

## Original Research Article

# Prevalence of attention deficit hyperactivity disorder, gender difference and its co morbidity among urban school children in a city of southern Rajasthan, India

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### ABSTRACT

**Background:** Attention deficit hyperactivity disorder (ADHD) is one of the most commonly diagnosed disorders of childhood (3-5%). The main characteristics of attention deficit hyperactivity disorder are inattention, hyperactivity, and impulsivity. The Objective of this study was to study prevalence of ADHD in school aged children.

**Methods:** A cross sectional descriptive school-based study was conducted in a private school of Udaipur from January 2017 to September 2018. All eligible students were included. Total 1200 students were enrolled. They were assessed for the presence of ADHD using INCLLEN diagnostic tool and those found positive were further assessed for the presence of co-morbid conditions using child behavior checklist (CBCL).

**Results:** In present study out of total 1200 students 730(60.83%) were male and 470(39.17%) were female. 76 (6.3%) students out of 1200 were ADHD Positive. ADHD was more common in male students (73.7%), urban locality (57.89%), in age group 6 to 9 years (44.7%) and higher economic class (46.1%). Hyperactivity-Impulsivity type was most common type (51.32%). Male students had predominance of hyperactivity (60.7%) whereas in female student's inattention type was predominant (45%). Aggressive Behavior (19.6%) and rule breaking behavior (80.4%) was more common in male. Somatic complaints were more common in females (60%). Oppositional defiant disorder was observed in male (21.4%) and female (10%) students. 15.8% of ADHD students had learning disorder.

**Conclusions:** Present study shows 6.3% prevalence of ADHD. Hyperactivity type of ADHD was more common in boys, while Inattention type was more common in girls. Among associated co morbid conditions - aggressive behavior, rule breaking behavior and oppositional defiant disorder (ODD) was found to be more prevalent in boys while anxious behavior, somatic complaints and social problems were more commonly found in girls. Thought problems, learning disorders and conduct disorders are also observed in ADHD students.

**Keywords:** Attention deficit hyperactivity disorder (ADHD), Child behavior checklist (CBCL), INCLLEN, Oppositional defiant disorder (ODD)

### INTRODUCTION

Attention deficit hyperactivity disorder (ADHD) is one of the most commonly diagnosed disorders of childhood (3-5%).<sup>1-4</sup> According to recent studies it may persist into adolescent and adult life although majority of ADHD

referral are for school age (4-18 years) children, early evaluation is critical.<sup>5-8</sup> The main characteristics of attention deficit hyperactivity disorder are inattention, hyperactivity, and impulsivity. Children manifest by poor concentration, over activity, restlessness, disobedience, low social relations, and antisocial behavior.

Approximately 30% of children with ADHD have a learning disability, and a large majority underachieve academically.<sup>9</sup> Which may also be secondary to inherent problems with engagement in classroom activities, failure to follow through on instructions, and to complete assigned tasks and tests? Social impairments and difficulty with peer relations are often described as difficulty in attaining and keeping friends, resolving conflicts, and managing anger and frustration.<sup>10</sup> However, the area has remained underdiagnosed and field awaits a study applying INCLIN diagnostic tool to estimate the prevalence, gender difference and its co-morbidity among the school children. This study aims to obtain a profile and explore associated co morbid factors relating to children with Attention deficit hyperactivity disorder.

**METHODS**

A cross sectional descriptive school-based study was conducted in a private school of Udaipur from January 2017 to September 2018 after approval from Ethics Committee of institute.

**Inclusion criteria**

- All students between ages 6-18 who were willing to participate after parent’s consent were included.

**Exclusion criteria**

- Physically unfit students and having severe medical problems were excluded.

Total 1200 students were enrolled. Predesigned structured standardized tool INCLIN Tool for child and adolescent was filled by interviewing parents and teachers (class teacher) to collect data. Participants who

were found positive, CBCL was further filled for diagnosis of ADHD and associated co-morbid conditions.

**Statistical analysis**

The collected data were analysed and statistically evaluated using SPSS-PC-17 version. Quantitative data was expressed in mean; standard deviation and difference between two comparable groups were tested by student’s t-test (unpaired), while qualitative data were expressed in percentage. Statistical differences between the proportions were tested by chi square test or Fisher’s exact test. ‘P’ value less than 0.05 was considered statistically significant.

