Original Article

Prevalence and Patterns of Specific Learning Disabilities in Children with Attention Deficit Hyperactivity Disorder: A Cross-Sectional Study

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Abstract

Background: Attention Deficit Hyperactivity Disorder (ADHD) is one of the most prevalent neurodevelopmental conditions in childhood, affecting approximately 5–10% of children globally. Accumulating evidence suggests that a substantial proportion of children with ADHD also harbour concurrent Specific Learning Disabilities (SLD), yet the precise prevalence and subtype distribution of SLD within this population remain incompletely characterised, particularly in the Indian context. This study investigated the frequency, type, and associated factors of SLD among children with ADHD attending a tertiary paediatric centre in Bengaluru, India. **Material and Methods:** A cross-sectional study was conducted on 95 children aged 6–12 years diagnosed with ADHD according to DSM-5 criteria. The NIMHANS Index for Specific Learning Disabilities was administered to identify and classify SLD subtypes (dyslexia, dysgraphia, dyscalculia). Demographic, perinatal, and socioeconomic data were collected and analysed using Pearson's Chi-Square test. **Results:** Of 95 children with ADHD (mean age 8.5 years; 66.3% male), 63 (66.3%) had at least one co-occurring SLD. The hyperactive subtype of ADHD was most prevalent (45.3%). Dyscalculia was the most common SLD (49.5%), followed equally by dysgraphia and dyslexia (48.4% each). A total of 38.1% of children with SLD exhibited all three disability types concurrently. No statistically significant association was identified between SLD and any perinatal, socioeconomic, or demographic variable examined. **Conclusion:** Specific learning disabilities are highly prevalent in children with ADHD, irrespective of perinatal background, socioeconomic status, or ADHD subtype. These findings advocate for routine SLD screening in all children diagnosed with ADHD to enable early, targeted intervention and improved educational outcomes.

Keywords: ADHD, SLD, Targeted intervention.

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Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is a chronic neurodevelopmental condition and most commonly diagnosed behavioral disorder of childhood with global prevalence of 5% -10%, Indian estimates range from 4.7% to 29.2%.[1,2] It is characterized by persistent patterns of inattention, hyperactivity, and impulsivity that interfere with daily functioning and development.[3] Deficits in executive functioning, working memory, and processing speed are key features of ADHD and cause the most disabling consequence in the form of poor academic performance.[4]

Specific Learning Disabilities (SLD) is a cluster of neurodevelopmental conditions that impair the acquisition and use of academic skills—including reading (dyslexia), writing (dysgraphia), and mathematics (dyscalculia)—in children of otherwise adequate intelligence.[5] The co-occurrence of SLD with ADHD is estimated to be 20% to 80%, depending on the diagnostic criteria and population studied.[6] This compounds the challenge of academic performance in these children with ADHD and SLD.

There is a well-recognized neurological overlap between ADHD and SLD as both conditions implicate disruptions in phonological processing, working memory, and executive function, supported by shared genetic risk factors and similar patterns of atypical brain activation detected through functional neuroimaging.[7] Despite of this overlap, children with concurrent ADHD and SLD experience delay in diagnostics and therapy due to masking of specific learning disabilities by attentional difficulties.[8]

The co-occurrence of both these conditions not only leads to academic failure, restriction of educational aspirations but also increases the likelihood of grade repetition, psychosocial difficulties, and long-term functional impairment.[9] Thus, Early and precise identification of SLD in children with ADHD is of greater clinical implication.

Adolescents with this dual condition is at higher risk of academic dropout and occupational underachievement in adulthood. There is a paucity of data from Indian population about the prevalence

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and distribution of SLD subtypes in children with ADHD, hence this study was planned at a tertiary level government pediatric hospital in south India to evaluate the frequency and subtypes of SLD's in children with ADHD attending the NDC clinic and to evaluate potential socio-economic, perinatal and demographic corelates.

Materials and Methods

Study Design and Setting: A cross-sectional observational study was conducted at the outpatient pediatric neurodevelopmental clinic of Indira Gandhi Institute of Child Health, Bengaluru, between 2022 and 2025. Ethical clearance was obtained from the Institutional Ethics Committee, and written informed consent and assent were obtained from parents and participants, respectively.

Participants: Children aged 6 to 12 years with a confirmed DSM-5 diagnosis of ADHD were enrolled consecutively. Inclusion criteria required participants to be enrolled in formal schooling, have an intelligence quotient (IQ) of ≥70 as measured by Malin's Intelligence Scale for Indian Children (MISIC), and have no prior diagnosis of autism spectrum disorder (ASD), intellectual disability, or sensory impairment. Children receiving pharmacological treatment for ADHD at enrolment were included, provided that core ADHD symptoms were still clinically apparent. A total of 95 children fulfilled the inclusion and exclusion criteria and were enrolled.

Assessment Tools: The NIMHANS Index for Specific Learning Disabilities, a standardized and validated tool developed for Indian children, was used to assess for the presence and subtype of SLD. This battery evaluates domains of reading (dyslexia), writing (dysgraphia), and arithmetic (dyscalculia), and is considered reliable for use in English-medium schoolchildren. ADHD subtype classification (combined, predominantly inattentive, predominantly hyperactive-impulsive) was based on DSM-5 criteria, corroborated by structured clinical assessment.

