Section: Pediatrics

Original Research Article

PREVALENCE AND RISK FACTORS OF SPECIFIC LEARNING DISABILITY AMONG SCHOOL-GOING CHILDREN AGED 8–12 YEARS IN VILLUPURAM DISTRICT, TAMIL NADU: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Specific Learning Disability (SLD) is a neurodevelopmental disorder characterized by persistent difficulties in reading, writing, and arithmetic despite adequate intelligence and educational opportunities. Early identification is essential to reduce academic and psychosocial consequences. The objective is to determine the prevalence of Specific Learning Disability among school-going children aged 8–12 years and to identify associated risk factors.

Materials and Methods: A prospective cross-sectional study was conducted among 260 school children aged 8–12 years from government and government-aided schools in Villupuram district, Tamil Nadu. Children with IQ >90, normal hearing and vision, and academic scores below 50% were screened. Intelligence was assessed using the Binet-Kamat Test, and SLD was diagnosed using the NIMHANS Index for Specific Learning Disabilities. Statistical analysis was performed using R software.

Results: The prevalence of SLD was 9.2% (24/260). The most common subtype was combined Reading and Arithmetic disability (3.5%). Significant associations were observed with prematurity ($p<0.001$), low birth weight ($p<0.001$), head trauma ($p<0.001$), family history of SLD ($p=0.001$), and having only one sibling ($p=0.005$). ADHD was identified in 29.2% of children with SLD. Logistic regression revealed low birth weight (AOR=4.76), prematurity (AOR=3.95), head trauma (AOR=3.88), and one sibling (AOR=2.93) as independent predictors.

Conclusion: SLD affects nearly one in ten school-going children. Early screening and multidisciplinary intervention are necessary, especially among children with perinatal risk factors.

Keywords: Specific Learning Disability, Dyslexia, School Children, ADHD, Prevalence, Risk Factors, Learning Disorders.

INTRODUCTION

Specific Learning Disability (SLD) is a neurodevelopmental disorder characterized by persistent difficulties in acquiring and using academic skills such as reading, writing, and arithmetic despite normal intelligence, adequate educational opportunities, and the absence of sensory impairments. These difficulties are not attributable to intellectual disability, neurological disorders, emotional disturbances, or inadequate schooling. SLD is recognized as a significant public health and educational concern because it affects a child's academic performance, emotional well-being, and social development.[1,2] The prevalence of SLD varies across different countries and populations, with global estimates ranging from 5% to 15% among school-going children.[3] Variations in prevalence are

often influenced by differences in diagnostic criteria, assessment methods, language, cultural factors, and educational systems.[4] In India, the identification of SLD presents unique challenges due to multilingual educational settings, varying levels of educational resources, and limited awareness among parents and teachers.[5] Consequently, many children with learning difficulties remain undiagnosed and do not receive timely interventions.[6] Children with SLD commonly experience difficulties in reading (dyslexia), writing (dysgraphia), and mathematics (dyscalculia). These academic challenges frequently lead to poor school performance, low self-esteem, anxiety, behavioral problems, and school avoidance.[7] The impact of SLD extends beyond academics and can adversely affect social relationships, emotional health, and future educational and occupational opportunities.[8] Furthermore, SLD often coexists with other neurodevelopmental disorders, particularly attention deficit hyperactivity disorder (ADHD), making diagnosis and management more complex.[9] The age group of 8 to 12 years represents a critical period in a child's educational journey. During these years, children transition from basic literacy and numeracy skills to more advanced learning tasks that require higher levels of comprehension, reasoning, and problem-solving abilities.[10] As academic expectations increase, learning difficulties become more apparent, making this age group particularly important for early identification and intervention.[11] Timely diagnosis during this stage can significantly improve academic outcomes and reduce the long-term psychological and social consequences associated with learning disabilities.[7] Several biological, developmental, and environmental factors have been associated with the occurrence of SLD.[8] Prematurity, low birth weight, birth-related complications, head trauma, family history of learning disorders, and certain socioeconomic factors have been identified as potential risk factors. Understanding these associations can aid in recognizing vulnerable children and developing preventive and supportive strategies.[12] Despite the growing recognition of SLD, data regarding its prevalence and associated risk factors among Indian school children remain limited, particularly in rural and semi-urban settings. Therefore, the present study was undertaken to determine the prevalence of Specific Learning Disability among school-going children aged 8 to 12 years in Villupuram district, Tamil Nadu, and to identify the demographic, perinatal, familial, and clinical factors associated with its occurrence. The findings of this study may contribute to the development of effective screening programs, early intervention services, and inclusive educational policies for children with learning disabilities.