**RESULTS**

In present study out of total 1200 students 46.92% were from rural and 40.08% were from urban areas. Among those,730 (60.83%) were male and 470 (39.17%) were female. Maximum students 52% were in class1 -5<sup>th</sup> class, followed by 6-8<sup>th</sup> class 24.2%, class 9-10<sup>th</sup> 16.3%, class 11-12<sup>th</sup> 7.5%.

Majority of the students (36.7%) were in age group 6-9 years, and 28.2 % were in age group 9-12 years. Mean age of the participants were 8.26 years. 76 (6.3%) out of 1200 were ADHD positive. ADHD was found to be more common in male students (73.7%) in comparison to female students (26.3%).

Gender wise distribution of ADHD prevalence between male and female was statistically significant. (p<0.05). INCLIN results positive children have urban predominance (57.89%) than rural (32.90%) and in negative children rural children (47.87%) are predominating than urban (40.08%).

**Table 1: Socio demographic profile of participants.**

Variables	ADHD positive	ADHD negative	Total (%)	P value
<b>Residence</b>				
Urban	44 (57.89)	437 (38.88)	481(40.08)	0.005
Rural	25 (32.90)	538 (47.87)	563 (46.92)	
Tribal	7 (9.21)	149 (13.25)	156 (13.00)	
<b>Gender</b>				
Male	56 (73.68)	674 (59.96)	730 (60.83)	0.024
Female	20 (26.32)	450 (40.04)	470 (39.17)	
<b>Education status</b>				
Primary (class 1-5 <sup>th</sup> )	44 (57.9)	580 (51.60)	624 (52)	0.977
Middle (class 6-8 <sup>th</sup> )	17 (22.4)	273 (24.29)	290 (24.2)	
Secondary (class 9-10 <sup>th</sup> )	11 (14.4)	185 (16.46)	196 (16.3)	
Sr. secondary (11-12 <sup>th</sup> )	4 (5.3)	86 (7.65)	90 (7.5)	
Total	76 (100)	1124 (100)	1200 (100)	

Gender distribution of ADHD positive children shows male predominance (73.68%) which is statistically non-significant in comparison to ADHD negative students. Both ADHD positive and ADHD negative children were nearly equally distributed in all educational groups (Table 1 and 2). Among students having ADHD- hyperactivity: Impulsivity type was present in maximum no. of students (51.32%), Inattention type was seen in 16 (21.05%) and 21 (27.63%) has got the combined symptoms. Male students having maximum hyperactivity (60.7%) followed by mixed type (26.8%) and inattention type (12.5%), whereas in female student's inattention type was maximum (45%) followed by mixed symptoms (30%) and hyper activity (25%).

**Table 2: Distribution of Students according to age group.**

Age wise distribution of students	Gender		
	Male	Female	Total
6-9	265 (36.3)	176 (37.4)	441 (36.7)
9-12	206 (28.2)	132 (28.1)	338 (28.2)
12-15	174 (23.9)	116 (24.7)	290 (24.2)
15-18	85 (11.6)	46 (9.8)	131 (10.9)
Total	730 (100)	470 (100)	1200 (100)

**Table 3: Gender wise distribution of students according to different subtypes of ADHD.**

Subtypes	Male	Female	Total	P value
Inattention type	7 (12.5)	9 (45)	16 (21.05)	0.004
Hyper activity type	34 (60.7)	5 (25)	39 (51.32)	
Mixed type	15 (26.8)	6 (30)	21 (27.63)	
Total	56 (100)	20 (100)	76 (100)	