Socioeconomic status was classified using the modified Kuppuswamy scale. Detailed perinatal histories—including antenatal complications, birth weight, gestational age, mode of delivery, neonatal complications, and neonatal intensive care unit (NICU) admission—were obtained through structured parent interviews.

Statistical Analysis: Data were analysed using SPSS version 25.0. Categorical variables were summarised as frequencies and percentages. Pearson's Chi-Square test was used to examine associations between SLD and demographic, perinatal, and socioeconomic factors. A p-value of less than 0.05 was considered statistically significant.

Results

Demographic Characteristics: A total of 95 children with ADHD were enrolled. The mean age of the cohort was 8.5 years (SD ± 1.8), with children ranging from 6 to 12 years. Male to female ratio was approximately 2:1 with males constituting to 66%of study population. The majority of children were from lower-middle socioeconomic backgrounds (44.2%), based on the modified Kuppuswamy classification.

Most mothers had completed high school (39.6%), while nearly 1/3rd fathers had preuniversity or undergraduate qualifications. No statistically significant difference in parental education levels was observed between children with and without SLD.

ADHD Subtype Distribution: the most frequently identified presentation of ADHD in this cohort was the predominantly hyperactive-impulsive subtype accounting for 45.3% of the cohort. The combined subtype was present in 34.7% of children, while the predominantly inattentive subtype was seen in 20.0%.

Prevalence and Pattern of Specific Learning Disabilities: Of the 95 children with ADHD, 63 (66.3%) were found to have at least one co-occurring SLD. Among the SLD subtypes, all three – Dyscalculia, Dysgraphia and Dyslexia were equally prevalent with Dyscalculia identified in 47 children (49.5%). Dysgraphia and dyslexia affecting 46 children (48.4%). Significant number of children had multiple concurrent learning disabilities. Among the 63 children with SLD, more than one third children (38.1%) met criteria for all three SLD subtypes simultaneously, representing the largest single combination in the cohort. Dysgraphia with dyscalculia was the most common dual combination, observed in 57.2% of SLD-affected children, followed by dyslexia with dysgraphia and dyslexia with dyscalculia (47.6% each). Isolated single-domain SLD was comparatively rare: isolated dyslexia were present in 12.6%, isolated dyscalculia in 8.0%, and isolated dysgraphia in 3.2% of SLD-affected children.

Association Between ADHD Subtype and SLD: Among children with SLD, the hyperactive subtype of ADHD was the most common (44.4%), followed by the combined (36.5%) and inattentive (19.0%) subtypes. dyscalculia was most common in the hyperactive subtype (48.9%), dysgraphia was equally distributed between combined and hyperactive subtypes (41.3% each) and dyslexia was most prevalent in the hyperactive subtype (43.5%). However, no statistically significant association between ADHD subtype and the presence of SLD ($p = 0.869$) was found. The association of subtype-specific analyses corroborated this finding and was non-significant.

Perinatal and Sociodemographic Correlates: Perinatal factors analysis revealed that most children with SLD were born at term (60.3%), and the majority had normal birth weights (60.3%). It was seen that low birth weight (39.7%) and preterm birth were somewhat more common in the SLD group compared to children without SLD, but it was not statistically significant ($p = 0.342$ and $p = 0.27$, respectively). Perinatal complications—including NICU admission (48.4% of total cohort), neonatal seizures (14.7%), and neonatal sepsis (10.5%)—were also more frequently observed in the SLD group, but were found to be statistically insignificant. Paternal smoking, family history of behavioural disorders, and perinatal hypoxic-ischemic injury similarly showed no significant association with SLD.

The majority of SLD children were from lower-middle (42.9%) and upper-lower (31.7%) socioeconomic classes, paralleling the distribution of children without SLD. There was no statistically significant correlation with the presence or absence of SLD.

Table 1: Distribution of ADHD and SLD.

Total ADHD (n-95)	ADHD + SLD (n-63)
Mean age of children with ADHD & SLD (n-63)	8.5± 1.8 years
Gender (ADHD + SLD) (n-63)	Male – 42 (66.7 %) Female – 21(43.3%)
Distribution of ADHD (n-95)	Combined – 33 (34.7%) Hyperactive – 43 (45.3%) Inattentive – 19 (20%)
Distribution of SLD (n-63)	Dyscalculia – 47 (49.5%) Dysgraphia – 46 (48.4%) Dyslexia – 46 (48.4%)
Combination of SLD (n-63)	All 3 SLD – 24 (38.1%) Dyslexia with dysgraphia – 30 (47.6 %) Dyslexia with dyscalculia – 30 (47.6%) Dysgraphia with dyscalculia – 36 (57.2%) Dyslexia – 8 (12.6%) Dyscalculia – 5 (8%) Dysgraphia - 2 (3.2%)
ADHD with SLD (n-63)	Combined – 23 (36.5%) Hyperactive – 28 (44.4.%) Inattentive – 12 (19%)

Discussion

This study demonstrates a high prevalence of SLD (66.3%) in a hospital-based cohort of children with ADHD, consistent with previously published literature in children with ADHD4, with variability attributable to differing diagnostic tools, age ranges, and methodologies.[11] The present study adds to this literature by providing data from a South Indian tertiary care setting and demonstrates that the ADHD-SLD comorbidity is a robust and clinically significant phenomenon in this population.

