50.0
Gross Motor	8.8
Fine Motor	0.0
Social	2.9
Language	47.1

Assessment of ADHD subtype distribution revealed that the majority of children fell under the combined type (CT), followed by the inattentive type (IA), with the hyperactive-impulsive subtype (HI) being least common [Table 2]. This subtype distribution is consistent with existing literature suggesting that the combined presentation is the most frequently diagnosed form in clinical settings.

Table 2: Distribution of ADHD Subtypes

Type of ADHD	n	%
Predominantly Inattentive (IA)	12	24.0
Predominantly Hyperactive (HI)	5	10.0
Combined Type (CT)	33	66.0

Comorbidity analysis revealed a notable burden of co-occurring psychiatric and neurodevelopmental conditions across all ADHD subtypes. The inattentive group showed a higher frequency of anxiety and depressive disorders, suggesting a possible internalizing profile. In contrast, the hyperactive-impulsive and combined types were more commonly associated with externalizing disorders such as oppositional defiant disorder and conduct disorder. Intellectual disability and seizure disorders were predominantly noted in children with the combined subtype, highlighting a more complex clinical profile in this group. Additionally, learning disabilities and autistic traits were identified across all subtypes, but most prominently among those with combined ADHD [Table 3].

Table 3: Distribution of Comorbid Disorders According to ADHD Subtype

Comorbid Disorder	n (IA)	n (HI)	n (CT)
Anxiety Disorder	7	0	6
Depressive Disorder	2	0	0
Learning Disorder	2	1	5
Intellectual Disability	3	1	12
Oppositional Defiant Disorder	0	3	8
Conduct Disorder	0	0	7
Autistic Disorder	0	0	6
Seizure Disorder	1	0	9
Mood Disorder	0	1	0

DISCUSSION

This study examined developmental delays and comorbid psychiatric conditions among children diagnosed with ADHD who had normal intellectual functioning. A key finding was the high prevalence of language-related delays, affecting nearly half of the participants, despite intact global cognitive abilities. This is consistent with prior research showing that children with ADHD often struggle with various aspects of language development, including expressive, receptive, and pragmatic functions.[3] Language delay, in such cases, may not always co-occur with general intellectual deficits, underscoring the need for focused screening in this domain.

The low prevalence of gross motor and social delays observed in this cohort contrasts with some earlier studies that suggest broader neurodevelopmental vulnerabilities in ADHD.[4] However, fine motor delays were notably absent in our group, possibly due to the selection of children with normal intelligence and perhaps greater adaptive functioning. Still, even subtle deficits in early motor and social milestones may have long-term implications for executive functioning and academic adjustment.[9]

With regard to ADHD subtype distribution, the combined type (CT) was the most prevalent, followed by the inattentive (IA) and hyperactive-impulsive (HI) types. This distribution aligns with global clinical patterns where CT is commonly diagnosed due to the visibility of symptoms and broader functional impairment.[10] Subtype identification is clinically important, as each subtype may be associated with differing comorbidity profiles and long-term outcomes.

The pattern of psychiatric comorbidity observed in this study further supports the heterogeneity of ADHD. Children with the inattentive subtype were more likely to present with internalizing disorders such as anxiety and depression. This aligns with previous findings indicating that children with IA often experience emotional dysregulation and social withdrawal, which are less easily detected than the externalizing symptoms of HI and CT types.[11] In contrast, externalizing disorders, including oppositional defiant disorder (ODD) and conduct disorder (CD), were more frequently associated with the CT and HI groups. These findings are consistent with literature describing impulsivity and aggression as predictors of behavioral comorbidity in ADHD.[12]

A noteworthy observation was the concentration of intellectual disability, seizure disorders, and autistic traits within the combined subtype group. This reinforces evidence suggesting that children with CT tend to exhibit more complex neurodevelopmental profiles and often require multidisciplinary intervention.[13] The presence of such comorbidities has implications for treatment planning, school support systems, and prognosis.

The high prevalence of developmental and psychiatric comorbidities in this study supports the

need for comprehensive assessment protocols in ADHD. A narrow focus on core symptoms may overlook critical co-occurring challenges that influence the child's overall functioning. Early identification of these associated conditions could allow for more personalized and effective therapeutic strategies.

CONCLUSION

Children with ADHD and normal intelligence frequently exhibit developmental and psychiatric comorbidities, particularly language delays and internalizing or externalizing disorders. The combined subtype was most prevalent and associated with more complex comorbidity patterns. These findings emphasize the importance of subtype-specific assessment and comprehensive evaluation to guide early and individualized interventions.

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