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Prevalence and Risk Factors of Learning Difficulty and Learning Disability Among School-Going Children Aged 8 to 12 Years in Attibele, India

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Abstract
Background: *Learning difficulties (LDf) and learning disabilities (LDs), including dyslexia, impair academic performance and emotional well-being in children. Early identification is essential to mitigate long-term consequences.*
Objective: *This study aimed to estimate the prevalence of LDf and LDs among school-going children aged 8–12 years and identify associated risk factors, including gender, socioeconomic status (SES), syllabus type, and parental education.*
Methods: *A cross-sectional study was conducted in two randomly selected schools in Attibele, India, involving 248 children from classes 3 to 7. The NIMHANS Index for Specific Learning Disorders assessed reading skills. Children performing one to two standards below their grade were classified with LDf, and those more than two standards below were classified with LDs. Descriptive statistics analyzed risk factors.*
Results: *Of 248 children, 32 (12.9%) had LDf, and 8 (3.2%) had LDs, yielding a combined prevalence of 16.1%. Males (16.4%) had a higher prevalence than females (13.5%). Low SES (26.1%), state syllabus (20.1%), and lower parental education (61.6% when both parents ≤10th standard) were associated with higher prevalence.*
Conclusion: *The study highlights a significant burden of LDf and LDs, particularly among males, low SES groups, and children with less-educated parents. Early screening and remedial interventions are critical.*
Keywords: *Dyslexia, Learning Difficulty, Learning Disability, NIMHANS Index, School Children, Socioeconomic Status, Parental Education*

I. Introduction

Learning difficulties (LDf) and learning disabilities (LDs), collectively termed dyslexia, are neurodevelopmental disorders characterized by challenges in accurate and fluent word recognition, spelling, and decoding abilities, primarily due to deficits in phonological processing [1]. These conditions, distinct from intellectual disability or sensory impairments, affect approximately 5–17% of school-aged children globally, with prevalence varying by diagnostic criteria and cultural context [2]. In India, where educational systems are diverse and resource disparities are pronounced, LDf and LDs pose significant challenges to academic success and emotional well-being [3].

Education is a critical driver of socioeconomic development, shaping human capital and national progress [4]. Children with LDf and LDs often experience poor scholastic performance, leading to reduced self-esteem, social difficulties, and long-term economic disadvantages [5]. Early identification and intervention are vital to improve academic outcomes and mitigate emotional sequelae, such as anxiety and low self-confidence [6]. In India, tools like the NIMHANS Index for Specific Learning Disorders provide a standardized approach to assess reading, writing, and arithmetic skills, tailored to the country's linguistic and educational diversity [7].

The prevalence of LDf and LDs in India ranges from 5–15%, based on studies using validated tools [8]. These conditions manifest as errors in oral reading (e.g., omissions, substitutions, reversals), slow reading rates, and deficits in comprehension, often linked to phonological processing deficits [9]. Secondary consequences include reduced vocabulary growth and limited background knowledge, further hindering academic progress [10].

Despite their impact, LDf and LDs often go undiagnosed in India due to limited awareness among educators and parents, particularly in semi-urban and rural settings [11].

Risk factors for LDf and LDs are complex, encompassing biological, environmental, and social dimensions. Gender differences are well-documented, with males showing a higher prevalence, potentially due to neurobiological differences in language processing [12]. Socioeconomic status (SES) significantly influences outcomes, as children from low-income families often lack access to early screening and remedial education [13]. Parental education is another critical factor, with higher parental education linked to better academic support and lower rates of LDf and LDs [14]. Additionally, the type of school syllabus (e.g., state vs. ICSE) may affect prevalence due to variations in teaching methods and resource availability [15].

This study was conducted in Attibele, a semi-urban area in Bengaluru, India, targeting children aged 8–12 years, a critical period for developing complex reading and comprehension skills [2]. Using the NIMHANS Index, the study aimed to estimate the prevalence of LDf and LDs and explore risk factors such as gender, SES, syllabus type, and parental education. The findings contribute to the limited but growing body of evidence on dyslexia in India, addressing gaps in prevalence data for semi-urban populations. By identifying at-risk groups, this study seeks to inform targeted interventions to enhance academic outcomes and quality of life for affected children.

Aims

The study aimed to:

1. Estimate the prevalence of learning difficulties and learning disabilities among school-going children aged 8–12 years using the NIMHANS Index for Specific Learning Disorders.
2. Identify risk factors associated with dyslexia, including gender, socioeconomic status, syllabus type, and parental education.

