

## Epidemiological Study in Children with Specific Learning Disorders

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## Summary

Specific learning disorder (SLD) is one of the most common neurodevelopmental disorders affecting 3%-10% of children SLD referred to academic skills disorders, follows the traditional approach of classifying learning by specific academic skills. These skills include reading, mathematics and written expression. In each case, the skills are measured by standardized tests whose scores must fall substantially below the level expected with respect to age, intelligence and age- appropriate education. These deficits interfere with academic skills, leading to low grades or failures. Other associated features are low self- esteem, demoralization, social skills deficits, dropping out of school and difficulties in employment and social adjustment. To make an epidemiological study on children having specific learning disorders, evaluating their sociodemographic data, perinatal history, developmental history and psychiatric comorbidity. So, 72 children whose intelligence quotients ranged between (90- 110) on the abbreviated version of Stanford- Binet fifth edition Scale for Children. They were selected from the out patient clinic, Children's Hospital, Ain Shams University and Dyslexia unit in Center of Special needs Children in Faculty of postgraduate Childhood Studies, Ain Shams University. The participants were diagnosed Specific learning disorder by a psychiatrist according to the Diagnostic and Statistical Manual of Mental Disorders, 5<sup>th</sup> ed. (DSM- V) criteria, collecting their sociodemographic data and evaluating their psychiatric comorbidities. Results Showed that age of children ranges between (6- 10.5) years old with a female/ male ratio of 19/ 53. The majority were in the lower 33 (n= 33, 45.8%) socioeconomic strata. Nineteen (26.4%) children had history of parent consanguinity and 18 (25.0%) had family history of impaired learning. Twenty- six (36.1%) children had history of perinatal events. The majority of children (n= 48, 66.7%) had combinations of two or more types of impairment. 32 (44.4%) had abnormal development of speech and 7 (9.7%) had abnormal development of gait. Neurological examination was abnormal in 6 (8.3%) children children. Most common psychiatric comorbidity with SLD is ADHD regarding MINI- kid assessment. Conclusion from this study, it has been concluded that ADHD is the most common psychiatric comorbidity associated with SLD.

**KeyWords:** Specific learning disorder (SLD), MINI- KID assessment

## دراسة منهجية طبية علي الأطفال الذين يعانون من صعوبات التعلم المحددة

تعد صعوبات التعلم المحددة (SLD) واحدا من اضطرابات النمو العصبي الأكثر شيوعا التي تؤثر على 3% إلى 10% من الأطفال، وتشير صعوبات التعلم المحددة إلى اضطرابات المهارات الأكاديمية، ويتبع النهج التقليدي لتصنيف التعلم حسب مهارات أكاديمية محددة. وتشمل هذه المهارات القراءة والرياضيات والتعبير الكتابي. وفي كل حالة، يتم قياس المهارات من خلال اختبارات موحدة يجب أن تقل درجاتها بشكل كبير عن المستوى المتوقع فيما يتعلق بالعمر والذكاء والتعليم المناسب للعمر. يتعارض هذا العجز مع المهارات الأكاديمية، مما يؤدي إلى انخفاض الدرجات أو الفشل. ومن السمات الأخرى المرتبطة بذلك تدني احترام الذات، والإحباط، ونقص المهارات الاجتماعية، والتسرب من المدارس، وصعوبات العمل والتكيف الاجتماعي. كان الهدف إجراء دراسة وبائية عن الأطفال الذين يعانون من صعوبات التعلم المحددة وتقييم مهاراتهم الاجتماعية والديموغرافية، وتاريخهم في الفترة المحيطة بالولادة، وتاريخ النمو، والاعتلال النفسي المصاحب على 72 طفلا تراوحت معدلات ذكائهم بين (90- 110) على النسخة المختصرة من مقياس ستانفورد بينيه الخامس للأطفال. تم اختيارهم من العيادة الخارجية ومستشفى الأطفال بجامعة عين شمس ووحدة عسر القراءة بمركز الأطفال ذوي الاحتياجات الخاصة بكلية الدراسات العليا للطفولة جامعة عين شمس. تم تشخيص المشاركين بصعوبات التعلم المحددة من قبل طبيب نفسي وفقا للدليل التشخيصي والإحصائي للاضطرابات العقلية، الطبعة الخامسة. معايير (DSM- V) لجمع البيانات الاجتماعية والديموغرافية وتقييم الأمراض النفسية المصاحبة لهم. اشارت النتائج إن عمر الأطفال يتراوح بين (6- 10,5) سنة، ونسبة الإناث إلى الذكور 19/ 53، وكانت الأغلبية في الطبقات الاجتماعية والاقتصادية 33 (n= 33, 45,8%)، تسعة عشر (26,4%) طفل لديهم تاريخ من قرابة الوالدين 18 (25,0%) لديهم تاريخ عائلي من ضعف التعلم. ستة وعشرون (36,1%) طفل لديهم تاريخ من أحداث الفترة المحيطة بالولادة. غالبية الأطفال (n= 48, 66,7%) لديهم مزيج من نوعين أو أكثر من الإعاقه. 32 (44,4%) لديهم تطور غير طبيعي في الكلام و 7 (9,7%) كان لديهم تطور غير طبيعي في المشية. كان الفحص العصبي غير طبيعي في 6 (8,3%) من الأطفال. الاعتلال النفسي الأكثر شيوعا مع SLD هو اضطراب فرط الحركة ونقص الانتباه فيما يتعلق بتقييم MINI- Kid من هذه الدراسة، تم التوصل إلى استنتاج أن اضطراب فرط الحركة ونقص الانتباه هو أكثر الأمراض النفسية شيوعا المرتبطة بSLD.

