

SPECIFIC LEARNING DISORDER IN CHILDREN WITH ATTENTION DEFICIT/HYPERACTIVITY DISORDER

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ABSTRACT

BACKGROUND

Attention Deficit/Hyperactivity Disorder (ADHD) is a behavioural and neurocognitive condition characterized by developmentally inappropriate and impairing levels of gross motor overactivity, inattention, and impulsivity. ADHD is often underdiagnosed and undertreated in countries like India which leads to increased burden and impairment in children and their family. Specific Learning Disorder (SLD) is a disorder in one or more of the psychological processes involved in understanding and in using language, spoken or written, which may manifest itself in an imperfect ability to listen, think, speak, read, write, spell and do mathematical calculations. Studies show SLD in upto 20-30% of children with ADHD. Children with SLD and ADHD have more severe learning problems.

MATERIALS AND METHODS

Subjects aged 7-16 years diagnosed with ADHD according to SNAP IV scale were included. Full psychiatric evaluation of the subjects was done. Parents were interviewed on first visit and teachers were contacted telephonically & interviewed on next visit. Subjects were then assessed for SLD using DSM-5 criteria.

RESULTS

Thirty subjects were assessed in this study. The mean age of subjects was 9.73 ± 2.63 with 93.33% males. 10% had a family history of ADHD while 20% had a developmental delay. 33.33% had SLD with Reading Disorder being the most common i.e. 23.33%. 16.66% had a Disorder of Written Expression while 10% had difficulty in Arithmetic.

CONCLUSION

SLD has been found to co-exist with ADHD and Reading Disorder being the most common. Children who have co-morbid SLD with ADHD have more severe impairments and may need adjunctive interventions.

KEYWORDS

Attention Deficit/Hyperactivity Disorder, Specific Learning Disorder, Reading Disorder, Disorder of Written Expression, Arithmetic Disorder.

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BACKGROUND

Over the past three decades behavioural and Learning Disorders have emerged as major chronic conditions affecting the development of school-aged children and adolescents.^{1,2} Educators have reported a rise in the number of children with these disorders.³ Paediatricians have also reported an increased number of children with outpatient visits related to behavioural and emotional disorders.^{4,5}

Additionally, a marked increase has also been observed in the number of children with emotional and behavioural disorders who are treated with psychotropic medications.⁶ Attention Deficit/Hyperactivity Disorder (ADHD) is a behavioural and neurocognitive condition characterized by developmentally inappropriate and impairing levels of gross motor over activity, inattention, and impulsivity. It is the most common childhood behavioural disorder diagnosed in outpatient settings with a pooled estimate of worldwide prevalence is 5.29 percent.⁷ This disorder reflects the interplay of biological, psychological, and social factors. Biological factors such as genetic risk are clearly implicated in the neuropathology of ADHD. This disorder is a source of considerable adversity for those affected and their families. Persons affected by this disorder in childhood are at risk for learning, behavioural, and social problems and also for the development of serious impairments such as academic failure, substance abuse, and criminality in adolescence and adulthood. Consequently, the disorder places a substantial demand on mental health, educational, and judicial

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services.⁸ ADHD is associated with deficits in various cognitive skills: planning, sustaining attention, maintaining performance, identifying and adjusting to errors, judging the passage of time, and inhibiting inappropriate responses. They tend to have sleep-related breathing disorders, periodic limb movements, and habitual snoring.⁹ Furthermore, excessively aggressive and antisocial behaviour may develop, adding further problems.¹⁰ As a result, children with ADHD are rejected by others and treated in a controlling and negative fashion by their peers, teachers, and parents.^{11,12} Their families experience considerable stress, feelings of incompetence, and marital discord because of these behavioural problems. These children's parents tend to use coercive parenting strategies. Children with ADHD are more likely than their unaffected peers to live in families whose lives are disrupted by poverty, marital separation, and parental psychopathology.^{13,14} Frequently, these children feel demoralized and incompetent. Compared with their normally developing peers, children with ADHD get lower marks, fail more grades at school, are more poorly organized, and more often have a diagnosis of a mental retardation. In countries like India ADHD has often been missed and misdiagnosed. There are many young people who do not receive the diagnosis despite of having presented on many occasions to health services. There are also individuals who don't fulfil all the criteria so they miss the formal diagnosis and are not treated as ADHD. Parents often bring their children only with the complaint of learning difficulty, conduct problems and other co-morbidities which occur later on in adolescence but on complete assessment they come out to be case of ADHD. 28% of children diagnosed with either ADHD or LD had reports of having been diagnosed with both conditions.¹⁵ SLD means a disorder in one or more of the psychological processes involved in understanding and in using language, spoken or written, which may manifest itself in an imperfect ability to listen, think, speak, read, write, spell and do mathematical calculations. Beyond the general diagnosis of LD are the specific disorders of learning in the areas of Reading (Dyslexia), Maths (Dyscalculia), Writing (Dysgraphia) and Motor Problems (Dyspraxia). Boys were more likely than girls to have each of the diagnoses (ADHD without LD, LD without ADHD, and both conditions). Children with LD and ADHD have more severe learning problems than children who have LD but no ADHD and the former also had more severe attention problems than children who had ADHD but no LD.¹⁶ Children with each of the diagnoses (ADHD without LD, LD without ADHD, and both conditions) were more likely than children with neither ADHD nor LD to have other chronic health conditions.