MATERIALS AND METHODS

Study Design and Setting: A prospective cross-sectional study was conducted among school-going children aged 8–12 years in government and government-aided schools under the Rashtriya Bal Swasthya Karyakram (RBSK) programme in Villupuram district, Tamil Nadu, India, from June 2024 to May 2025.

Study Population: Children aged 8–12 years studying in selected schools and fulfilling the eligibility criteria were included in the study.

Sample Size and Sampling Technique: The minimum sample size calculated was 256 and was rounded off to 260 participants. Schools were selected by simple random sampling using the lottery method. Eligible students were identified through cluster sampling within the selected schools.

Eligibility Criteria

Inclusion Criteria

- Children aged 8–12 years.
- IQ score >90.
- Normal hearing and vision.
- Academic performance below 50%.
- Written informed consent from parents/guardians.

Exclusion Criteria

- Hearing or visual impairment.
- IQ <90.
- Locomotor disability.
- Chronic medical illness.
- Refusal of parental consent.

Data Collection Procedure: Teachers were sensitized regarding Specific Learning Disability (SLD) and were provided with screening proformas, sociodemographic questionnaires, and consent forms. Eligible children underwent hearing and vision assessment followed by intelligence assessment using the Binet-Kamat Test of Intelligence (BKT). Children with IQ scores above 90 were further evaluated using the NIMHANS Index for Specific Learning Disabilities. A diagnosis of SLD was made when academic performance was two standards below the expected level for age and grade. Information regarding demographic characteristics, antenatal and postnatal factors, family history, and other potential risk factors was collected using a structured proforma. Children diagnosed with SLD were also assessed for comorbid ADHD.

Study Instruments

- Binet-Kamat Test of Intelligence (BKT) for assessment of intellectual functioning.
- NIMHANS Index for Specific Learning Disabilities for diagnosis of SLD.
- Structured questionnaire for demographic and risk factor assessment.

Statistical Analysis: Data were analyzed using R statistical software. Continuous variables were expressed as mean ± standard deviation, while categorical variables were expressed as frequencies and percentages. Associations between variables

were assessed using the Chi-square test. Odds ratios (OR) with 95% confidence intervals (CI) were calculated. Binary logistic regression analysis was performed to identify independent predictors of SLD. A p-value <0.05 was considered statistically significant.

Ethical Considerations: The study was approved by the Institutional Ethics Committee of Government Villupuram Medical College. Written informed consent was obtained from parents or guardians prior to participation. Confidentiality of participant information was maintained throughout the study.

RESULTS

Prevalence and Types of Specific Learning Disability

[Figure 1] shows the distribution of Specific Learning Disability (SLD) among the study participants. Of the 260 children screened, 24 were diagnosed with SLD, yielding a prevalence of 9.2%. The most common subtype was combined Reading and Arithmetic disability, observed in 9 children (3.5%), followed by combined Reading, Writing, and Arithmetic disability in 5 children (1.9%). Reading and Writing disability was identified in 4 children (1.5%), while Writing and Arithmetic disability was present in 3 children (1.2%). Isolated Reading disability and isolated Writing or Arithmetic disability were less common, accounting for 0.8% and 0.4% of the study population, respectively.

