



A Retrospective Study of Specific Learning Disorders and Comparing the Effect on Academic Performances with Online Education among School Children Due to Covid-19 Pandemic Across Bangalore

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Abstract

Background: In young school-age children, neurodevelopment illnesses classified as specific learning disorders are frequently diagnosed, though often they may not be discovered until maturity. Problems with these skills can affect learning in subjects like physics, arithmetic, history, and social studies as well as daily life and social relationships learning problems can have an impact on a person's life in ways other than only their academic performance if they are not diagnosed and treated. These problems include an increased risk of psychological distress, deteriorating overall mental health, unemployment, and school dropout. **Objective:** To find out how often specific learning disorders, including dyslexia, dysgraphia, and dyscalculia, are among middle school children and assess the child's academic performance before and during online education as a result of a specific learning disorder. **Methods:** Considering the criteria for inclusion and LD checklist, a total of 208 participants were considered for the study. Confirming the diagnosis, the positive children had an additional individual NIMHANS Index evaluation. Teachers were given the APRS questionnaire to assess students' academic performance and to identify the incidence of dyslexia, dysgraphia, and dyscalculia based on that scale. Previous student records were also taken to evaluate students' performances in both online and traditional classroom settings. The data were analyzed using a descriptive method. **Results:** The prevalence of dyslexia is about 31 per cent, dysgraphia is about 28 per cent, and dyscalculia is about 41 per cent based on the outcomes. The Case Group's mean APRS score was 43.76, while the control group's mean score was 187.47. The Chi-Square demonstrates an association between the case and control groups. For the Learning Disorder with p value 0.001 and the academic performance score with p value 0.001. **Conclusion:** Online Education during Covid-19 Pandemic affected Academic performances among school children and had a significant impact on their Learning Disabilities.

Keywords: Academic Performances, Covid 19, Dyscalculia, Dysgraphia, Dyslexia, Online Education, Specific Learning Disorder

1. Introduction

Children that have serious difficulty with their academic performance and have socio-psychological effects are known to be at risk for specific learning problems or disorders¹. Learning disorders come in many different forms, but rather a group of impairments like Dyslexia, Dyscalculia and Dysgraphia. In India, there has been a surge in awareness and identification of children with Learning Disorders during the last decade or two. Despite this increased interest, we still lack a complete picture of the incidence and prevalence of Learning Disorders in India². SLD prevalence in India is between 3 and 10%, according to several studies. In Chandigarh, the prevalence

was 1.58% and 6.6% in South India. SLD was observed to be more frequent in lower socioeconomic groups than in higher socioeconomic ones Learning processes are dramatically altered when students switch from traditional classrooms and in-person teacher training to computer-based education in a virtual classroom, especially for students with learning difficulties³. The findings of this study will assist in identifying children with learning impairments as well as the challenges that students have when learning online during a pandemic⁴. They might not have good communication skills for work, and once they run into problems with online learning, pupils begin to lose heart⁵. Epidemiological information is still lacking, and India is a sizable nation with a diversified sociocultural