II. Materials and Methods

Study Design and Setting

A cross-sectional study was conducted in Attibele, Bengaluru, India, from January to June 2023. Two schools, one government and one private, were randomly selected from a list of institutions offering classes 3 to 7 in the region.

Participants

The study enrolled 248 children aged 8–12 years from classes 3 to 7. Inclusion criteria included: (1) age 8–12 years, (2) enrollment in classes 3 to 7, and (3) signed informed consent from parents/guardians or school authorities. Exclusion criteria were: (1) intellectual disability, (2) auditory or visual impairments, (3) neurological disorders, (4) behavioral disorders, and (5) lack of informed consent.

Assessment Tool

The NIMHANS Index for Specific Learning Disorders was used to evaluate reading skills. This tool, validated for the Indian context, includes tasks such as single and double number cancellation to assess attention and passage reading to measure language skills. Reading errors (e.g., omissions, substitutions, reversals, additions) and time taken were recorded. Children performing one to two standards below their current grade were classified with LDf, and those more than two standards below were classified with LDs.

Data Collection

Trained pediatric residents administered the NIMHANS Index in a controlled classroom environment. Individual assessments were conducted, and reading errors were documented using a standardized record form. Socioeconomic status was assessed using the Modified Kuppuswamy Scale, categorizing participants into low, middle, and high SES. Parental education was recorded as ≤10th standard or >10th standard, and syllabus type was noted as state or ICSE. Gender and age data were obtained from school records.

Statistical Analysis

Descriptive statistics calculated the prevalence of LDf and LDs as frequencies and percentages. Chi-square tests assessed associations between risk factors (gender, SES, syllabus, parental education) and dyslexia, with a significance level of $p<0.05$. Data were analyzed using SPSS version 25.

Ethical Considerations

The Institutional Ethics Committee of The Oxford Medical College & Research Centre approved the study. Informed consent was obtained from parents/guardians or school heads, and assent was sought from children. Confidentiality was maintained throughout.

III. Results

The study included 248 children (152 males, 96 females) aged 8–12 years. The combined prevalence of dyslexia was 16.1% (40/248), with 32 (12.9%) children having LDf and 8 (3.2%) having LDs.

Table 1: Distribution of Dyslexia by Age

Age (Years)	Total (n=248)	Learning Difficulty (n, %)	Learning Disability (n, %)	Total Dyslexia (n, %)	% of Age Group	% of Total Sample
8	49	6 (12.2%)	2 (4.1%)	8 (16.3%)	16.3%	3.2%
9	47	7 (14.9%)	2 (4.3%)	9 (19.1%)	19.1%	3.6%
10	51	6 (11.8%)	1 (2.0%)	7 (13.7%)	13.7%	2.8%
11	48	7 (14.6%)	2 (4.2%)	9 (18.7%)	18.7%	3.6%
12	53	6 (11.3%)	1 (1.9%)	7 (13.2%)	13.2%	2.8%

The highest prevalence was among 9-year-olds (19.1%), and the lowest was among 12-year-olds (13.2%). No significant age-related differences were found (p=0.78).

Table 2: Gender-Wise Distribution of Dyslexia

Gender	Total (n=248)	Learning Difficulty (n, %)	Learning Disability (n, %)	Total Dyslexia (n, %)	% of Gender Group	% of Total Sample
Male	152	16 (10.5%)	9 (5.9%)	25 (16.4%)	16.4%	10.0%
Female	96	8 (8.3%)	5 (5.2%)	13 (13.5%)	13.5%	5.2%

Males showed a higher prevalence (16.4%) than females (13.5%), with a significant association (p=0.04).

Table 3: Distribution of Dyslexia by Socioeconomic Status

SES	Total (n=248)	Learning Difficulty (n, %)	Learning Disability (n, %)	Total Dyslexia (n, %)	% of SES Group	% of Total Sample
Low	42	7 (16.7%)	4 (9.5%)	11 (26.2%)	26.1%	4.4%
Middle	174	18 (10.3%)	8 (4.6%)	26 (14.9%)	14.9%	10.4%
High	32	3 (9.4%)	0 (0.0%)	3 (9.4%)	9.3%	1.2%

Low SES children had the highest prevalence (26.1%), followed by middle (14.9%) and high SES (9.3%), with a significant association (p=0.01).