**الكلمات المفتاحية:** صعوبات التعلم المحددة SLD، تقييم MINI-Kid.

## Introduction:

According to the DSM-5 Criteria, Specific learning disorder (SLD) is defined as a neurodevelopmental disorder with a biological basis resulting in cognitive abnormalities and academic skill deficits. This disorder includes reading, mathematics and writing deficits which are combined into one overarching diagnostic category (McDonough, et.al., 2017); (Scaria, et.al., 2023).

SLD has a biological basis, genetic and environmental factors. Recent studies have a united opinion that SLD may also result from structural and functional disorder of the central nervous system. These disorders cause delay in the development of the cognitive processes necessary for reading, speaking, writing, or using mathematical skills. (Altay, et.al., 2018)

It was found that 92.5% of the cases had one or more psychiatric comorbidities. The most frequent psychiatric comorbidity was attention deficit hyperactivity disorder (82.3%), followed by specific phobia (46.3%), oppositional defiant disorder (26.3%), enuresis (25%) and tic disorders (22.5%). Also it had been found that students with attention-deficit/hyperactivity disorder (ADHD) and specific learning disorder (SLD) have higher rates of academic difficulty than their unaffected peers. (Altay, et.al., 2018; Lefler, et.al., 2023)

The quality of life of children with learning disabilities is worse than that with typical development and the severity of learning disabilities is positively correlated with a poor quality of life. This mainly manifests as negative emotions on self- image, peer, family relationships, and social interaction. They also lack social skills due to pressure or low self- esteem, having low academic scores and unstable emotions, and often feel inferior due to the incomprehension of their parents. anxiety and depression are the consequences later on. (Huang, et.al., 2020); (Eseadi, et.al., 2024)

## Aim of the Study:

To make an epidemiological study on children having specific learning disorders, evaluating their sociodemographic data, perinatal history, developmental history and psychiatric comorbidities.

## Patients And Methods

### Design of the Study:

A Cross Sectional Study.

### Place of the Study:

Outpatient Clinic, Children's Hospital, Ain Shams University and dyslexia unit in Center of Special needs children in Faculty of postgraduate Childhood Studies, Ain Shams University

### Subjects:

Sample Selection: Include 72 children, whose intelligence quotients ranged between (90- 110) on the abbreviated version of Stanford- Binet fifth edition Scale for Children. They were selected from the outpatient clinic, Children's Hospital, Ain Shams University and Dyslexia unit in Center of special needs children in Faculty of postgraduate Childhood Studies, Ain Shams University The participants were diagnosed Specific learning disorder by a psychiatrist

according to the Diagnostic and Statistical Manual of Mental Disorders, the 5<sup>th</sup> edition (DSM-5) criteria collecting their sociodemographic data and evaluating their neuropsychiatric comorbidities.