**Table 4: Distribution of ADHD positive students among different variables.**

	Male	Female	Total	P value
<b>Age wise distribution of student</b>				
6-9	30 (53.6)	4 (20)	34 (44.7)	0.069
9-12	13 (23.2)	9 (45)	22 (28.9)	
12-15	9 (16.1)	6 (30)	15 (19.8)	
15-18	4 (7.1)	1 (5)	5 (6.6)	
<b>Educational status</b>				
Primary (class 1-5 <sup>th</sup> )	35 (62.5)	9 (45)	44 (57.9)	0.194
Middle (class 6-8 <sup>th</sup> )	13 (23.2)	4 (20)	17 (22.4)	
Secondary (class 9-10 <sup>th</sup> )	5 (8.9)	6 (30)	11 (14.4)	
Sr. secondary(11-12 <sup>th</sup> )	3 (5.4)	1 (5)	4 (5.3)	
<b>Socio-economic class</b>				
Class-I (>6254)	26 (46.4)	9 (45)	35 (46.1)	0.872
Class-II (3127-6253)	8 (14.3)	4 (20)	12 (15.8)	
Class-III (1876-3126)	7 (12.5)	1 (5)	8 (10.5)	
Class-IV (938-1875)	9 (16.1)	4 (20)	13 (17.1)	
Class-V (<938)	6 (10.7)	2 (10)	8 (10.5)	
Total	56 (100)	20 (100)	76 (100)	

Distribution of ADHD positive Students according to ADHD subtypes between male and female was statistically significant ( $p < 0.05$ ) (Table 3).

A 44.7% of students with ADHD were in 6 to 9 years of age group studying in the primary class (class 1-5<sup>th</sup>). Majority of the students were from socio economic class-I (46.1%) followed by class-IV (17.1%), class-II (15.8%), class-III and class-V (10.5%). Difference was found statistically non-significant (Table 4). Aggressive behavior was more common in male (19.6%) than female

students (10%). Distributions of ADHD positive students according to anxious /depressive behavior between male and female was statistically insignificant ( $p > 0.05$ ). Majority of students have rule breaking behavior (65.8%), rule breaking behavior was more common in boys (80.4%) in comparison to girls (25%) and found statistically significant ( $p < 0.05$ ). Somatic complaints (most commonly pain) were reported in 34(44.7%) of the total students and were more common in females (60%) as compared to males (25%) and difference between male and females was statistically non-significant.

Thought problems (guilty feeling, feeling of insecurity) were almost equally common among males (76.8%) and females (80%) students suffering from ADHD. Conduct disorder was more commonly observed in boys (9.2%) in comparison to girls (5%). Social problems (Isolated, attention seeking) were common in both female (90%)

and male students (75%) and that was statistically non-significant (Table 5). Difference in oppositional defiant disorder observed in male (21.4%) and female (10%) students was statistically non-significant. A 15.8% of ADHD students were having learning disorder with non-significant difference in gender distribution (Table 6).

**Table 5: Distribution of ADHD positive students according to co-morbid conditions.**

Aggressive behavior	Male	Female	Total	P value
Present	11(19.6)	2 (10)	13 (17.1)	0.524
Absent	45 (80.4)	18 (90)	63 (82.9)	
Total	56 (100)	20 (100)	76 (100)	
<b>Anxious/depressive behavior</b>				
Yes	38 (67.9)	17 (85)	55 (72.4)	0.238
No	18 (32.1)	3 (15)	21 (27.6)	
Total	56 (100)	20 (100)	76 (100)	
<b>Rule breaking behavior</b>				
Yes	45 (80.4)	5 (25)	50 (65.8)	0.001
No	11 (19.6)	15 (75)	26 (34.2)	
Total	56 (100)	20 (100)	76 (100)	
<b>Somatic complaints</b>				
Yes	22 (39.3)	12 (60)	34 (44.7)	0.181
No	34 (60.7)	8 (40)	42 (55.3)	
Total	56 (100)	20 (100)	76 (100)	
<b>Thought problems (guilty feeling, feeling of insecurity)</b>				
Yes	43 (76.8)	16 (80)	59 (77.6)	0.987
No	13 (23.2)	4 (20)	17 (22.4)	
Total	56 (100)	20 (100)	76 (100)	
<b>Conduct disorder</b>				
Yes	6 (10.7)	1 (5)	7(9.2)	0.758
No	50 (89.3)	19 (95)	69(90.8)	
Total	56 (100)	20 (100)	76(100)	
<b>Social problems (isolated, lack of friendship, peer problems, withdrawal)</b>				
Yes	42 (75)	18 (90)	60 (78.9)	0.274
No	14 (25)	2 (10)	16 (21.1)	
Total	56 (100)	20 (100)	76 (100)	

