

Prevalence of Attention Deficit Hyperactivity Disorder among School Children and Associated Co-morbidities - A Hospital Based Descriptive Study

Rimal HS,¹ Pokharel A²

¹Department of Pediatric

²Department of Psychiatry

Birat Medical College Teaching Hospital

Biratnagar, Nepal.

Corresponding Author

Hem Sagar Rimal

Department of Pediatric

Birat Medical College Teaching Hospital

Biratnagar, Nepal.

E-mail: hemsagarr@yahoo.com

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ABSTRACT

Background

Attention Deficit Hyperactivity Disorder is the most common neuro- developmental disorders of childhood characterized by the core symptoms including inattentiveness and distractibility and frequently involve impairments in executive functioning, increased impulsivity, and restlessness.

Objective

To find out the prevalence of Attention Deficit Hyperactivity Disorder among school aged children Presented to Pediatric clinic and also to investigate associated co-morbidities.

Method

This study was conducted at Nobel Medical College Teaching Hospital, Biratnagar during April 2014 - March 2015. Attention Deficit Hyperactivity Disorder was diagnosed by the developmental Pediatrician after taking relevant history and the clinical assessment using Attention Deficit Hyperactivity Disorder rating scale with diagnostic criteria consistent with Diagnostic Statistical Manual - IV classification. Spence anxiety scale child and parent rated version and Strength and Difficulty Questionnaire were also used.

Result

Result showed the yearly prevalence of Attention Deficit Hyperactivity Disorder being 41(11.7%) with male: female ratio of 4:1. The study reported that Attention Deficit Hyperactivity Disorder combined type was the commonest type that was 26(63%) cases followed by Inattentive type 9(22%) cases and 6(15%) were hyperactive type. The mean age for Attention Deficit Hyperactivity Disorder was 7 years and 5 months. The most common co-morbidities were sleep problem 12(29.3%), Learning difficulty 10(24.4%), Anxiety disorder 10(24.4%), Oppositional Defiant Disorder 9(22%), Autism Spectrum Disorder 5(12%), speech delay 6(14.6%), and 4(10%) had associated tics. There was abnormal SDQ prevalence of 29.3% across the area of emotional distress. The mean abnormal SDQ score in total difficulty area 8 (20.7%), socializing with peer 9(22%), behavioral difficulty 11(26.8%), hyperactivity/inattention 23(56.1%) and impact of difficulties in young person's life being 5(12.2%).

Conclusion

There is high prevalence of Attention Deficit Hyperactivity Disorder in children and adolescents in Nepal. This study has also looked at co-morbidities associated with Attention Deficit Hyperactivity Disorder and the findings of the study have thrown lights on the mental health and other developmental issues associated with it.

KEY WORDS

Attention deficit hyperactivity disorder, co-morbidities, learning difficulties, mental health, sleep problem

INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) is the most common neuro- developmental disorders of childhood, characterized by the core symptoms including inattentiveness and distractibility (difficulty completing work) and frequently involve impairments in executive functioning (organization, working memory), increased impulsivity (taking out of turn, interrupting), and restlessness (difficulty remaining seated, fidgeting). Some ADHD children suffer predominately from inattention (ADHD-I); others exhibit principally hyperactive-impulsive behavior (ADHD-HI), while the third subgroup show all the above-mentioned symptoms and signs (ADHD-C) and this is the commonest type.¹⁻³

There are several co-morbidities, commonly associated with ADHD that include anxiety disorders, oppositional defiant disorder, sleep disorders, affective disorders, learning disabilities, and tics. A cross sectional analysis of data on data from 2007 national survey of children's health between ages of 6 to 17 years found that 18% of children with ADHD had an anxiety disorder versus 2% of children without ADHD and 14% of children with ADHD had a depressive disorder versus 1% of children without ADHD.⁴ This in turn, leads to poorer outcomes for children and families with ADHD and mental health co-morbidities, relative to children with ADHD alone. The presence of co-morbidities has been associated with poor functioning in daily life and educational domains.^{5,6} Mental health co-morbidities greatly influence the presentation, diagnosis, and prognosis of children with ADHD, as co-morbidities increase the overall level of disease burden.^{5,7} Various studies have found that children with ADHD and co-morbid Oppositional Defiant Disorder engages in more aggressive and delinquent behaviors. These children are also at risk of academic under achievement, substance abuse, lower self-esteem, and social maladjustment.^{7,8}

METHODS

This was a hospital based prospective study done at Nobel Medical College Teaching Hospital, Biratnagar, over a period of one year from April 2014 to March 2015. In total 41 study subjects were taken in this study by using a convenience sampling technique among the children presented for consultation to pediatric outpatient clinic at Nobel Medical College and Teaching Hospital (NMCTH), Biratnagar of eastern region, Nepal.

