

**Original research article****A study of dyslexia as a contributor to scholastic backwardness among high school students**

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**Abstract**

**Background and Objectives:** Dyslexia is recognized as an important cause for the scholastic backwardness. SpLDs afflicts almost 5-15% of school-going children. Dyslexia reportedly afflicts 80% of all children identified as having SpLDs. There are only very few studies that have been done on high school students. It is not clearly known to what degree dyslexia is present in high school students, which would lead to significant failures in board results. This study is focused on this vulnerable group of school students who can be severely impacted by their reading difficulties. This problem is relatively neglected at Taluk level schools.

**Methods:** This is a cross-sectional study. 5 English medium high schools which are present in Hoskote were approached for participation in the study. The sample selected included the students who are scholastically backward. A semi-structured proforma was used to collect the socio-demographic details. 3 subsets (reading, spelling and comprehension) of NIMHANS Index for Specific Learning Disabilities - Level-II, were used to screen the 240 students for dyslexia. Statistical method: Statistical analysis of the data was done on the SPSS22.0 Version. Using appropriate statistical method, dimensional comparisons were made using central tendencies like the Mean and S.D. Chi-square and Fischer Exact test were applied to check for an association between the different variables and dyslexia.

**Results:** This study showed the occurrence of dyslexia to be 14.2%. It also showed the association with the habitat, type of family and difficulties in mathematics.

**Interpretation and conclusion:** Dyslexia among high school students is usually neglected and understudied, but this population is greatly impacted, since it has multiple implications on the rest of their lives. Our study finds both males and females to be equally afflicted by this disorder and an important cause for scholastic backwardness.

**Keywords:** Dyslexia, specific learning disabilities, scholastic backwardness

**Introduction**

Dyslexia is a neurodevelopmental disorder manifesting as persistent failure to acquire efficient reading skills despite normal intelligence, conventional schooling, intact hearing and vision, adequate motivation and socio-cultural opportunity<sup>[1, 2]</sup>. SpLDs afflicts almost 5-15% of school-going children<sup>[2,3]</sup>. Dyslexia reportedly afflicts 80% of all children identified as having SpLDs<sup>[2]</sup>. Even though dyslexia is recognized as an important cause for the scholastic backwardness, many other reasons, such as, below average intelligence, vision and hearing impairment, chronic medical and mental disorders, emotional problems and poor socio-cultural environments are suggested<sup>[4]</sup>.

It is reported that children with dyslexia felt different from the rest, tormented by the peers and suffered neglect from the teachers<sup>[5]</sup>. Undetected and unmanaged dyslexia results in chronic scholastic backwardness leading to school drop-outs, emotional and behavioural disturbance<sup>[6]</sup>. It also causes anxiety and stress in

parents and affects quality of life in their family<sup>[7,8]</sup>. The studies to measure prevalence of dyslexia in India are scanty and its importance is under recognized<sup>[9]</sup>. The true prevalence of the problem remains disputable among the scholars due to variable diagnostic criteria and measurement tools used<sup>[10]</sup>. The published prevalence studies in India are decades old. From different studies prevalence range in India was found to be 2% to 17%.

### **Need for the study**

Most of the older studies were focused on primary school students. There are only very few studies that have been done on high school students. It is not clearly known to what degree dyslexia is present in high school students, which would lead to significant failures in board results. This study is focused on this vulnerable group of school students who can be severely impacted by their reading difficulties. Also, most of the studies hitherto have been done in cities; this problem is relatively neglected at Taluk level schools. Hence, the need for present study. An increasing number of students with dyslexia enter higher education because they are automatically promoted in our system without any exams or detention at lower levels. That is why there could be a good number of dyslexics at high school level, where, because of the board exams, they find it very hard to perform well in academics and get severely distressed. This study attempts to identify the extent of dyslexia problem amongst high school children, which can help the educators design and implement appropriate remedial measures to help such children in their schools.