- ✘ Ethical Considerations: This study was approved by Research Ethics Committee of Ain Shams University. An informed consents were taken from Parents after description of the study and its aim. The patients had the right to withdraw from the study at any time without giving any reasons. Number of ethical committee approval: FWA000017585
- ✘ Sample Size Calculation: A sample of 72 children would be enough, assuming an average rate of neuropsychiatric disorders among children with specific learning disorders of 25% ranging between 15% and 35%, if true at 95% confidence level.
- ✘ Inclusion Criteria:
  1. School aged children ranging from to (6- 12) years old.
  2. Previously diagnosed with specific learning disorders.
  3. Having average IQ (90- 110).
  4. Absence of uncorrected visual& hearing abnormalities.
- ✘ Exclusion Criteria:
  1. Children with neurological diseases including (muscle disease, cerebral palsy, epilepsy).
  2. Children with IQ below 90.

## Methodology:

All studied cases were subjected for the following; Detailed history taking& Socio- demographic data, Including, age of child and mother in years and months, Gender, Order of birth, number of siblings in the family, Nursery attendance, maternal education, Maternal job, family history, maternal morbidity during pregnancy, perinatal history, developmental history, nutritional history, Socioeconomic score, parents' educational level.

## Examination:

Neurological examination was carried out including the assessment of any developmental delay, tone, power, motor or sensory affection.

## Neuropsychological Assessment:

A group of neuropsychological tests were carried out to help us confirming the diagnosis of Specific learning disorders including Minikid assessment.

## Statistical Analysis:

Statistical analysis was done using IBM© SPSS© Statistics version 24 (IBM© Corp. Armonk, NY). Normality of numerical data distribution was examined using the D'Agostino- Pearson test. Normally distributed numerical data are presented as mean± SD and intergroup differences are compared using One- way ANOVA with application of the Bonferroni for post hoc comparisons if needed. Categorical variables are presented as counts and percentages and between- group differences are compared using Fisher- Freeman- Halton's test unless otherwise indicated. Ordinal data are compared using linear by linear association. P- Values< 0.05 are

considered statistically significant.

**Results:**

⌘ Descriptive Statistics of the Whole Study Population:

Table (1) Characteristics of the study population

Variable	Metric	
Age (years), mean± SD (range)	8.5± 1.3 (6- 10.5)	
Male Sex, N (%)	53 (73.6%)	
Sec, N (%)	Lower	33 (45.8%)
	Upper Lower	11 (15.3%)
	Lower Middle	13 (18.1%)
	Upper Middle	9 (12.5%)
	Upper	6 (8.3%)
Parent Consanguinity	19 (26.4%)	
Family history of impaired learning, n (%)	18 (25.0%)	
Cs Delivery, N (%)	54 (75.0%)	
History of perinatal events, n (%)	26 (36.1%)	
History of formula feeding, n (%)	56 (77.8%)	
History of breast feeding, n (%)	49 (69.0%)	
Abnormal development of speech, n (%)	32 (44.4%)	
Abnormal development of gait, n (%)	7 (9.7%)	
History of impaired reading, n (%)	58 (80.6%)	
History of impaired writing, n (%)	40 (55.6%)	
History of impaired mathematical ability, n (%)	26 (36.1%)	
Abnormal neurological examination, n (%)	6 (8.3%)	