MATERIALS AND METHODS

Study was conducted in the Department of Psychiatry and Paediatric Neurology in a tertiary care hospital in North India on subjects diagnosed with ADHD according to Swanson, Nolan and Pelham (SNAP)-IV Scale. The subjects were drawn from outdoor and indoor of Psychiatry and Paediatrics Department between age of 7-16 years. 30

cases were taken for the study. Informed consent was taken from parents/guardians of the subjects. A detailed history of the subject was taken, parents interviewed on first visit and teachers interviewed on next visit. Screening Checklist for Suspected Learning Disabilities and DSM-5 criteria were used to diagnose Specific Learning Disorder. Subjects with IQ <70, schizophrenia or any psychotic illness, visual, hearing and motor disabilities and paediatric neurological disorder were excluded from the study.

The data thus obtained was analysed to study co-morbidity between ADHD and SLD. Their age and gender distribution along with relation with developmental delay was studied. Statistical significance was set as $p < 0.05$.

RESULTS

The present study was conducted to assess Specific Learning Disorder in children presenting with ADHD. Patients diagnosed with ADHD using SNAP-IV scale were screened for SLD using Screening Checklist for Suspected Learning Disabilities and were further diagnosed using DSM-5 criteria.

It was found that the mean age of the sample was 9.73 ± 2.63 . The picture is dominated by a significant number of male patients i.e. 93.33% of the sample size (N=30) and females comprise only 6.66% of the sample i.e. 2.

In our study 6 (20%) patients had delayed development as compared to 24 (80%) having a normal development. None of the female patients had a history of developmental delay. The data however, was not significant. In those having developmental delay 33% had a disorder of reading, 50% had a Disorder of Written Expression (with a p-value of 0.041*) and only 16.7% had an Arithmetic Disorder.

10% patients i.e. 3 in number did have a positive family history of ADHD. None of the female patients had a family history of ADHD. This data was not statistically significant.

Patients according to their parents scored 23.46 ± 4.16 out of 30 on sub scale of Inattention, while 23.8 ± 3.97 on Impulsivity/Hyperactivity and 19.23 ± 4.31 on Oppositional Defiant Disorder sub scale. Scores on inattention, impulsivity/hyperactivity and oppositional defiant sub scale vary with change in age. But, only in case of inattention sub scale and total average score of SNAP IV this variation is significant with p-value of 0.036 and 0.026 respectively while in impulsivity/hyperactivity and ODD it is not significant.

Teacher rated mean scores is 26.7 for Inattention and 26.23 for Impulsivity/Hyperactivity which is higher than those of Parents with 23.46 for Inattention and 23.8 for Impulsivity/Hyperactivity. However, in case of Oppositional Defiant Disorder parent rated mean score is 19.23 which is comparatively higher than teacher rated score of 19.06.

It is found that 33.33% patients had SLD along with ADHD i.e. 10 patients had SLD in one or more domains of learning.

In our study out of 30 patients with ADHD, 7(23.33%) had Reading Disorder, 5(16.66%) had Disorder of Written Expression while 3(10%) had Arithmetic Disorder.

Both the female patients had Arithmetic Disorder i.e. 6.66% and none of them had Reading Disorder and Disorder

of Written Expression. While in case of male patients only 1 patient had Arithmetic Disorder (3.33%), while 7 had Reading Disorder (23.33%), 5 had Disorder of Written Expression (16.33%).

Maximum percentage of patients having reading disorder were in the age group 12-14 years age i.e. 50%, followed by 33.3% in >14 years age group and 18.8% in <8 years age group. None of the patient in age group 8-12 had Reading Disorder. This data is not statistically significant.

Out of those with developmental delay 50% had a Disorder of Written Expression and those with normal development 8.3% had this disorder. This data is statistically significant with a p-value of 0.041.

Both the female patients had an Arithmetic Disorder. Amongst male patients with ADHD only 3.33% i.e. 1 patient had an Arithmetic Disorder. This difference is statistically significant with a p-value of 0.007.