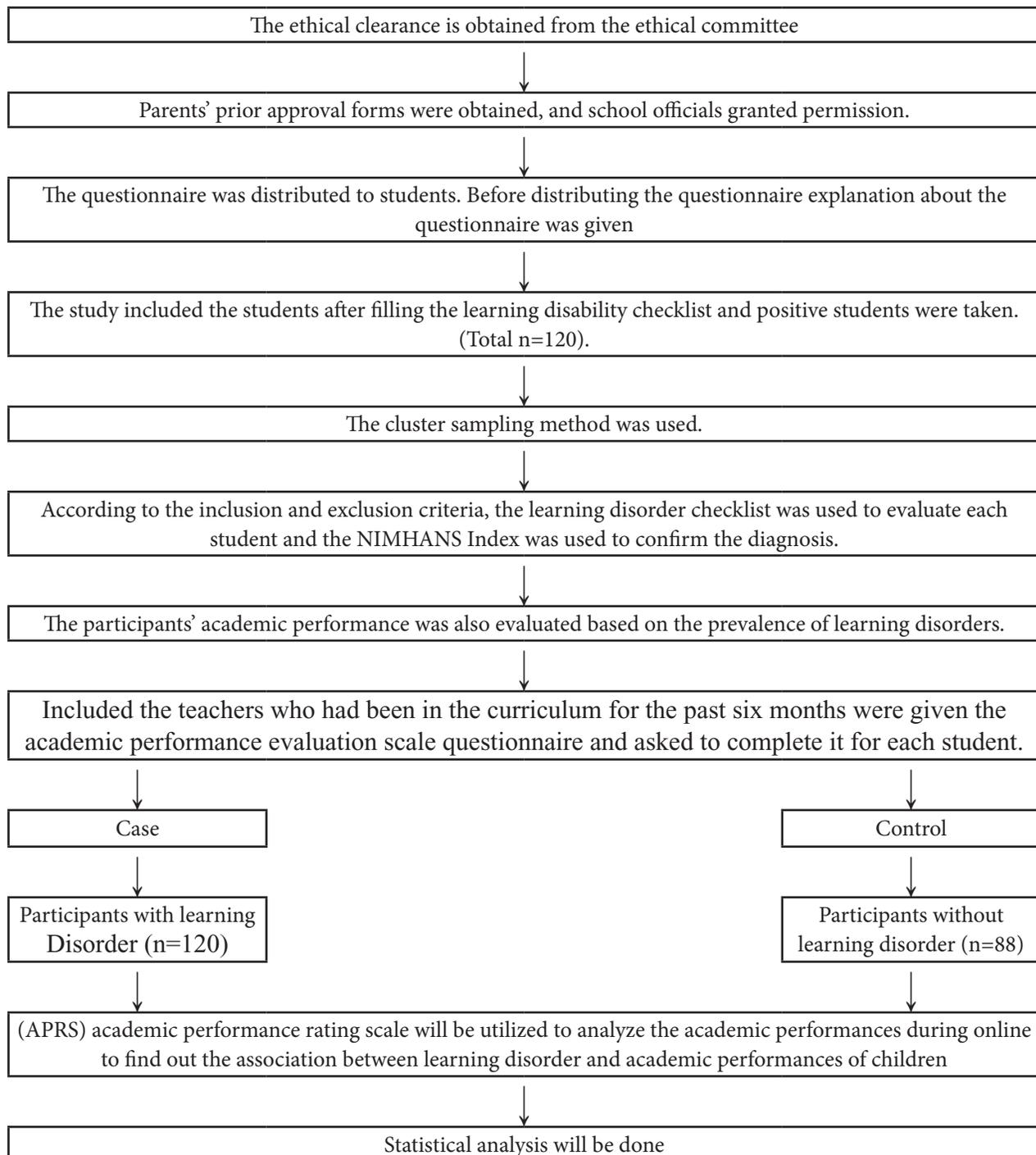
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and educational landscape⁶. More study is required to further advance our understanding of the condition. Children with certain learning problems are more likely to have psychiatric comorbid conditions, according to research by Mona Sameehkhodeir⁷, SLD is thought to affect between 5 and 15% of people. The overall prevalence rate of SLD was 11%, according to investigations conducted in India at NIMHANS, Bangalore. In contrast to only 6% of students who showed problems in math, 8 to 15% of the student population displayed SLD in

written expression. According to studies done in South India, SLD affects 15.17 per cent of the population, whereas dyslexia, dysgraphia, and dyscalculia affect 12.5%, 11.2%, and 10.5% of participants, respectively⁸.