n= number, SD= standard deviation

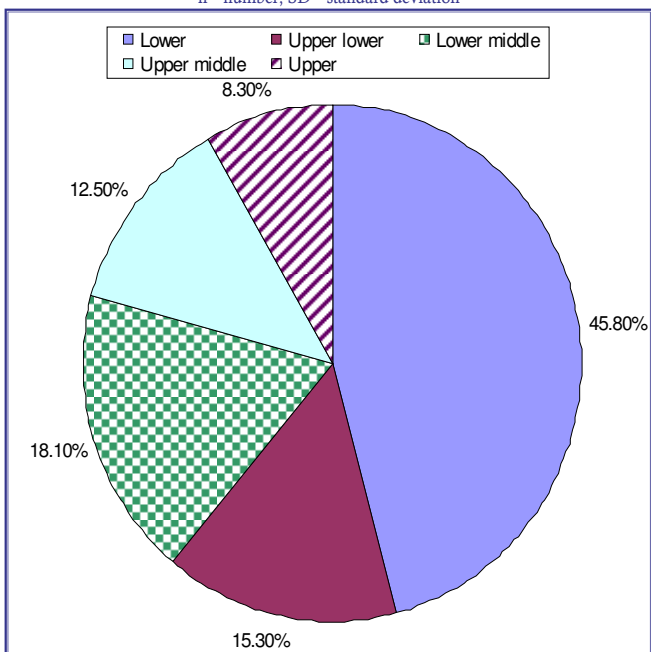


Figure (1) Socioeconomic class of study population

The study included 72 children with a mean± SD age of 8.5± 1.3 years (range, 6- 10.5 years) and a female/ male ratio of 19/ 53. The majority were in the lower 33 (n= 33, 45.8%), upper lower (n= 11, 15.3%) and lower middle (n= 13, 18.1%) socioeconomic strata. Fewer children were in the upper middle (n= 9, 12.5%) and upper (n= 6, 8.3%) socioeconomic strata Table (1)& Figure (1).

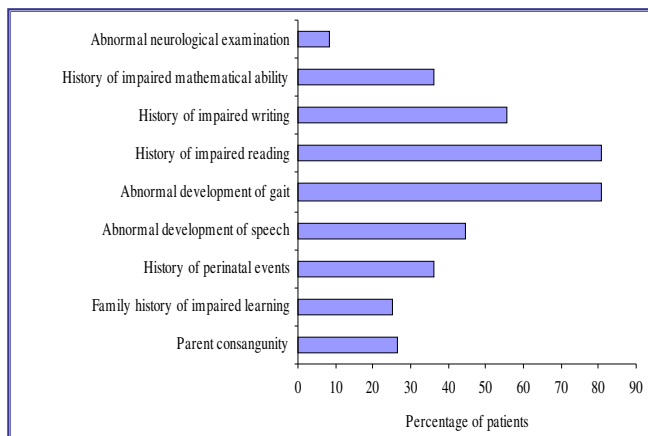


Figure (2) Relevant clinical findings in patients' medical history and clinical examination

Nineteen (26.4%) children had history of parent consanguinity and 18 (25.0%) had family history of impaired learning. Twenty- six (36.1%) children had history of perinatal events, 32 (44.4%) had abnormal development of speech and 7 (9.7%) had abnormal development of gait. Reading was impaired in 58 (80.6%) children, writing in 40 (55.6%) and mathematical ability in 26 (36.1%). Neurological examination was abnormal in 6 (8.3%) children Table (1)& Figure (2).

Table (2) Type of learning impairment

Variable	Number (%)
Reading Only	13 (18.1%)
Writing Only	5 (6.9%)
Mathematical Ability Only	6 (8.3%)
Reading and Writing	28 (38.9%)
Reading and Mathematical Ability	13 (18.1%)
Writing and Mathematical Ability	3 (4.2%)
Reading, Writing and Mathematical ability	4 (5.6%)