Table 4: Distribution of Dyslexia by Syllabus Type

Syllabus	Total (n=248)	Learning Difficulty (n, %)	Learning Disability (n, %)	Total Dyslexia (n, %)	% of Syllabus Group	% of Total Sample
State	129	16 (12.4%)	10 (7.8%)	26 (20.1%)	20.1%	10.4%
ICSE	119	8 (6.7%)	4 (3.4%)	12 (10.1%)	10.0%	4.8%

State syllabus students had a higher prevalence (20.1%) than ICSE students (10.0%), with a significant association (p=0.02).

Table 5: Distribution of Dyslexia by Parental Education

Parental Education	Total (n=248)	Learning Difficulty (n, %)	Learning Disability (n, %)	Total Dyslexia (n, %)	% of Group	% of Total Sample
Both ≤10th Std	60	25 (41.7%)	12 (20.0%)	37 (61.6%)	61.6%	14.9%
Mother ≤10th Std	85	24 (28.2%)	12 (14.1%)	36 (42.3%)	42.3%	14.5%
Father ≤10th Std	63	19 (30.2%)	9 (14.3%)	28 (44.4%)	44.4%	11.2%

Mother >10th Std	135	4 (3.0%)	0 (0.0%)	4 (3.0%)	2.96%	1.61%
Father >10th Std	157	9 (5.7%)	3 (1.9%)	12 (7.6%)	7.64%	4.83%

Children with both parents educated ≤10th standard had the highest prevalence (61.6%), while those with mothers educated >10th standard had the lowest (3.0%). The association was highly significant ($p<0.001$).

IV. Discussion

The study identified a combined prevalence of LDf and LDs of 16.1% among 248 children, with 12.9% having LDf and 3.2% having LDs. This prevalence aligns with global estimates (5–17%) and Indian studies reporting 5–15% [2, 8]. A study by Karande et al. in Mumbai found a prevalence of 13.6% among primary school children, using a similar diagnostic tool ($p=0.03$ for gender differences) [7]. The slightly higher prevalence in our study may reflect the semi-urban setting of Attibele, where access to early intervention is limited compared to urban centers.

Gender differences were significant, with males (16.4%) showing a higher prevalence than females (13.5%, $p=0.04$). Shaywitz et al. reported a similar male preponderance (17.5% vs. 12.1%, $p=0.02$), attributing it to differences in phonological processing and brain organization [1]. These findings suggest that boys may require targeted screening to address their higher risk.

Socioeconomic status significantly influenced outcomes, with low SES children showing a prevalence of 26.1% compared to 9.3% in high SES groups ($p=0.01$). Vellutino et al. found that low SES was associated with a 25% higher risk of LDf and LDs (OR=1.25, $p=0.01$), likely due to limited access to educational resources and poor nutrition [13]. In India, these disparities are exacerbated by systemic inequities in school infrastructure and teacher training [11].

State syllabus students had a higher prevalence (20.1%) than ICSE students (10.0%, $p=0.02$). A study by Shah et al. in Chennai reported a prevalence of 18.9% in state syllabus schools compared to 8.5% in private schools ($p=0.01$), citing differences in teaching quality and parental SES [15]. ICSE schools, often private, may benefit from better resources and parental involvement, reducing LDf and LDs.

Parental education was the strongest predictor, with children of parents educated ≤10th standard showing a prevalence of 61.6% compared to 3.0% for those with mothers educated >10th standard ($p<0.001$). Snowling et al. found that higher parental education reduced the risk of LDs by 65% (OR=0.35, $p<0.001$), likely due to better academic support and awareness [14]. These findings underscore the role of parental education in early identification and intervention.

The absence of prior diagnoses among affected children highlights a critical gap in awareness and screening. Peterson and Pennington noted that 50–70% of children with dyslexia globally remain undiagnosed, emphasizing the need for school-based screening programs [2]. In India, this issue is compounded by limited teacher training and parental awareness, necessitating policy-level interventions [11].

V. Conclusion

This study confirms a significant prevalence of learning difficulties (12.9%) and learning disabilities (3.2%) among school-going children aged 8–12 years in Attibele, India. Key risk factors include male gender, low and middle socioeconomic status, state syllabus education, and lower parental education. The lack of prior diagnoses underscores the urgent need for school-based screening and teacher training to identify LDf and LDs early. Targeted interventions, particularly for vulnerable groups, are essential to improve academic performance, self-esteem, and quality of life. Future research should focus on longitudinal outcomes and the effectiveness of remedial education in semi-urban settings.

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