The ethical approval for the study was obtained from the IRC of Nobel Medical College Teaching Hospital. An informed consent was obtained from the parent and children for this study. The data regarding demographic profile of the children were obtained when they first met the pediatrician.

Attention Deficit Hyperactivity disorder was diagnosed by

the developmental Pediatrician after taking relevant history and the clinical assessment using accepted diagnostic criteria consistent with DSM-IV classification. The ADHD rating scale was also used as a diagnosing tool. The diagnosis of ADHD was sub typed into Inattentive (ADHD-I), Hyperactivity/impulsivity (ADHD-HI) and combined type (ADHD-C). The diagnoses of associated co-morbidities were made by the developmental pediatrician using appropriate screening tools and relevant history and examination.

Attention Deficit Hyperactivity Disorder (ADHD) Rating Scale:

ADHD rating scale is an 18-items scale that rates symptoms using a 4-point Likert-type severity scale (0 = none, 1 = mild, 2 = moderate, and 3 = severe). It is based on the DSM-IV criteria for diagnostic criteria for ADHD. It has nine items that assess inattentive symptoms and nine items that assess hyperactive and impulsive symptoms. The ADHD Rating Scale has been developed and standardized as a rating scale for children.

Strength and Difficulty Questionnaire (SDQ):

Parent report version of Strength and difficulty questionnaire (SDQ) was given to all the parents of children with ADHD to assess the mental health status of children and when needed cases were referred to other professionals for their input. Parent report SDQ was used for children below 11 yrs of age and self report SDQ was used for children of 11 yrs and older.

The SDQ is an instrument that has been widely used to assess mental health problems, emotional and behavioral problems and strength among children and adolescents.⁹ The final conclusion on the presence or absence of mental health problems as measured by SDQ is ideally computed from the combined reports from parents, teachers, and self-report by child.¹⁰ However, self reports may be sufficient screening tool for adolescents aged 11 years or older.¹¹ The clinical usefulness of SDQ in identifying mental health problems in adolescents has been established, with a reliability and validity that is as good as that of Child Behavior Checklist.¹² The Self rated SDQ possesses 25 items in the following 5-item scales: emotional and conduct problems, hyperactivity/inattention, peer relationship problems, and pro-social behavior. Each item is scored on a 3-point scale (0 not true; 1 somewhat true; 2 certainly true) and the sum of all answered items in a scale creates its total score (possible range, 0-10), whereas the sum of all answered items in the first 4 scales creates the total overall score (possible range, 0-40). The higher the total score is the larger the difficulties are. The SDQ total scores could be considered as "normal" (range, 0-15), "borderline" (range, 16-19), and "abnormal" (range, 17-40), indicating the presence of general psychopathology. For the subscales, abnormal scores were taken as follows: emotional scale and hyperactivity/inattention range, 7 to 10; conduct problems range, 5 to 10; peer relationship problems range,

6 to 10; and pro-social behavior range, 0 to 4. The abnormal SDQ score in any area indicate substantial risk of clinically significant problem in that area.¹³

Diagnostic and Statistical Manual of mental disorders (DSM-IV):

Diagnostic and statistical manual of mental disorders, 4th Edition is also known as DSM-IV that is published by American psychiatric association (APA) which includes all the recognized mental disorders. It has set criteria to diagnose various disorders.

Spence anxiety scale:

Child rated and parent rated version of Spence anxiety scale was used to screen for anxiety disorder where appropriate. The data were analyzed using the SPSS version 16

RESULTS

A total of 41 school aged children were identified to have ADHD according to the Diagnostic Statistical Manual -IV diagnostic criteria, during the period of 12 months out of 350 children presented to the pediatric clinic 41 were diagnosed of having ADHD that resulted into the yearly prevalence of 11.7%. A study done by Rimal HS et al. to asses mental health problems of school children using SDQ also noted similar prevalence rate of abnormal SDQ score across the domain of Hyperactivity/Inattention.¹⁴ Male constituted 33(80.5%) while females were 8(19.5%). The mean age of children was 7 years and 5 months. Among those 41 children, almost half of them were from joint family and rest from nuclear family 18(44%) and 3(7%) from extended family background.(Table 1)