### **Materials and Methods**

#### **Source of data**

The data was collected from five English medium high schools at Hoskote, which is a taluk in the state of Karnataka, India, which draws students from lower and middle class population with a semiliterate background. The target student population was high schoolers, studying in 8<sup>th</sup>, 9<sup>th</sup>, 10<sup>th</sup> classes and who were in the age group of 12-15 years. They were selected as per the teachers' report based on failing in multiple subjects in the last 2 years. Among them, those who voluntarily wanted to participate were taken for evaluation.

#### **Sample size**

240 students of 12-15 years were selected from 5 English medium high schools based on their performance in exams in the previous two years and teachers' reports.

#### **Method of collection of data**

##### **1. Sampling procedure**

Five taluk level English medium high schools at Hoskote were selected. Students studying in 8<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup> and who were in the age group of 12-15 years were selected as per the teachers' report, based on failing in multiple subjects in the last 2 years. Among them, those who volunteered to participate were taken up for evaluation. The basic socio-demographic information about the sampled student was collected on a semi-structured proforma. In addition parental education, occupation and socio-economic status information were obtained.

##### **2. Identification of dyslexia**

The sampled children were subjected to a five level serial screening procedure to detect dyslexia.

##### **Screening Level 1**

Though general intelligence has a significant bearing on the scholastic performance, for the limited purpose of this study, The IQ of the index high schoolers was taken as at least above-average, considering the fact that they have passed 7<sup>th</sup> STD and have entered high school. Hence; a separate and formal IQ assessment was not done in this study. However it was done where required.

##### **Screening Level 2**

At this level the students with any visual impairment were excluded using Snellen chart and near vision charts, where required.

##### **Screening Level 3**

At this level students with hearing problems were excluded based on normal conversation and standard 6m distance whispering test.

##### **Screening Level 4**

At this level children with other psychiatric disorders like ADHD, depression, and anxiety (screened by another consultant during a school camp); severe chronic ailments which can affect their studies were

excluded.

### Screening Level 5

All the remaining children were subjected to NIMHANS Index for Specific Learning Disabilities- level-II, in that instrument, only reading subtests will be used. In that, the following particular tests were applied:

- I. Reading-Aloud a specified English passage.
- II. Spelling of Specific English Words from Specified Word Bank.
- III. Reading Comprehension of Suitable Specified Passages (Q&A).

Since in level-II the norms of this battery is available for children up to std-7<sup>th</sup>, the assessment of students studying in 8<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup> could also be done considering the fact that children whose performance was two levels lower than their expected level, could be taken as having mild dyslexia. If it is three levels lower than their expected level, they could be assessed as having moderate dyslexia. Those whose performance would be four levels less than their expected level were assumed to be having severe dyslexia<sup>[11]</sup>.

Initially, the tool was designed to be used for age group up to 12 years, but later the original workers have extended it to be used for the age group up to 16 years.

### Inclusion criteria

1. Five taluk level English medium high schools will be taken up.
2. Students studying in 8<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup>.
3. Age 12-15 years for ensuring more homogenous cognitive maturity.
4. Informed written consent to be counter signed by the parents if required.

### Exclusion criteria

Children with impaired vision, impaired hearing, other psychiatric disorders like ADHD, depression, anxiety, severe and chronic ailments that may interfere with school performance, will be excluded.

### Instruments

1. Visual and hearing screening instruments, when required.
2. A semi structured proforma for socio demographic details. This semi structured proforma also evaluated type of family, education and occupation of parents, attendance to School, siblings' help in index child, playtime, TV and mobile usage time, and difficulty in mathematics.

### Modified BG Prasad's socioeconomic status scale<sup>[12]</sup>

Prasad's socioeconomic classification is widely used in Indian medical literature. It was proposed for the first time by Prasad on per capita income per month and then revised by him based on cost of living<sup>[12]</sup>

3. The NIMHANS Index for Specific learning disabilities: It was developed by Kapur, John, Rozario and Oommen in 1991 in the department of clinical psychology, NIMHANS Bangalore. This tool has been used in a number of studies to confirm the diagnosis of SLD including dyslexia and to differentiate children with dyslexia from those without. In this tool, only the three reading subtests pertaining to level II, as described above, were used

### Statistical method used

Statistical analysis of the data was done on the SPSS 22.0 Version (statistical package for social sciences software) using appropriate statistical method, dimensional comparisons were made using central tendencies like the Mean and S.D. Chi-square and Fischer Exact test were applied to check for an association between the different variables and dyslexia.