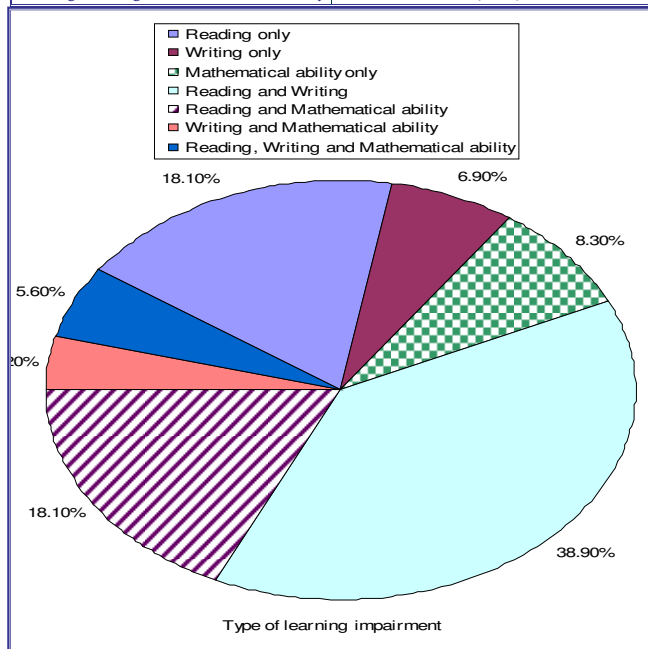


Figure (3) Patient classification according to type of learning impairment

Table (2) and Figure (3) display a classification of children according to the type of learning impairment. Thirteen (18.1%) children had difficulty in reading only, 13 (18.1%) had writing impairment only and 6 (8.3%) had mathematical impairment only. The majority of children (n= 48, 66.7%) had combinations of two or more types of impairment.

Table (3) Results of psychometric assessment

Variable	Metric
MINI- KID, n (%)	
Anxiety Disorder	12 (16.7%)
Depressive Disorder	14 (19.4%)
Tic Disorder	4 (5.6%)
ADHD	45 (62.5%)
Oppositional Defiant Disorder	8 (11.1%)
Conduct Disorder	7 (9.7%)
Somatic Disorder	1(1.4%)

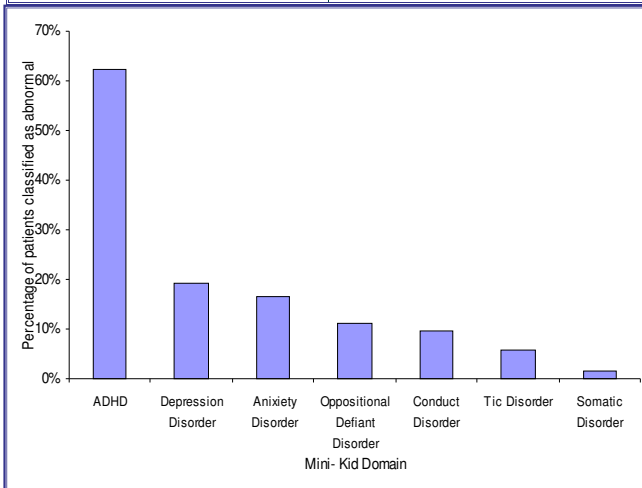


Figure (4) Results of MINI- KID test

MINI- KID assessment showed the most common disorder was ADHD (62.5%) followed by depressive disorder (19.4%), anxiety disorder (16.7%), oppositional defiant disorder (11.1%) and conduct disorder (9.7%). Tic and somatic disorders were present in only 5.6% and 1.4% of children, respectively Table (3)& Figure (4).

### Discussion:

The main results of this study were as following: The study included 72 children with a mean  $\pm$  SD age of  $8.5 \pm 1.3$  years (range, 6- 10.5 years) and a female/ male ratio of 19/ 53. The majority were in the lower 33 (n= 33, 45.8%), upper lower (n= 11, 15.3%) and lower middle (n= 13, 18.1%) socioeconomic strata. Fewer children were in the upper middle (n= 9, 12.5%) and upper (n= 6, 8.3%) socioeconomic strata. Nineteen (26.4%) children had history of parent consanguinity and 18 (25.0%) had family history of impaired learning. Twenty- six (36.1%) children had history of perinatal events, with 54 (75%) delivered C.S, 32 (44.4%) had abnormal development of speech and 7 (9.7%) had abnormal development of gait. Reading was impaired in 58 (80.6%) children, writing in 40 (55.6%) and mathematical ability in 26 (36.1%) and neurological examination was abnormal in 6 (8.3%) children.

Our results were supported by study of Bandla, et.al. (2017), as they reported that the number of SLD children is amounting to a total of 62. Age was ranged from (6- 12) years. They comprised 40 males (M) and 22 females (F) with the gender distribution ratio (M/ F) of 1.8: 1.