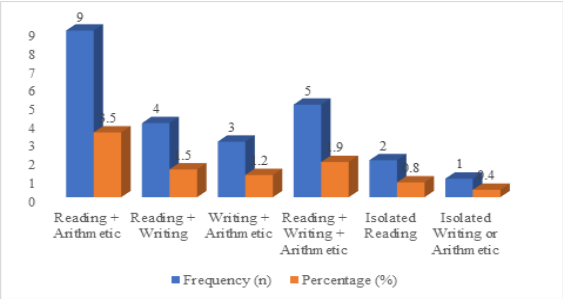

Figure 1: Types of Specific Learning Disability Identified

Demographic Characteristics and Association with SLD

[Table 1] presents the demographic characteristics of children with and without SLD. The mean age of children diagnosed with SLD was significantly higher than that of children without SLD (10.2 ± 1.1 years vs. 9.6 ± 1.0 years; p=0.031). Among children with SLD, 16 (66.7%) were males and 8 (33.3%) were females. The proportion of males was significantly higher in the SLD group compared to the non-SLD group (45.8%), indicating a significant association between male gender and SLD (p=0.048) [Figure 2].

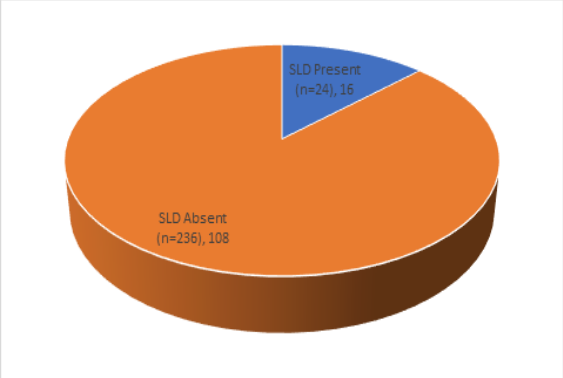

Figure 2: Gender-wise Distribution of Children with and without Specific Learning Disability (SLD)

Antenatal and Postnatal Risk Factors

[Table 2] depicts the association between antenatal and postnatal risk factors and SLD. Prematurity was reported in 50.0% of children with SLD compared to 16.1% of children without SLD (p<0.001). Similarly, low birth weight was observed in 58.3% of children with SLD and 18.6% of children without SLD (p<0.001). A history of head trauma was present in 41.7% of children with SLD compared to 12.3% of those without SLD (p<0.001). Maternal infection during pregnancy, birth asphyxia, and previous hospitalization did not demonstrate statistically significant associations with SLD.

Table 1: Demographic Characteristics and Association with SLD

Variable	SLD Present (n=24)	SLD Absent (n=236)	p-value
Age (Mean ± SD)	10.2 ± 1.1	9.6 ± 1.0	0.031*
Male	16 (66.7%)	108 (45.8%)	0.048*
Female	8 (33.3%)	128 (54.2%)	

Table 2: Antenatal and Postnatal Risk Factors Associated with SLD

Risk Factor	SLD Present (n=24)	SLD Absent (n=236)	p-value
Prematurity	12 (50.0%)	38 (16.1%)	<0.001
Low Birth Weight	14 (58.3%)	44 (18.6%)	<0.001
Head Trauma	10 (41.7%)	29 (12.3%)	<0.001
Maternal Infection	3 (12.5%)	26 (11.0%)	0.823
Birth Asphyxia	4 (16.7%)	30 (12.7%)	0.565
Previous Hospitalization	5 (20.8%)	32 (13.6%)	0.28

Family and Sociodemographic Factors: [Table 3] summarizes the family and sociodemographic characteristics of the study participants. Family history of SLD was reported among 12.5% of children with SLD, whereas none of the children without SLD had a positive family history (p=0.001). Having only one sibling was significantly more common among children with SLD than among those

without SLD (75.0% vs. 44.1%; p=0.005). No significant associations were observed between SLD and parental consanguinity (p=0.284) or medium of instruction (p=0.375).