2. Subjects and Methods

The ethics committee provides ethical clearance. The study involved children between the ages of 8 to 14 years, only after



completing the learning disability assessment for disorder identification. Including the school which is maintaining old records of children. Children attend classes through online education. The study also included students with IQs above 70 and teachers who had been teaching these children for over six months. Children having autism and other disabilities and excluded children with neurological disorders. Received permission from school officials, permission from parents, and consent from children. The investigator distributed the screening proforma of the learning disability checklist was given to students, and Other proformas were provided for the collection of sociodemographic data and other characteristics, and the investigator later collected the completed proformas back. Children were interpreted as having SLD if they scored higher than 19 on the learning disability checklist. To confirm the diagnosis, each of these children underwent an individual evaluation using the NIMHANS Index. After confirming the students' prior records, each teacher of a positive student was given the Academic Performance Rating Scale and requested to complete the questionnaire. They were then evaluated according to the results.

3. Outcome Measures

3.1 Learning Disabilities Checklist

Language (17 items), reading (15 items), writing (12 items), Mathematics (12 items), Social-emotional functioning (10 items), gross and fine motor skills (8 items), and attention are all included (8 items) and other things make up the 91 items on this checklist, which measures six areas of learning disabilities (10 items). Items from the Learning Disabilities Checklist were responded to using a Yes/No (problem present or not). Whether there were issues or not as indicated by the numbers 1 and 0, respectively. More learning issues are revealed by higher scores. The overall checklist had a score range of 0-91. If a participant's overall score was 19 or more, they were considered to have LDs, and if it was at or below 19, they were considered to not have LDs⁹.

3.2 NIMHANS Index

The NIMHANS Index for Specific Learning Disorders was developed at NIMHANS in Bangalore by the Department of Clinical Psychology. Tests in math, reading, writing, and spelling are included. It consists of two stages. Performance that is two standards below the child's current level is indicative of SLD. The NIMHANS Index is suggested by the 2016 Rights of Persons with Disabilities (RPWD) Act for the diagnosis of SLD¹⁰.

3.3 Academic Performance Rating Scale

The APRS is a brief teacher survey that provides precise and reliable data regarding a student's level of academic performance and behaviour in classroom settings. Estimate the performance of the above student throughout the past week for each of the items listed below. Please only circle one option per item^{11,12}.

4. Statistical Analysis

Data analysis was performed using SPSS for Windows (version 29.0). The mean and standard deviation for demographic factors and outcome variables were calculated using descriptive statistics. The scale used to rate children's academic performance was one of many variables whose association was investigated using the Chi-Square test. The tables and graphs were created in Excel.

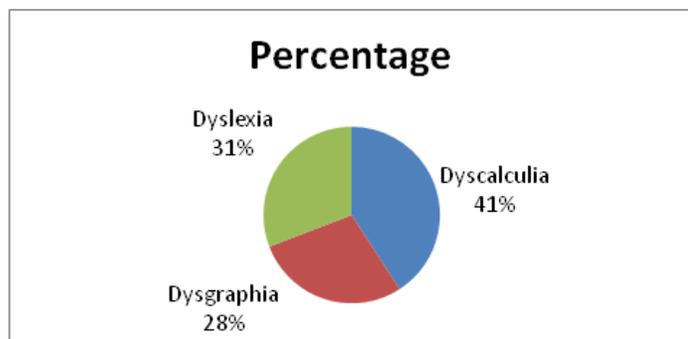
5. Results

Table 1. Learning disorder checklist and NIMHANS Index

Group		LD Checklist (Score)	NIMHANS Index
Group A (Case)	Mean	55.54	1.00
Group B (Control)	Mean	9.72	2.00

It is inferred from table 1 based on the total study population of 208, 120 students were included in the case group based on the score obtained in the checklist. The normal score for the learning disorder checklist is 19. The subjects in the case group scored above 19 to 87 with a mean of 55.54 which indicates positive for specific learning disorders and in the control group the students scored between 0 to 18 which indicates negative for SLD with a mean of 9.72 that the mean NIMHANS Index score in group A was 1.00 and the mean score in group B was 2.00. The NIMHANS Index is the confirmation of diagnosis. A total of 120 students got positive in the case group and in the control group 88 subjects got negative for a learning disorder.