It also showed that there was a significant association with prematurity, cesarean section, delayed speech, and family history of SLD.

Also Kumari, et.al. (2016) was found that the following things were found to be statistically Significant in association with learning disorders:

low birth weight (P= 0.0085); pre- term birth (P= 0.032); motor developmental delay (P= 0.0457); language delay (P= 0.0002); and social development (P= 0.0001).

Also, in the study of Singh, et.al. (2017), out of the total studied 2015 case records, 73.35% were males; male to female ratio being 2.75:1. Mean age was 12.9 years and 87.99% were right handed. 67.14% were from state board schools and had English as their medium for instructions (94.19%).

The present study showed that regarding classification of children according to the type of learning impairment. Thirteen (18.1%) children had difficulty in reading only, 13 (18.1%) had writing impairment only and 6 (8.3%) had mathematical impairment only. The majority of children (n= 48, 66.7%) had combinations of two or more types of impairment and the most common combination was mixed reading and writing 28 (38.9) children.

In line with our study, Bandla, et.al. (2017) showed that pure reading disability is found in 22 (35.48%), writing disability in 1 (1.61%), dyscalculia in 3 (4.83%) whereas combined learning disability in 36 (58.06%), which is found to be the most common type of learning disability. Mathematic disability is found to occur less frequently in SLD special education group (16.7%) than in SLD schools group (34.4%).

Also in accordance with our results, study of Chacko& Vidhukumar (2020) as they reported that the prevalence of impairment in reading, written expression, and mathematics was found to be 12.57%, 15.6%, and 9.93%, respectively. The prevalence of mixed type (reading/ writing impairment along with mathematics impairment) was 9.26%. Among those with SLD (n= 244), 75% had a combination of impairment in reading and written expression, 54.92% had a combination of impairment in written expression and mathematics, 44.67% had a combination of reading, written expression, and mathematical impairment, 9.43% had impairment in written expression only, and 4.1% had impairment in mathematics only.

In the study of Sharma, et.al. (2018), a total of 23 students were identified as having SLD, with a prevalence of 2.87%. The most common type was combined type (dyslexia and dyscalculia). The prevalence of arithmetic disability was found to be around 2.25%, reading disability was 2.5%, and that of writing disability was around 1.37%.

On the other hand, Mogasale, et.al. (2012), demonstrated that the prevalence of specific learning disabilities was 15.17% in sampled children, whereas 12.5%, 11.2% and 10.5% had dysgraphia, dyslexia and dyscalculia respectively.

The difference in prevalence between other studies and ours may be due to the different diagnostic tools used in the various studies and differences in the populations studied.

As regarding socioeconomic state, results of our study agrees with a study done in Faculty of Medicine Menoufia University by Moselhy, et.al. (2019) where more than half of the families had low socioeconomic status (58%) and the remaining (42%) ranging between middle and high SES.

On the contrary Kumari, et.al. (2016) showed that 48.72% belonged to

upper middle class; 15.38% belonged to lower middle class, and 5.13% belonged to upper class

In line with Kaumari, et.al. (2016); Sahu, et.al. (2019) showed that majority of Children with learning disorders were in upper middle class (70.7%), lower middle (19.5%) then upper class (9.8%)

Differences in the relation of socioeconomic status and learning impairment may be due to culture differences & areas from which sample size was taken, as in developing countries there is noncooperation between home and school in addition to negligence of students in low socioeconomic societies.

The current study showed that 90% of children have psychiatric comorbidities MINI- KID assessment showed that the most common psychiatric co- morbidity was ADHD (62.5%) followed by depressive disorder (19.4%), anxiety disorder (16.7%), oppositional defiant disorder (11.1%) and conduct disorder (9.7%).

In agreement with our study, Khodier, et.al. (2020) and Bandla, et.al. (2017) reported that ADHD is the most common psychiatric co- morbidity in children with SLD with trends towards inattentive subtype.

Gross- Tsur, et.al. (1996) concluded that 26% of the students with arithmetic disability (dyscalculia) had ADHD.