Table 1. Demographic characteristics of sample population

Variables	Number (%)
Mean Age(SD)	7 yrs 5 months(2 years 3 months)
Gender	
Male	33(80.5%)
Female	8(19.5%)
Types of family	
Joint family	20(49%)
Nuclear family	18(44%)
Extended family	3(7%)
Employment status of Father	
Employed	34(83%)
Unemployed	7(7%)
Employment status of mother	
Employed	12 (29%)
Unemployed	29(71%)

The result showed that 26(63%) cases had combined signs of hyperactivity (ADHD-C), while 9(22%) cases showed inattentive signs and symptoms .The other children 6(15%) suffered from Hyperactive signs and symptoms only. (Table 2)

Data was analyzed to ascertain the associated co-morbidities. The most common co-morbidities were sleep problem 12(29%), Learning difficulty 10(24%), Anxiety disorder 10(24.4), Oppositional Defiant Disorder 9(22%),

Table 2. Sub types of ADHD and associated co-morbidities among the participants (n=41)

ADHD Sub types	Number (%)
ADHD Combined type (ADHD-C)	26(63%)
ADHD Hyperactive type (ADHD-H)	6(15%)
ADHD Inattention type (ADHD-I)	9(22%)
Associated co-morbidities	
Sleep problem	12(29%)
Learning difficulties	10(24%)
Anxiety disorder	10(24%)
Oppositional defiant disorder	9(22%)
Autism spectrum disorder	5(12%)
Speech delay	6(15%)
Tics	4(10%)

Autism Spectrum Disorder 5(12%), speech delay 6(14.6%), and 4(10%) had associated tics.(Table 2)

There was high, abnormal SDQ prevalence, of 29.3% across the domain of emotional distress. Similarly, the mean abnormal SDQ score in socializing with peer was 22%, in behavioral difficulty 26.8%, in Pro-social behavior 17%, in hyperactivity/inattention 56.1% and in the domain of impact of difficulties in young person’s life was 12.2%. There was statistically significant gender difference noted in case of abnormal rating in the area of emotional distress and total abnormal SDQ score(p value <0.05). This study

Table 3. Distribution of abnormal SDQ score across various domains

SDQ Clinical Ranges (Dichotomized)	Gender Distribution (n 41)		
	Male N=33	Female N=8	P value
Mean Total SDQ score n(%)			
Normal/Borderline score 21(51%)	20(61%)	1(12.5%)	* <0.05
Abnormal 20(49%)	13(39%)	7 (87.5%)	
Emotional problem SDQ score n(%)			
Normal/Borderline 29(71%)	26(79%)	3(37.5)	* <0.05
Abnormal 12(29%)	7(21%)	5(63.5%)	
Hyperactivity/inattention SDQ score n(%)			
Normal/borderline 6(15%)	3(9%)	3(37.5%)	* <0.05
Abnormal 35(85%)	30(91%)	5(62.5%)	
Conduct problem SDQ score n(%)			
Normal/borderline 30(73%)	24(73%)	6(75%)	0.89
Abnormal 11(27%)	9(27%)	2(25%)	
Peer relationship problem SDQ score n(%)			
Normal/borderline 32(78%)	26(79%)	6(75%)	0.94
Abnormal 9(22%)	7(21%)	2(25%)	
Pro-social SDQ score n(%)			
Normal/borderline 33(83%)	26(87.5%)	7(93%)	0.63
Abnormal 8(17%)	7(13.5%)	1(7%)	
Difficulty with young person’s life SDQ Score n(%)			
Normal/borderline 36(88%)	29(88%)	7(87.5%)	0.97
Abnormal 5(12%)	4(12%)	1(12.5%)	

also noted higher prevalence of ADHD among boys as compared to girls that is statistically significant with p value <0.05 . (Table 3)

Cases were investigated and managed with the help of multi-disciplinary team members. Nearly half of the participants 18(44%) of participants were referred to Psychologist, 8(19.5%) to Speech therapist and 6(14.6%) were referred to audiologist.

DISCUSSION

There have been varied report available around the world on prevalence of ADHD in school children ranging from 3-17.8%.¹⁵⁻¹⁷ Our study has found the prevalence of ADHD that is comparable to one of the study conducted by national center for health statistics in the year 2007 in USA where parent reported diagnosed prevalence of ADHD for all the children ages 6-17 years was 8.2% (95% CI 7.7-8.7).^{18,19} The higher prevalence in our set up could be because of the fact that we received lots of referral from the paediatricians and other health professionals as there are very few centres to provide this kind of service but no other local data is available to compare with it.