The above graph 1 shows that there is a prevalence of Dyscalculia at about 41%, Dysgraphia shows 28% and Dyslexia is about 31%. According to LD score results, the students were divided into 3 types of learning disorders based on the questionnaire and previous academic reports of children. According to my study, Most of the students got affected with dyscalculia followed by Dysgraphia and Dyslexia.



Graph 1. Prevalence of specific learning disorder.

Table 2. Effect on academic performances for specific learning disorder

Group		Academic Performance Rating (Score)
Group A (Case)	Mean	43.76
Group B (Control)	Mean	187.47

It can be concluded from table 2 the academic performance rating scale, which was calculated by class teachers, was used to evaluate students' academic performances. The normal score for APRS is 110 to 120. In the case group, the students were affected in a range of 22 to 60 with a mean value of 43.76 which indicates that the students were affected by academic performance and in the control group the students scored between 114 to 260 with a mean of 187.47 which indicates the students were not affected with academic performances for students.

It is inferred from table 3 the risk is $110/120 = 0.91$ for patients with variable learning disorders (referred to as "exposed" subjects), as opposed to an "unexposed" risk of $80/88 = 0.90$. As a result, the relative risk is $0.91/0.90 = 1.01$, meaning that the risk of developing a learning disability is approximately 10% higher than that of the unexposed group. An odds-based calculation is comparable to the one above yields a larger odds ratio, 1.1, than the RR.

The significance of the variable is demonstrated by the p-value is less than 0.05 (P0.05). As a result, the alternative

hypothesis is accepted for the variable learning disorder, and the null hypothesis is rejected. Similarly, for the subjects with variable academic performance ('exposed' subjects), the risk is $95/120 = 0.79$, compared to an 'unexposed' risk of $10/88 = 0.11$. Inferring that the students exposed to academic performance are approximately 71% more likely to be affected by their academic results than the unexposed group, the relative risk is consequently $0.79/0.11 = 7.18$. The odds ratio obtained from a similar calculation using odds is larger than the RR at 29.64. The significance of the variable is demonstrated by the p-value is less than 0.05.

It is a non-parametric test; it is done to know whether the data is equally distributed. In above table 4, the results of the test for age in years were in the expected direction and significant difference, $Z = -4.526$, $p < 0.05$. Age in years with the Case group had the mean rank of 120.49, while age in years with the control group had the mean rank of 82.70. The results of the test for LD checklist score were significant, $Z = -12.314$, $p < 0.05$. LD checklist with case group had a mean rank of 148.50, while with control group had a mean rank of 44.51, results of the test for the NIMHANS Index were significant, $Z = -14.387$. NIMHANS Index with the case group had a mean rank of 60.50, while with control group had a mean rank of 164.50, results of the test for APRS were significant, $Z = -12.317$. APRS with the case group had a mean rank of 60.50, while the control group had a mean rank of 164.50.

6. Discussion

The study's results demonstrate that SLD prevalence is higher in children and that online learning has an impact on their academic performance. According to the findings, dyscalculia affected the majority of the children when compared to other types of LD, and 62.5% of boys between the ages of 8 and 12 were more affected. This discovery is consistent with previous research in this field. This study is the first to compare the academic performances of children during online classes with offline classes due to Covid-19 pandemic. LDs are not visible until the children start attending school. Learning issues can

Table 3. Relative risk and odds ratio

	Groups	With outcome	Without outcome	Total	Risk	Odds	Relative risk	Odds ratio
LD CHECKLIST	Case	110	10	120	0.91	11	1.01	1.1
	Control	80	8	88	0.90	10		
APRS	Case	95	25	120	0.79	3.80	7.18	29.64
	Control	10	78	88	0.11	0.13		