### Results

**Table 1:** Distribution of the study group based on the presence of dyslexia

Dyslexia	Frequency	Percent
No	206	85.8
Yes	34	14.2
Total	240	100.0

Among the study participants 34(14.2%) had occurrence of dyslexia. Remaining 206 students (85.8%) had no dyslexia.

Chi-square and Fischer Exact test were applied to check for an association between the different Variables and dyslexia. The results are as follows:

**Table 2:** Age and dyslexia

Age	No Dyslexia	Dyslexia	p value
12- 13 year	106(82.8%)	22(17.2%)	0.15
14-15 year	100(89.3%)	12(10.7%)	

22(17.2%) participants belonging to age group of 12-13 years and 12(10.7%) participants belonging to age group of 14-15 were found positive for Dyslexia. However, this was not statistically significant.

**Table 3:** Gender and dyslexia

Gender	No dyslexia	Dyslexia	P value
Male	110(83.3%)	22(16.7%)	0.21
Female	96(88.9%)	12(11.1%)	

22 male participants (16%) and 12 female participants (11.1%) were found positive for dyslexia. However, this was not statistically significant.

**Table 4:** Habitat and dyslexia

Habitat	No dyslexia	Dyslexia	P value
Rural	120(95.2%)	6(4.8%)	0.001
Suburban	86(75.4%)	28(24.6%)	

28(24.6%) of study participants who belonged to suburban areas and 6(4.8%) who belonged to rural areas were found positive for dyslexia, this was found to be statistically significant.

**Table 5:** SES and dyslexia

SES	No dyslexia	Dyslexia	P value
Upper middle	50(86.2%)	8(13.8%)	0.34
Lower middle	86(82.7%)	18(17.3%)	
Upper lower	34(85.0%)	6(15.0%)	
Lower	36(94.7%)	2(5.3%)	

Out of the total number of participants, dyslexia was observed in 8, 18, 6 and 2 participants belonging to upper middle, lower middle, upper lower and lower SES, respectively. However the above findings were not statistically significant.

**Table 6:** Mother's education and dyslexia

Mother's Education	No dyslexia	Dyslexia	P -value
Primary school	26(92.9%)	2(7.1%)	0.571
High school	37(82.2%)	8(17.8%)	
Post high school	37(86.0%)	6(14.0%)	
Graduate	3(75%)	1(25%)	

8(17.8%) of study participants' mothers were educated beyond high school. 6 participants' Mothers (14.0%) were post high school. 2 participants' mothers had studied up to primary School (7.1%) and 1 participants' mother (25%) was educated until graduate. The above Participants were found to be positive for dyslexia; however this was not statistically significant.

**Table 7:** Father's education and dyslexia

Father's Education	No dyslexia	Dyslexia	P -value
Primary school	40(90.9%)	4(9.1%)	0.164
High school	26(92.9%)	2(7.1%)	
Post high school	70(79.5%)	18(20.5%)	
Graduate	70(87.5%)	10(12.5%)	

18(20.5%) of study participants' fathers were educated beyond post high school. 10 participants' fathers (12.5%) were graduates. 4 participants' fathers had studied up to primary school(9.1%) and 2 participants' fathers(7.1%) were educated until high school. The above participants were found to be positive for dyslexia, however this was not statistically significant.

**Table 8:** Type of family and dyslexia

Type of family	No dyslexia	Dyslexia	P value
Nuclear family	116(93.5%)	8(6.5%)	0.001
Joint family	90(77.6%)	26(22.4%)	

26(22.4%) of study participants staying in joint family and 8(6.5%) staying in nuclear family were found to be positive for dyslexia; this was statistically significant.