DISCUSSION

Attention Deficit/Hyperactivity Disorder (ADHD) is a chronic, debilitating disorder which may impact upon many aspects of an individual's life, including academic difficulties, social skills problems and strained parent child relationships. ADHD may affect all aspects of a child's life. The adverse effects of ADHD upon children and their families changes from the preschool years to primary school and adolescence, with varying aspects of the disorder being more prominent at different stages. There is a significant difference in the prevalence of ADHD between the males and the females. It is generally agreed that the prevalence of ADHD is significantly greater in boys than girls. In our study the Male: Female ratio was much in favour of the male gender with 28 patients out of 30 i.e. 93.3% being males while only 2 patients (6.7%) were females. This excess may be due to the socio-cultural taboos, where people in many parts of the country are still biased towards the male child and neglect the healthcare needs of the female child. Another factor that may be responsible for this bias is the small sample size. In our study the mean age of the sample was 9.73 ± 2.63 . Both the female patients were less than 8 years of age with mean age of 7.5 ± 0.70 , while similar results were seen in male patients, with majority of the patients i.e. 14 (46.66%) in age group of less than 8 years age, followed by 6 (20%) in 12-14 years age group. The prevalence of mental retardation and other developmental delay was lower among children having ADHD without LD and higher among children having LD without ADHD. Having a family member with ADHD makes one more likely to also have the disorder. Children who have ADHD typically have a parent, sibling, or other close relative with ADHD.¹⁷ Our study however, shows only 10% patients having a family history of ADHD. This might be because of the smaller sample size of our study. As children with ADHD get older, the way the disorder impacts upon them and their families changes. The core difficulties in executive function seen in ADHD result in a different picture in later life, depending upon the demands made on the individual by their environment.¹⁸ Co-morbid problems,

such as SLD, may also start to impact on the child. Similarly, the prevalence of ADHD is known to vary with age. In our study symptoms of inattention were more severe in those who were <8 years of age, and this severity decreased in the age group 8-12 years and again increased in the subsequent age groups. Similar was the case in impulsivity/hyperactivity and oppositional defiant disorder subscales for both parents and teachers, but this data was not statistically significant.

As per our study prevalence of SLD in ADHD patients is 33.33% i.e. 10 subjects. World over the data on prevalence of SLD in ADHD patients has shown marked variation because of lack of proper studies and small sample size.

Among psychiatric disorders, ADHD is the most frequently associated with Dyslexia.¹⁹ Between the two disorders there is a bidirectional relationship since the co-morbidity is very high if one examines children with Dyslexia for ADHD or children with ADHD for Dyslexia. As per our study 23.33% patients had Reading Disorder (RD) and all of them were males. Results from several previous twin studies suggest that the phenotypic association between RD and ADHD is largely attributable to common genetic influences. Instead, it is possible that the common genetic influences associated with RD and ADHD may interact with the social environment, leading to a higher risk for aggressive or conduct disordered behaviours. Specific Reading and Spelling Disorder occur in about 4 per cent of 8- to 10-year-old children, when defined as two standard deviations below non-verbal IQ.^{20,21}

In our study however, no association between family history of ADHD and RD was found. Children with ADHD may be especially vulnerable to deficits in written language. Preliminary evidence suggests that handwriting quality and written language among children with ADHD are impaired, compared with children without ADHD.²² ADHD patients with Disorder of Written Expression in our study were 16.66% i.e. 5 patients out of 30 and all of them were male. No relation between family history of ADHD and Disorder of Written Expression could be elicited.

Children with ADHD are slower and less accurate in calculation than nondisabled children. There is speculation that this performance deficit is due to an overload of working memory caused by the cognitive effort needed in executing calculation. Moreover, the poor performance in calculation may be associated with hyperactivity and distractibility, two major indicators of ADHD.²³ Among those with Arithmetic Disorder in our study there were only 3 (10%) patients out of 30, including 2 female patients and only 1 male patient, the relation being significant ($p=0.007^*$).

Many studies over the years have indicated a very strong co-morbidity of the two conditions but the exact percentage of overlap varies widely in these studies because of methodological inconsistencies. Furthermore, children with co-morbid ADHD and LD experience more-severe impairments than children with ADHD alone

(Barkley, 1984) and may need adjunctive interventions (e.g. direct instruction).

N = 30	No. of Males	No. of Females
ADHD pts.	28	2
Mean Age	7.5 + 0.70	9.8 + 2.65
Family History of ADHD	3	0
Developmental Delay in ADHD pts.	6	0

Table 1. Socio-Demographic Variables

93.33% of sample were males and 6.66% females. The mean age was 9.73 ± 2.63 years. 10% of children had family history of ADHD and 20% had developmental delay.