Also Saleh, et.al. (2018) reported that 80% of the dyslexic children in their study have co- morbid neuropsychiatric disorder but with different percentage showing that 70% of children have depression and 46.7% have anxiety, 36.7% have ADHD, 30% have conduct disorder and 23.3% have oppositional defiant disorder.

Furthermore, Sahu, et.al. (2019), stated that psychiatric comorbidity in children with SLD is very common where 61% of children exhibited signs of attention deficit disorder (ADD; n= 14), ADHD (n= 9), social anxiety (n= 1), and both oppositional defiant disorder and ADD (n= 1). On Conners 3- Parent Short Form, substantial number of children had elevated scores on inattention (n= 28), hyperactivity (n= 11), executive function (n= 17), aggression (n= 23), and peer relation (n= 24). All children had higher score on learning problems.

In line with our study, study was done in British journal of psychiatry by Richards, et.al. (2001) reported that Learning disability is strongly associated with risk of affective disorder

Also Emslie, et.al. (1995) showed that the prevalence of mood disorders in the learning- disabled population is higher than in those who are not learning disabled. This area has been recently reviewed. The reasons for this difference in prevalence are not clear. It is possible that the learning disabilities and the difficulties they cause could induce mood disorders in susceptible individuals. Also, chronic mood disorders can, over time, cause learning disabilities. There is evidence that neuropsychological deficits are a consequence of altered mood states, which in the developing individual could lead to delays in learning. However, for clinicians, the association between learning disabilities and mood disorders is most evident, because the mood- disordered learning- disabled child is more likely to be referred for evaluation than a child with

a learning disability alone.

Also Rodrigues, et.al. (2016) compared signs of depression among children with and without a learning disorder. Children with Learning Disabilities indicated a higher prevalence of depressive symptoms.

Having Depression and anxiety can be explained by their attendance in special unit for learning disability which is exposing them to more stress and negative effect of labeling them having reading difficulties and they are more different than their school peers leading to low self esteem. (Saleh, et.al., 2018)

As regarding ADHD, children who have difficulty with sustaining attention over time or difficulty with selective attention would be expected to have academic performance problems. Likewise, children who have cognitive and behavioral impulsivity would be expected to have academic problems because they make decisions too rapidly or based upon inadequate data. (Cantwell, et.al., 1991)

In the study of Sharma, et.al. (2018), on comparing the relation between SLD and attention- deficit hyperactivity disorder (ADHD), 7 out of 23 students were having ADHD, while no child was having ADHD in whom SLD was absent ( $p < 0.001$ ). Out of 7 students with ADHD, 5 had inattentive- type ADHD and 2 students had hyperactive- type ADHD.

The study by Haft, et.al. (2019) compares anxiety and attentional biases among students with SLD, and children who have typical development. According to the study, the SLD group indicated higher levels of anxiety, and a significant attention bias. SLD comes with academic, as well as social stressors, thus it is possible for children to experience emotional distress.

IQ was average in the vast majority (95.8%) of children and above average in only (4.2%).

In line with our study, Sahu, et.al. (2019) reported that Full IQ of children with SLD ranges between (96- 114) and in Saleh, et.al. (2018) IQ score ranges from (90- 114), and many studies excluded children with below average IQ from any researches related to learning disorders.

This is consistent with our studies, explained that Dyslexia reflects the problem in brain areas that help in interpretation of language, it does not interfere with thinking abilities, and most children with dyslexia has average or above average IQ. (Kelly and Natalie, 2016)

### Conclusion:

From this study it had been concluded that specific learning disorder is disabling disorder seriously compromises the child's overall emotional behavioral aspects and social competency. It is associated with psychiatric comorbidities and the most common one in our study is ADHD. In addition, SLD was considered as a major stress factor negatively affecting the child/ mother parenting interaction.

Sociodemographic data concluded that the majority of children are males aged (6- 10.5) years old with low socioeconomic status, and having delayed speech development. 26% of children have history of parent consanguinity. 36% have history of perinatal events and 25% have family history of learning impairment.

**Recommendations:**

1. Further studies with larger sample size to investigate other neuropsychiatric co- morbidities that cannot be estimated in our study.
2. Control group is also recommended in order to compare the effect of remediation sessions and medications on their out come.

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