ADHD is often associated with different co-morbid conditions like mood disorders, anxiety, oppositional defiant disorder or learning disorders in children, and substances abuse on adults. Studies on adults, demonstrated 87% of the patients with ADHD had at least one psychiatric co-morbidity which raises the importance of an accurate early diagnosis of ADHD during childhood.¹⁹

A large population-based study found that approximately 67% of children with ADHD present with one or more psychological or neuro-developmental co-morbidities compared with 11% of children without ADHD. Out of those children with ADHD, 33% had a single co-morbidity, 16% had two, and 18% had three or more.⁴ In our study 32% had single co-morbidity, 34% had two and 17% had three or more whereas 17% did not have any co-morbidity.

In this study, we noted 12(29.3%) children with ADHD having sleep related problem. In a study done by Moreau V et al. parental reports indicated more severe sleep disturbances, and actigraphic recordings of longer sleep onset latency, lower sleep efficiency, and lower total sleep time.²⁰ A study from Canada by Corkum P et al. reported that the children with ADHD have significant sleep disturbances comprising of dyssomnias, parasomnias, and sleep related involuntary movements.²¹

Our study noted that 10(24.4%) children with ADHD had anxiety disorder which is consistent with the findings from a study done in Hongkong where Co-morbid anxiety disorders were observed in 27.5% of 6-12 years age group children with ADHD.²² Children with anxiety disorder may be very tense, quick to panic and seeks lots of reassurances and also avoids unfamiliar situations.¹

The learning difficulty (LD) and oppositional defiant disorder (ODD) are two other common co-morbidities associated with ADHD in our study. In this study, percentage of children having LD was 24.4% which is lesser than the finding from a study done in Turkey and USA that was 35.7% and 46% respectively.^{4,15} In the same study 9 (22%) of school children had ODD that is almost similar to the finding of our study. One of the study suggested that the co-morbidity of CD and ODD in ADHD may increase the risk of a further development of mood disorder, but most studies had a small sample size.²³

There were other co-morbidities found to be associated with ADHD although they were less common. In this study 6(14.6%) had speech delay, 5(12%) had Autism Spectrum Disorder (ASD) and 4(10%) had Tics.

The analysis of data obtained from the parent report SDQ showed that 21(51%) children with ADHD had normal/ borderline SDQ rating and 20(49%) had rated abnormal total SDQ score which means there is a substantial risk of having clinically significant mental health conditions. Similarly, abnormal SDQ score in socialising with peer was 22%, in behavioral difficulty 26.8%, in Pro-social behavior 17%, in hyperactivity/inattention 56.1% and 12.2% of participants had abnormal SDQ in the domain impact of difficulties in young person's life.

There was high abnormal SDQ prevalence of 29.3% across the area of emotional distress. Girls were more likely to have abnormal SDQ score across Emotional problem domain which was statistically significant (p value <0.05 , CI 95%). Similar finding was obtained in a Finish study but it was community sample.²⁴ In our study, ADHD was found significantly higher in boys than girls when screened by SDQ which is consistent with other studies as well. In this study, the mean abnormal total SDQ score was 20.7% that is slightly higher than the findings from a Brazilian study(18%) but much higher than the study of Olyanka et al where it was reported to be 10 % only.²⁵ Gender difference was also reported to be statistically significant in case of mean total abnormal SDQ score as girls scored higher than boys (p value <0.05 , CI 95%).

The main limitation of this study was the small sample size. Multi-centric study with the same methodology would generate more reliable result that will have better external validity.

CONCLUSION

There is high prevalence of ADHD in school aged children and adolescents in Eastern Nepal. This study has also looked at co-morbidities associated with ADHD and the findings of the study have thrown lights on the mental health issues associated with ADHD. The high rate of co-morbidities associated with ADHD clearly indicates that it is absolutely necessary to work on these areas to reduce the impact of co-morbidities on young person's life.