The male predominance observed in our cohort (male-to-female ratio 2:1 in the SLD group) aligns closely with data from Karande et al (2.1:1).[12] This gender disparity is thought to reflect a combination of biological susceptibility—males demonstrating greater neurobiological vulnerability to both ADHD and SLD—and a referral bias favoring boys, whose externalizing behavioural symptoms are more conspicuous to teachers and parents.[13] Girls with ADHD, especially those with the inattentive presentation, are at risk of being overlooked and consequently underdiagnosed for both ADHD and comorbid SLD.[14]

The predominance of the hyperactive subtype in our cohort (45.3%) is similar to findings from Bhardwaj et al,[15] and may reflect the tertiary care, clinic-based ascertainment strategy, where children with hyperactive-impulsive presentations are more frequently referred. The absence of a significant association between ADHD subtype and SLD echoes the conclusions of Karande et al,[12] and challenges the hypothesis that inattentive presentations carry a preferentially higher SLD risk. Our data suggest that SLD screening is warranted across all ADHD subtypes.

The near-equivalent prevalence of all three SLD subtypes (dyslexia 48.4%, dysgraphia 48.4%, dyscalculia 49.5%) and the high rate of concurrent multi-domain SLD (38.1% with all three types) reflect the shared neurobiological underpinnings of reading, writing, and arithmetic processing. These domains are all heavily dependent on phonological processing, rapid automatised naming, and working memory—cognitive capacities consistently impaired in both ADHD and SLD.[16,17] The high rate of compound SLD in this cohort underscores the inadequacy of single-domain screening and the clinical imperative for comprehensive neuropsychological assessment in children with ADHD.

Regarding SLD subtypes, dyscalculia, which is frequently underdiagnosed relative to dyslexia in clinical practice, emerged as the most prevalent single SLD type in this cohort.[18] This finding is consistent with the growing recognition that arithmetic difficulties in children with ADHD are at least as prevalent as reading difficulties, driven by impairments in visuospatial working memory and processing speed.[19] The relative underestimation of dyscalculia in many studies may reflect the historically greater attention devoted to dyslexia in research and clinical training.

The absence of statistically significant associations between SLD and perinatal adversity—including low birth weight, preterm birth, NICU admission, neonatal seizures, and sepsis—is noteworthy. Although preterm birth and low birth weight are recognised risk factors for both ADHD and neurodevelopmental impairment generally,[20] our data suggest that within a population already diagnosed with ADHD, these perinatal variables do not reliably discriminate between those who do and do not develop SLD. This finding resonates with the multifactorial aetiological model of SLD, wherein genetic and heritable neurobiological factors may exert a more dominant influence than perinatal insults.[21] Similarly, the absence of significant associations with socioeconomic status and parental education aligns with data suggesting that SLD—when properly distinguished from environmental educational deprivation—is primarily a biological rather than social construct, occurring across the full socioeconomic spectrum.[22]

The high rate of early school grade representation among children with SLD (peak in 2nd and 3rd standards) aligns with the natural history of SLD, where demands on foundational academic skills—phonological decoding, written expression, and arithmetic fluency—become maximally challenging in early primary school. This observation has direct clinical relevance: routine screening for SLD should be conducted at the point of ADHD diagnosis, particularly in children entering or attending the early primary years. Delayed identification not only allows cumulative academic deficits to accrue but also permits the

development of secondary emotional and behavioural sequelae, including school refusal, oppositional behavior, and impaired self-esteem.

Limitations: Several limitations of this study merit consideration. The single-centre, hospital-based design introduces selection bias towards more severe or treatment-seeking cases, limiting generalisability to community populations. The sample size, while adequate for the primary analysis, may lack power to detect modest associations between individual perinatal variables and SLD. The NIMHANS Index for SLD, although standardised and validated, was designed for English-medium students, potentially disadvantaging children from regional language backgrounds. As a cross-sectional study, causal inference regarding the direction of associations between identified risk factors and SLD is precluded, and parental recall bias may have affected the accuracy of perinatal histories.

Conclusion

This study confirms that specific learning disabilities are highly prevalent—present in nearly two-thirds of children with ADHD—and that dyscalculia, dysgraphia, and dyslexia occur at near-equivalent and often concurrent rates in this population. The absence of significant associations between SLD and ADHD subtype, socioeconomic status, and perinatal background indicates that SLD risk is distributed broadly across children with ADHD, irrespective of clinical or demographic profile. These findings strongly advocate for the integration of systematic SLD screening into the routine clinical assessment of all children presenting with ADHD. Multi-centre, community-based longitudinal studies with validated regional-language SLD tools are needed to refine our understanding of ADHD-SLD comorbidity in the Indian context and to translate these findings into evidence-based educational and clinical policy.

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Conflicts of interest

There are no conflicts of interest.

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