Age Group	SLD							
	No SLD	SLD Present	Reading Disorder		Written Expression		Arithmetic Disorder	
			Male	Female	Male	Female	Male	Female
Less than 8	7	9	3	0	3	0	1	2
8-12	5	0	0	0	0	0	0	0
12-14	1	5	3	0	2	0	0	0
More than 14	2	1	1	0	0	0	0	0

Table 3. Age & Gender Wise Distribution of SLD in Patients with ADHD (N=30)

The age group 12-14 years had 83.3% patients with SLD as compared to <8 years age which had 56.3% patients with SLD. However, the age group of >14 years had 33.3% while 8-12 years did not have any patient with SLD. Maximum percentage of patients having reading disorder and Disorder of written expression were in the age group 12-14 years age while Arithmetic Disorder was common in <8 years.

	Gender	Arithmetic		Total	p-value
		No	Yes		
Female		0	2	2	0.007*
		0%	100.0%	100.0%	
Male		27	1	28	
		96.4%	3.6%	100.0%	
Total		27	3	30	
		90.0%	10.0%	100.0%	

Table 4. Gender Wise Distribution of Patients with Arithmetic Disorder (N=30)

Arithmetic Disorder was more common in females as compared to males.

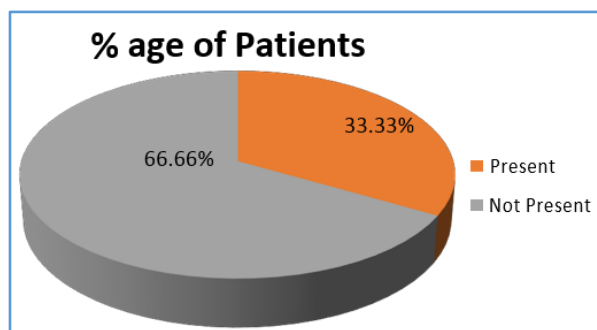


Figure 1. Number of Patients with Specific Learning Disorder (SLD) (N=30)

33.33 % patients had SLD along with ADHD i.e. 10 patients had SLD in one or more domains of learning.

Developmental History	Written Expression		Total	p-value
	No Disorder	Present		
Delayed	3	3	6	0.041*
Normal	22	2	24	
Total	25	5	30	

Table 2. Patients having Disorder of Written Expression with Developmental Delay (N=30)

50% of children with developmental delay had Disorder of Written Expression (with a p- value of 0.041*).

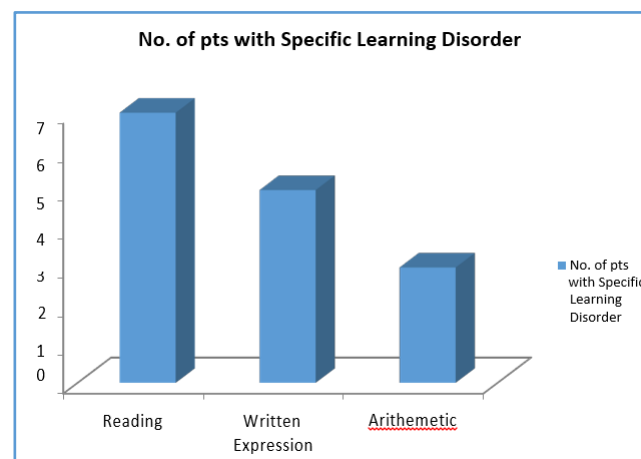


Figure 2. Number of Patients with Specific Learning Disorder (SLD)

Out of 30 patients with ADHD, 7(23.33%) had Reading Disorder, 5(16.66%) had Disorder of Written Expression while 3(10%) had Arithmetic disorder.

CONCLUSION

ADHD was found to be more common in males than females. 10% of patients were found to have positive family history of ADHD. A change in impact of the disorder on patients and their children was seen as the children grew older.

ADHD and SLD often occur co-morbidly. Reading Disorder was the most common among SLD followed by Disorder of Written Expression and Arithmetic Disorder. No significant difference was found in gender wise distribution of patients with RD and Disorder of Written expression. However, Arithmetic disorder was more common in females

than males. No relevant relation was found between SLD and family history of ADHD.

ADHD and LD are two discrete disorders with distinct symptom clusters. Distinguishing between ADHD and LD can be difficult because of overlapping symptoms and because some behaviours that may result from LD can look like ADHD symptoms. The study indicates a very strong comorbidity of the two conditions. Studies of the families of children with either LD or ADHD indicate strong patterns of inheritance for both conditions, but also show that they are independent disorders.

Limitations

Ours is a hospital-based study and size of the sample is small due to which the results cannot be generalized to other patients with ADHD.

Moreover, the number of female patients with ADHD who came to the OPD during this period is very less as compared to the male patients also, majority of our sample consist of referred patients and is not a representative sample of the community.

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