**Table 9:** Attendance at school and dyslexia

Attendance at School	No dyslexia	Dyslexia	P value
>80%	44(81.5%)	10(18.5%)	0.22
60-80%	112(84.8%)	20(15.2%)	
<60%	50(85.8%)	4(7.4%)	

20(15.2%) of study participants with school attendance between 60-80% followed by 10(18.5%) participants with school attendance of more than 80% and 4(7.4%) with attendance less than 60% were found to be positive for dyslexia. however, this was not statistically significant.

**Table 10:** Siblings' help to index child and dyslexia

Siblings' help to index child	No dyslexia	Dyslexia	P value
Yes	172(86.0%)	28(14.0%)	0.8
No	34(85.0%)	6(15.0%)	

28(14.0%) of study participants had a siblings help for the studies and 6(15.0%) didn't have help from the siblings either they didn't have siblings or then didn't receive any help from them, were found to be positive for dyslexia, this was not statistically significant.

**Table 11:** Playtime and dyslexia

Play time- frequency and distribution	No dyslexia	Dyslexia	P value
Daily	116(89.2%)	14(10.8%)	0.1
Weekly	90(81.8%)	20(18.2%)	

20(18.2%) of study participants who used to play once in a weekly and 14(10.8%) participants who used to play daily were found positive for dyslexia; however, this was not statistically significant.

**Table 12:** Performance in math's and dyslexia

Performance in Mathematics	No dyslexia	Dyslexia	P value
No difficulty	168(90.3%)	18(9.7%)	0.001
Difficulty	38(70.4%)	16(29.6%)	

18(9.7%) of study participants with no difficulty in mathematics and 16(29.6%) with difficulty in Mathematics were found to be positive for Dyslexia, this was statistically significant.

## Discussion

Our study aimed to measure the occurrence of dyslexia among high school students aged between 12-15 years, who were scholastically backward. The study was conducted in 5 high schools in Hoskote, which is suburban area. The present study is one of the few studies which aim to find the dyslexia as a contributor to scholastic backwardness among high school students and other associated factors of dyslexia.

Our study included similar number of students from each age group, with slightly higher representation among the 12yr Old's. There were 132 males and 108 female students, who were distributed equally among the rural and suburban populations. Nearly half the students belonged to lower middle SES. Children, who were found to have dyslexia, were correlated based on type of family, education and occupation of parents, attendance to school, siblings' help in index child, playtime, TV and mobile usage time, and difficulty in mathematics. Previous studies Beniwall RP *et al.*, (2018)<sup>[14]</sup> have evaluated correlation with parental illiteracy, low school attendance in school and also, Melekian (1990)<sup>[15]</sup> have evaluated correlation with

socio economical status, parental occupation and education.

The total occurrence of dyslexia is 14.2% among the scholastically backward students, where both male and female students were found to have dyslexia equally. Mogasale VV *et al.* (2013), Choudhary *et al.*, (2002)<sup>[16]</sup>, Roongpraiwanet *al.*, (1994)<sup>[13]</sup>, Shayawitzet *al.*,<sup>[17]</sup> and Berger *et al.*,<sup>[18]</sup>. Have reported the prevalence of dyslexia 11.2%, 7.47%, from 6.9% to 9.0%, 6.3%, and 9, 9% respectively. These studies have reported the prevalence of this disorder in the population. Hence, their data cannot be correlated with our data. As far as our search for literature led us, we have not found similar methodology, or calculation of occurrence of dyslexia. In the studies which have reported prevalence, like Roongpraiwanet *al.*, Karande & Venkataraman<sup>[19]</sup>, Sauveret *al.*,<sup>[20]</sup>, Shifreret *al.*,<sup>[21]</sup>, Flannery *et al.*,<sup>[22]</sup>, Lewis *et al.*,<sup>[23]</sup>, Rutter & Yule<sup>[24]</sup> and Sun *et al.*,<sup>[25]</sup>, there was a disparity in the male to female representation of this disorder. This may have been contributed by the methodology involved. It is also found that most of the studies have been done in primary school children such as Sun *et al.*, (2013), Roongpraiwanet *al.*, Agrawal *et al.*, (1991)<sup>[26]</sup> and Mogasale *et al.*, (2013). Very few studies have been done in high school and college going students like Arun P *et al.*, (2013)<sup>[27]</sup>, Pino M<sup>[28]</sup> and Sahoo MK<sup>[29]</sup>. It is quite possible that some of the children who would have had these disabilities, have found compensatory mechanisms to cope with, as explained in van Viersen, Sietskeet *al.*,<sup>[30]</sup> or would have dropped out of schools as shown in the study done by Daniel, S. S. *etal.* (2006) who reported a drop-out rate of dyslexics can be as high as 35%, twice as the national average school drop-out rate of many countries; or the pathology of learning disorders itself may be like that of delayed milestones, where some children may have gained the ability over the years, albeit with a delay.