REFERENCES

1. Washington D. Diagnostic and statistical manual of mental disorders (4th ed. text rev.). American Psychiatric Association 2000.
2. Mark L. Worlich CJW, Tomas E Brown, Steven W. Evans, Edward M Gotlib, John R Knight et al. Attention Deficit/Hyperactivity Disorder Among Adolescent: A review of the diagnosis, Treatment, and Clinical Implication. *Pediatrics*. 2005;115(6):1734-46.
3. Gipson TT, Lance EI, Albury RA, Gentner MB, Leppert ML. Disparities in Identification of Comorbid Diagnoses in Children With ADHD. *Clinical pediatrics*. 2015;54(4):376-81.
4. Larson K, Russ SA, Kahn RS, Halfon N. Patterns of comorbidity, functioning, and service use for US children with ADHD. *Pediatrics*. 2011;127(3):462-70.
5. Kunwar A, Dewan M, Faraone SV. Treating common psychiatric disorders associated with attention deficit/hyperactivity disorder. *Expert opinion on pharmacotherapy*. 2007;8(5):555-62.
6. Bowen R CD, Bailey K, Stein MT, Stein MB,. Nature of Anxiety comorbid with attention deficit hyperactivity disorder in children from a pediatric primary care setting. *Psychiatric Res*. 2008;34(6):201-9.
7. Waschbusch DA, Pelham WE, Jr., Jennings JR, Greiner AR, Tarter RE, Moss HB. Reactive aggression in boys with disruptive behavior disorders: behavior, physiology, and affect. *Journal of abnormal child psychology*. 2002;30(6):641-56.
8. Bukstein OG. Disruptive behavior disorders and substance use disorders in adolescents. *Journal of psychoactive drugs*. 2000;32(1):67-79.
9. R G. The Strengths and Difficulties Questionnaire: a research note. *J Child Psychol Psychiatry* 1997; 38:581-6.
10. Goodman R MH, Bailey V. The Strengths and Difficulties Questionnaire: a pilot study on the validity of the self-report version. *Eur Child Adolesc Psychiatry*. 1998;7:125-30.
11. Muris P, Meesters C, van den Berg F. The Strengths and Difficulties Questionnaire (SDQ)-further evidence for its reliability and validity in a community sample of Dutch children and adolescents. *European child & adolescent psychiatry*. 2003;12(1):1-8.
12. Goodman R. Psychometric properties of the strengths and difficulties questionnaire. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2001;40(11):1337-45.
13. R G. Psychometric properties of the Strengths and Difficulties Questionnaire. *J Am Acad Child Adolesc Psychiatry* 2001;40:1337-45.
14. Rimal HS PA. Assessment of Mental Health Problems of School Children Aged 11-17 Years Using Self Report Strength and Difficulty Questionnaire(SDQ). *J Nepal Pediatric Soc*. 2013;33(3):172-6.
15. Zorlu A, Unlu G, Cakaloz B, Zencir M, Buber A, Isildar Y. The Prevalence and Comorbidity Rates of ADHD Among School-Age Children in Turkey. *Journal of attention disorders*. 2015. Available from DOI 10.1177/1087054715577991
16. Baumgaertel A, Wolraich ML, Dietrich M. Comparison of diagnostic criteria for attention deficit disorders in a German elementary school sample. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1995;34(5):629-38.
17. Montiel-Nava C, Ortiz Leon S, Jaimes Medrano A, Gonzalez Avila Z. [Prevalence of attention deficit/hyperactivity disorder in venezuelan college students. Preliminary findings]. *Investigacion clinica*. 2012;53(4):353-64.
18. Kandyce Larson SAR, Robert S. Kahn, Neal Halfon. Patterns of Comorbidity, Functioning, and Service Use for US Children With ADHD, 2007. *Pediatrics*. 2011 (127): 462-70.
19. Visens LS. [Attention deficit hyperactivity disorder (ADHD): an overview]. *Vertex*. 2012;23(105):325-30.
20. Moreau V, Rouleau N, Morin CM. Sleep of Children With Attention Deficit Hyperactivity Disorder: Actigraphic and Parental Reports. *Behavioral sleep medicine*. 2013. Available from 10.1080/15402002.2013.764526, Accession number (23473239)
21. Corkum P, Tannock R, Moldofsky H. Sleep disturbances in children with attention deficit/hyperactivity disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1998;37(6):637-46.
22. Shea CK, Lee MM, Lai KY, Luk ES, Leung PW. Prevalence of Anxiety Disorders in Hong Kong Chinese Children With ADHD. *Journal of attention disorders*. 2014. Available from 10.1177/1087054714562830, Accession number(25525156).
23. Chen MH, Su TP, Chen YS, Hsu JW, Huang KL, Chang WH et al. Higher risk of developing mood disorders among adolescents with comorbidity of attention deficit hyperactivity disorder and disruptive behavior disorder: a nationwide prospective study. *Journal of psychiatric research*. 2013;47(8):1019-23.
24. Koskelainen M, Sourander A, Vauras M. Self-reported strengths and difficulties in a community sample of Finnish adolescents. *European child & adolescent psychiatry*. 2001;10(3):180-5.
25. Cury CR, Golfeto JH. Strengths and difficulties questionnaire (SDQ): a study of school children in Ribeirao Preto. *Rev Bras Psiquiatr*. 2003;25(3):139-45.