**Table 6: Distribution of ADHD positive students according to oppositional defiant disorder.**

Oppositional defiant disorder	Male	Female	Total	P value
ODD positive	12 (21.4)	2(10)	14 (18.4)	0.426
ODD negative	44 (78.6)	18 (90)	62 (81.6)	
Total	56 (100)	20 (100)	76 (100)	
<b>Learning disorder</b>				
Present	9 (16.1)	3 (15)	12 (15.8)	0.807
Absent	47 (83.9)	17 (85)	64 (84.5)	
Total	56 (100)	20 (100)	76 (100)	

**DISCUSSION**

Out of total 1200 students, 46.92% were from rural and 40.08% were from urban areas. 730 (60.83%) were male and 470 (39.17%) were female. Maximum students 52%

were in class1-5<sup>th</sup>class, followed by 6-8<sup>th</sup> class (24.2%), class 9-10<sup>th</sup> (16.3%), class 11-12<sup>th</sup> (7.5%). Majority of the students 36.7% were in age group 6-9 years, and 28.2 % were in age group 9-12 years. Mean age of the participants were 8.26 years.

Present study shows 6.3% prevalence of ADHD. Other studies have reported prevalence of 2-15%.<sup>11-14</sup> The prevalence of 6.3% is consistent with other Indian studies in school age children.<sup>11,15</sup> Prevalence in present study was found to be low when compared with some other studies reported from India and from western countries.<sup>12,13,16,17</sup> Most recent Indian study done by HS Ramaya et al, found that the prevalence of ADHD in their study was 1.3% which was much lower than our results. Rajeshwari Mannapur et al, also showed lower prevalence of only 2.3%.<sup>15,18</sup> Epidemiological studies reveal prevalence rates of ADHD ranging widely from 1-23% depending upon the diagnostic tool used and the population sample as shown in two meta-analysis.<sup>19,20</sup>

ADHD was found to be more common in male (73.7%) in comparison to female students (26.3%). Gender wise distribution of ADHD prevalence between male and female was statistically significant. ( $p < 0.05$ ). ADHD was found to be more common in male students (73.7%) in comparison to female students (26.3%). Male female ratio was found to be 2.8:1. A study done by Rajeshwari Mannapur et al, also found ADHD was significantly more prevalent in boys than girls, with male to female ratio of 3.6:1.<sup>15</sup> Similarly Mohamed F et al, also reported a higher prevalence of ADHD in boys than girls with the ratio 2.7:1 the gender wise differences in prevalence strengthen the evidence for a biologically based, often genetically transmitted, etiology for hyperkinetic disorder.<sup>21</sup> Other studies done in Western countries also reported a greater incidence of ADHD in boys than in girls.<sup>14,22</sup> In a study conducted by Gratz et al, inferred that ADHD was much more common among males than females, the ratio ranging from 2:1 to 10:1 respectively, various Indian studies have reported ADHD to be 3.3 to 7.7 times more common among boys than girls.<sup>15-18,23,24</sup> Most recent Indian study done by HS Ramaya et al, found male to female ratio of 1.6:1.<sup>18</sup> A recent meta-analysis of studies done in last decade gives a pooled prevalence of male is to female ratio of 2.4:1, which is consistent with the present study.<sup>25</sup>

ADHD positive children have urban predominance (57.89%) than rural (32.90%) and in negative children rural children (47.87%) are predominating than urban (40.08%). Both ADHD positive and ADHD negative children were nearly equally distributed in all educational groups.

Among the positive students for ADHD, Hyperactivity - Impulsivity type was present in maximum no. of students 39 (51.32%), Inattention predominance was seen in (21.05%), and 21 (27.63%) got the combined symptoms.<sup>16</sup> Similar results were reported by Rajeshwari Mannapur et al, they found that out of 23 ADHD subjects, 11(47.82%) were hyperactive /impulsive type, 7 (30.45%) were inattentive type and 5 (21.73%) were diagnosed to have combined type of ADHD.<sup>15</sup> In contrast, ADHD-combined type was the most commonly diagnosed sub-type 53.8% in a study done in Pakistan by