Table 4. Chi-Square test for case and control group of learning disorder score

Chi-Square Tests		
Association of LD and Academic performance		
	Value	P
Pearson Chi-Square	205.952	0.001
Pearson Chi-Square	208.000	0.001

occasionally be caused by and/or contribute to maladaptive behaviors¹³. When youngsters fail to meet expectations or produce results that are less than anticipated, it frequently shows that they feel alone and have lost interest in learning¹⁴. Children who experience many difficulties in their academic performance and have socio-psychological effects are known to have certain learning disabilities or disorders, which are recognized as a primary reason¹⁵. The prevalence of specific learning disabilities was found to be 9.6 per cent in the sampled children, while dyslexia, Dysgraphia, and dyscalculia were each present in 7.4 per cent, 8.6 per cent, and 7.1 per cent of the children, respectively¹⁶. The study was conducted by Chintan G. Shah and Pankaj M. Buch. Children who were diagnosed with SpLDs made up 65.7% (n = 25/38) of the total number of children. Online learning brought in a new scholastic reality that either improved students or led to academic decline¹⁷. The majority of research on educational losses during the COVID-19 pandemic versus the period before the pandemic has been conducted. Children with SLD have been severely affected academically in online classrooms, and they also have more trouble understanding math, according to the current study. According to Jakob Hein and M.W. Bzafka., conducted research on the particular disease affecting math ability. According to prevalence studies conducted on a sample of people from rural and urban areas, 6.6% (n = 12) of rural students and 6.59% (n = 12) of urban students did significantly less on arithmetic exams than on spelling tests. From child to child, learning issues present a wide range of symptoms. While one youngster may struggle with reading and spelling, another may enjoy reading but find math challenging¹⁸. Another child may have problems hearing what is being said or understood when spoken to aloud. Despite the variations in the problems, they are all learning disorders^{19,20}. Finding someone with a learning disability is not always simple. There is no one symptom or profile that you can point to as evidence of a problem because of the huge variability²¹. However, at certain ages, some warning signs are more prevalent than others⁸. Our study shows a greater prevalence rate than more recent research. This can be the result of various researchers' use of distinct diagnostic instruments and diverse populations under study being different^{22,23}. Another significant finding was that despite the study's increased prevalence of SLD, none of the affected children had ever been assessed or diagnosed

with the condition before, and none were receiving special education services^{17,24}. This reveals the absence of a system for the early detection of SLD and the lack of knowledge among teachers and parents about SLD. SLD was linked to a family history of substandard academic achievement. Unlike some earlier studies, we observed no association between SLD and parental consanguinity or birth order. SLD is linked to physical adolescent disease^{25,26}. Previous research has shown that neurodevelopment disorders like SLD are more common in those who also have physical illnesses like epilepsy. Another study revealed that learning issues, poor memory, concentration, and visuospatial skills are all related²⁷. The study concluded that children are more likely to have SLD, which includes dyslexia, dysgraphia, and dyscalculia. Additionally, it was determined that online classes affected students' academic achievement, with the data demonstrating a significant decline in SLD students' performance.

7. Limitations and Recommendations

- The screening test was administered both online and offline.
- Study duration is small.
- We didn't consider the socio-economic status of the subjects in the study.

Parental and educational information on SLD is necessary. Impaired writing expressiveness was the most typical symptom of SLD. Comprehensive assessments of academic skill inadequacies should be conducted on children who have these risk factors, and immediate preventive intervention should be implemented. The screening tests must be improved for the diagnosis of LD.

8. Conclusion

The study found that SLD, which includes dyslexia, dysgraphia, and dyscalculia, is more prevalent in children. Additionally, it was shown that online education affected children's academic performance, with the data demonstrating a significant decline in performance among SLD children.

9. Conflicts of Interest

There are no conflicting perspectives.

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