Table 3: Family and Sociodemographic Factors Associated with SLD

Variable	SLD Present (n=24)	SLD Absent (n=236)	p-value
Consanguinity	7 (29.2%)	50 (21.2%)	0.284
Family History of SLD	3 (12.5%)	0 (0%)	0.001
One Sibling	18 (75.0%)	104 (44.1%)	0.005
Tamil Medium	20 (83.3%)	180 (76.3%)	0.375

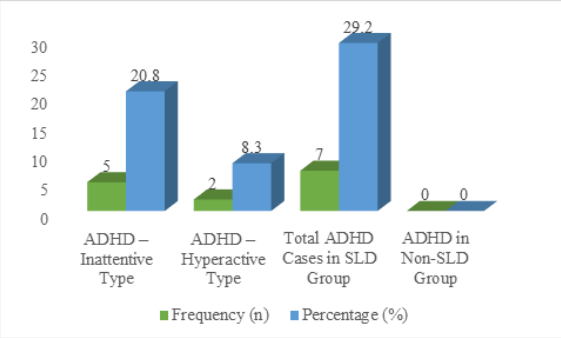

Figure 3: Comorbid ADHD among Children with SLD

Comorbid Attention Deficit Hyperactivity Disorder: As shown in [Figure 3], seven of the 24 children diagnosed with SLD had coexisting attention deficit hyperactivity disorder (ADHD), corresponding to a prevalence of 29.2%. The inattentive subtype was the most frequently observed form of ADHD, affecting 5 children (20.8%), while the hyperactive subtype was present in 2 children (8.3%). No cases of ADHD were identified among children without SLD.

Binary Logistic Regression Analysis: [Table 4] presents the results of multivariable logistic regression analysis. Low birth weight emerged as the strongest independent predictor of SLD (AOR=4.76, 95% CI: 2.02–11.23; p<0.001), followed by prematurity (AOR=3.95, 95% CI: 1.71–9.15; p=0.001) and head trauma (AOR=3.88, 95% CI: 1.52–9.89; p=0.004). Children with only one sibling had approximately three times higher odds of SLD compared to those with more siblings (AOR=2.93, 95% CI: 1.16–7.37; p=0.023). Although male gender was associated with increased odds of SLD (AOR=2.12), the association did not reach statistical significance after adjustment for confounding variables (p=0.065). The model demonstrated good calibration with a Hosmer–Lemeshow goodness-of-fit test p-value of 0.312 and explained 28% of the variance in SLD occurrence (Nagelkerke R^2=0.28).

Table 4: Binary Logistic Regression Analysis of Independent Predictors of SLD

Variable	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p-value
Prematurity	3.95	1.71–9.15	0.001
Low Birth Weight	4.76	2.02–11.23	<0.001
Head Trauma	3.88	1.52–9.89	0.004
One Sibling	2.93	1.16–7.37	0.023
Male Gender	2.12	0.95–4.75	0.065

DISCUSSION

The present study assessed the prevalence of Specific Learning Disability (SLD) among school-going children aged 8–12 years and identified associated risk factors. The prevalence of SLD in the present study was 9.2%, indicating that nearly one in ten children had learning difficulties despite normal intelligence and sensory functions. This finding is consistent with the study by Ahearn EM., who reported an SLD prevalence ranging from 7% to 10% among Indian school children.[13] Similarly, Altarac and Saroha reported prevalence rates between 5% and 15% worldwide, highlighting the substantial burden of SLD among school-aged children.[14] The slight variation in prevalence across studies may be attributed to differences in diagnostic criteria, study population, age groups, and assessment tools used. In the present study, male children constituted 66.7% of the SLD group, and a significant association between male gender and SLD was observed. Similar findings were reported by Shaywitz et al,[15] and Ahearn,[13] who found a higher prevalence of learning disabilities among boys compared to girls. This gender difference may be due to biological factors as well as increased referral and identification of boys because of associated behavioral problems and hyperactivity. The most common subtype of SLD observed in the present study was combined Reading and Arithmetic disability (3.5%), followed by combined deficits involving reading, writing, and arithmetic. These findings are comparable to those reported by Ramaa and Gowramma, who observed that mixed learning disabilities were more common than isolated deficits.[16] The overlap between different academic domains may reflect shared cognitive deficits involving phonological processing, working memory, and executive functioning. A significant association was found between SLD and prematurity, low birth weight, and head trauma. Children born prematurely had nearly four times higher odds of developing SLD, while low birth weight was associated with almost fivefold increased risk. Similar observations have been reported by Bhutta et al,[17] and Johnson et al,[18] who demonstrated that prematurity and low birth weight adversely affect

neurodevelopment and academic achievement. These findings support the hypothesis that early neurological vulnerability contributes to later learning difficulties.