Qureshi et al, in 2003.<sup>26</sup> Our results were consistent with another study on the prevalence of subtype of ADHD by Malhi et al, which estimated 50% of children diagnosed to be ADHD-hyperactive type, 35% were ADHD-inattentive type and only 15% were ADHD- Combined type.<sup>27</sup> Male students have maximum hyper activity type of ADHD( 60.7%) followed by mixed type (26.8%) and Inattention type (12.5%), whereas in female students inattention was maximum (45%) followed by mixed symptoms (30%) and hyper activity (25%). Distributions of ADHD positive Students according to subtype between male and female were statistically significant ( $p < 0.05$ ). It was consistent with the results of other studies; predominantly Hyperactive-impulsive type of ADHD was seen in majority of male children with ADHD.<sup>24,27,28</sup> Most of the students were from socio-economic (SE) class-I (46.1%) followed by class-IV (17.1%), class-II (15.8%), class-III and class-V (10.5%). The prevalence is found to be more in class I SE; reason behind this may be that parents were more educated and aware of symptoms of hyperactivity and inattention and have scored more in the diagnostic tool. Distributions of ADHD positive students according to socio economic class between male and female were statistically insignificant ( $p > 0.05$ ).

In present study children with ADHD also had co-morbid condition (psychosocial/learning) like aggressive behavior 17.1%, depressive behavior 72.4%, rule breaking behavior 65.8%, Somatic complaints 44.7%, thought disorder 77.6%, conduct disorder 71.1%, social problem 78.9%, ODD 18.4%, and learning disability 15.8%. Aggressive behavior was more common in males (19.6%) than female students (10%). The difference was statistically insignificant ( $p > 0.05$ ) males were showing more aggressive behavior in above observation, possible reason may be genetic, more pampering by parents and avoidance of minor behavioral problems during their parenting and their aggressive behavior was taken for granted. Other reasons may be related to hyperactivity/impulsiveness leading to lesser number of friends, fighting and burgling among peers. One Indian study done by Mannapur R et al, also states in favour of our observation that behavioral problems reported among ADHD children were aggressiveness, destructiveness and temper tantrums.<sup>15</sup> Similar behavioral problems were reported in 60% of children with ADHD in an Indian study done by Venkata JA et al.<sup>16</sup> In the same study they also reported peer difficulties like not being liked by classmates, being rejected, not having a single good friend in 75% of children with ADHD.<sup>16</sup> Distribution of ADHD positive students according to anxious /depressive behavior. Maximum number of students have shown the anxious /depressive behavior (72.4%). Distributions of ADHD positive students according to anxious /depressive behavior between male and female were statistically insignificant ( $p > 0.05$ ). In ADHD patients prevalence of anxiety disorder is 25% which is higher than normal population 2-9%.<sup>30-31</sup> Majority of students having rule breaking behavior (65.8%).<sup>29</sup> Habit of rule breaking was

more common in males (80.4%) than females (25%) and it was statistically significant ( $p < 0.05$ ). Out of total 9.2% of the students have conduct disorder. Distributions of ADHD positive students according to conduct disorder between male and female was statistically insignificant ( $p > 0.05$ ). Prevalence of conduct disorder is 6%-16% in general population.<sup>30,31</sup> Oppositional defiant disorder (extreme resistance to authority, conflict with parents, outburst of temper and revenge) was more common in male students with ADHD (21.4%). Prevalence of ODD in normal population is 2%-16%.<sup>30,31</sup> Almost equal percentage of female (15%) and male students (16.1%) having learning disorder. Distribution of ADHD positive students according to learning disorders between male and female were statistically insignificant ( $p > 0.05$ ). Prevalence of learning disorder in normal population is between 2-9%.<sup>30,31</sup>

## CONCLUSION

To conclude, ADHD is prevalent in Indian children. Present study shows 6.3% prevalence of ADHD which is nearly consistent to other studies. ADHD was more common in boys than girls.

Hyperactivity type of ADHD was more common in boys, while Inattention type was more common in girls. Among associated co morbid conditions-aggressive behavior, rule breaking behavior and ODD was found to be more prevalent in boys while anxious behavior, somatic complaints and social problems were more commonly found in girls. Though problems, learning disorders and conduct disorders are also observed in ADHD students.

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