Children who belonged to sub-urban population were found to have higher levels of dyslexia as compared to their peers who belong to rural areas. There are variable reports across the countries, where some investigators like Nagarathna (2014) have found higher rates of dyslexia among rural population as compared to that of sub-urban and urban population, while others have found no significant distribution. Our sample size was too small and cannot be assumed to represent enough population to clearly comment on this disparity. Further, there is little representation of urban population to arrive at a coherent conclusion on this variation. In the future, studies can explore various factors influencing the occurrence of dyslexia and can throw light on whether location of habitats would influence in the development of dyslexia or if other factors have contributed to its development.

Children who belonged to nuclear families fared better than those living in extended or joint families. Family dynamics could contribute to this finding, where any one of the parents may have been increasingly involved with the child's difficulty and remediated, which may have been missed in extended or joint families. Children growing in extended and joint families may have been less inclined to education as they would have a repertoire of other activities which the family considers higher in value than education, like business and entrepreneurship. This could be the reason why it would go un-remediated for a longer time. Previous studies have shown similar trends like Dhanda & Jagawat and Choudhary *et al.* whereas, our findings are on the contrary with the findings of study done by Saviour and Ramachandra who have also reported a preponderance of extended / joint family in their sample.

It is observed in the study that these children have specific disability in mathematical skills and was found to be reported significantly by those who were found to be dyslexic. There have been many studies which have studied this specific disability. The prevalence of this comorbidity within the group of children with learning disability is higher than the prevalence of just one of these learning disability in the general population (Landerl & Moll, 2010). The prevalence of children with dyscalculia who also show reading problems range between 17 and 70 percent, whereas the prevalence of children with dyslexia who also show arithmetical problems range between 11 and 56 percent (Barbaresi, Katusic, Colligan, Weaver, & Jacobsen, 2005; Dirks, Spyer, Van Lieshout, & De Sonneville, 2008; Gross-Tsur, Manor, & Shalev, 1996; Lewis, Hitch, & Walker, 1994; Rubinsten, 2009). The comorbid dyslexia and dyscalculia have more problems in learning than children with just one of the two learning disabilities (Tressoldi, Rosati, & Lucangeli, 2007).

Subjects who were found to have dyslexia were offered intervention at MVJ Medical College and Research Hospital or other place of their choice.

## Conclusion

This study was mainly undertaken in order to determine occurrence of dyslexia among the scholastic backward children in high school. The present study has focused on the occurrence of dyslexia among the scholastically backward children.

This study showed the occurrence of dyslexia to be 14.2% among the scholastically backward students. The study also showed the association with the habitat, type of family and difficulties in mathematics.

Dyslexia among high-school students is usually a neglected problem which has ripple effects on an adolescents' life. Future studies in this area, which can study the prevalence at a larger scale will help us plan and develop early interventions, support and expand educational policies. Teachers can be sensitized to this issue and trained to offer remedial education. Families can be psycho-educated so that the child may

receive support and encouragement.

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#### **Conflict of interest**

None declined.

#### **Ethical approval**

The study was approved by the ethical committee.

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