The present study also identified family history of SLD as a significant risk factor. This finding is consistent with previous studies that have demonstrated a strong genetic component in learning disorders. Research by Pennington and colleagues has shown that learning disabilities frequently cluster within families, suggesting hereditary influences on language processing and academic skills.[19] Another notable finding was the significant association between having only one sibling and SLD. Although limited literature exists regarding this factor, similar observations have been reported in some Indian studies, suggesting that family structure and home learning environment may influence academic development. Further research is required to clarify this association.

ADHD was identified in 29.2% of children with SLD in the present study. This finding is comparable to previous studies by Mayes et al,[20] and DuPaul et al,[21] which reported ADHD comorbidity rates ranging from 25% to 40% among children with learning disabilities. The coexistence of ADHD and SLD may be explained by shared deficits in attention, executive functioning, and working memory. The high prevalence of ADHD among children with SLD underscores the importance of comprehensive neurodevelopmental assessment in children presenting with academic difficulties. Multivariate logistic regression analysis demonstrated that low birth weight, prematurity, head trauma, and having only one sibling were independent predictors of SLD. Low birth weight emerged as the strongest predictor, with an adjusted odds ratio of 4.76. Similar findings have been reported by several longitudinal studies, emphasizing the role of adverse perinatal events in the development of learning disabilities. The findings of the present study highlight the need for early identification and intervention strategies within school health programs. Routine screening of children with known perinatal risk factors, teacher awareness programs, and multidisciplinary management approaches involving pediatricians, psychologists, and special educators may facilitate timely diagnosis and improve educational outcomes among affected children.

Limitations of the study: The present study has certain limitations that should be considered while interpreting the findings. First, the cross-sectional study design limits the ability to establish a causal relationship between the identified risk factors and Specific Learning Disability (SLD). Second, the study was conducted only in government and government-aided schools in Villupuram district; therefore, the findings may not be generalizable to children studying in private schools or other geographical regions. Third, only children with academic performance below 50% were screened for SLD, which may have resulted in underestimation of the true prevalence, as some children with SLD may achieve average academic scores through compensatory strategies or additional support. Fourth, information regarding antenatal, perinatal, and developmental risk factors was obtained from parents and may be subject to recall bias. Finally, the relatively small number of children diagnosed with SLD limited detailed subgroup analyses of different learning disability subtypes and associated comorbidities. Despite these limitations, the study provides valuable insights into the prevalence, risk factors, and comorbid conditions associated with SLD among school-going children and highlights the need for early screening and intervention programs.

CONCLUSION

The present study found that the prevalence of Specific Learning Disability (SLD) among school-going children aged 8–12 years was 9.2%, indicating that SLD is a significant educational and public health concern in this population. The most common pattern observed was combined Reading and Arithmetic disability. Male children were more frequently affected, and significant associations were identified with prematurity, low birth weight, head trauma, family history of SLD, and having only one sibling. Multivariate analysis revealed that low birth weight, prematurity, head trauma, and having only one sibling were independent predictors of SLD. In addition, nearly one-third of children with SLD had comorbid ADHD, emphasizing the need for comprehensive neurodevelopmental assessment in children with academic difficulties. The findings highlight the importance of early identification, routine school-based screening, teacher awareness, and multidisciplinary intervention strategies for children at risk of SLD. Early diagnosis and appropriate educational support can improve academic performance, reduce psychosocial consequences, and enhance the overall quality of life of affected children. Further large-scale multicentric studies are recommended to better understand the burden and determinants of SLD in diverse populations.

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