Original article

Prevalence of Attention-deficit hyperactivity disorder in primary school children: A cross-sectional study

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Abstract

Background: Attention-deficit/hyperactivity disorder (ADHD) is a common neurobehavioral disorder affecting children causing significant impairment in functioning. There is a lacuna of studies on ADHD in the Indian context and especially the community sample. Keeping this in mind the present study was conducted to identify prevalence, sociodemographic variables and co-morbidities of ADHD in primary school children.

Methods: Total 1000 Children of age group 6-12 years, from three different schools were included in this cross sectional study. In first stage, screening of children was done with the help of AAP (American Academy of Pediatrics) practice guidelines screening questionnaire and in the second stage, detailed diagnostic interview were conducted with the help of VADTRS (Vanderbilt ADHD diagnostic Teacher Rating Scale) and VADPRS (Vanderbilt ADHD diagnostic Parent Rating Scale).

Results: In this study the prevalence of ADHD in school going children was 5.7%, and it was found to be higher in male children (7.08%) as compare to that of females (3.80%). Prevalence was highest in the 9-10 year of age, and in children of Lower socioeconomic class (11.47%). In

this study most common type of ADHD was Inattentive type and most common co morbid disorder was Depression Anxiety Disorder.

Conclusion: ADHD is a highly prevalent, so early identification and thus early intervention of this disorder is helpful to prevent long term negative consequences.

Key words: ADHD, Prevalence, Co-morbidity, Primary school children

Introduction

Attention-deficit/hyperactivity disorder (ADHD) is a common neurobehavioral disorder affecting children causing significant impairment in functioning across different settings. Worldwide pooled prevalence of ADHD is 5.29% [1]. Prevalence of ADHD in India ranges from 1.6 to 14% in various studies [2]. About 7% school going children have been reported with ADHD [3]. The affected children exhibit varied behavioral problems depending on the type of ADHD, co-morbidities, and the type of care they receive. The major limitations in the previous studies are that samples were clinically referred cases and not from the community, small sample size, failure to use definitive diagnostic criteria [1, 4]. There is only a limited source of information regarding the prevalence of ADHD in the Indian context, especially north western India. Hence, the current study aims at selecting primary school children from the community. The objectives of the study were to identify the prevalence of ADHD in primary school children, to identify distribution and prevalence according to type of ADHD, to compare the distribution of ADHD among different age group, gender and socioeconomic status and to identify the presence of co-morbid psychiatric disorder among ADHD children.

Materials and methods

Sample

Total 1000 Children of age between 6-12 years of age were selected from three different primary Government schools of Bikaner city by convenient or purposive sampling. In most of the previous studies sample size was taken in the range of 100 to 800. To increase the power of our study we increase the sample size and made it round off to 1000. We included only government schools to obtain better sampling frame, because most of the private schools have their own screening protocols at the time of admission, which excludes most of the children with problems.

Tools

1. Personal Information performa- This performa was specifically designed for the current study and it recorded the information regarding socio–demographic characteristics like– age, sex, education, religion, birth order of child education, occupation, income, socioeconomic status of parents and other relevant information like social behavior, academic performance and family history of ADHD or any other psychiatric disorder etc., if any.

2. AAP practice guideline screening questions (AAP, 2001) - this questionnaire was given to the parents and school teachers of all the included children for early recognition of the problematic children [5]. In this study, this questionnaire was used only to detect or screen out the children with problems from the bigger sample, so that the study could be more feasible.

3. Vanderbilt ADHD diagnostic Parent Rating Scale (VADPRS) and Vanderbilt ADHD diagnostic Teacher Rating Scale (VADTRS) scales - This scale is valid for 6-12 years age group of children to find out types of ADHD and comorbid oppositional defiant disorder (ODD), conduct disorder (CD) and depression. VADPRS comprises 47 items and the VADTRS 35 items [6, 7]. The items represent predominantly DSM IV-TR criteria [8] for ADHD, but items

representing DSM IV-TR criteria for oppositional defiant disorder, conduct disorder, anxiety and depression are included as well. This scale also has eight performance items which are scored on two scales labeled: Academic performance and classroom behavior performance. This study was done in 2013, at that time this scale was based on DSM-IV TR criteria. Presently in this scale all items and scoring remains same to diagnose ADHD as per DSM-5 criteria.

Methods

Before starting the study, approval was obtained from Institutional Human Ethical Committee (IHEC). This was a cross sectional study, involving 1000 primary school children aged between 6 and 12 years which were selected from three different government primary schools in Bikaner city. After obtaining permission from the Principals of the schools, the written informed consent was taken from parents of the children. All the children of 6-12 years age, whose parents gave informed consent, were included in to the study. The children found to have mental retardation (MR), pervasive developmental disorder, epilepsy; children with gross neurological abnormalities, and other major medical illness were excluded from the study. For the parents, it was decided that ideally mother but any parent can fill it, while in teachers; all questionnaires were filled by individual class teacher. All the tools were translated into Hindi and translated back to English for ensuring correct translation. This was done for the convenience of parents and teachers.

This study was divided in two stages. In the first stage screening of children was done and in the second stage detailed diagnostic interview was conducted. AAP practice guidelines screening questionnaire was given to the parents and school teachers of all the included children for early recognition of the problematic children. Parents and teachers of problematic children were given

VADTRS and VADPRS scales to find out types of ADHD and comorbid oppositional defiant disorder (ODD), conduct Disorder (CD) and depression. The positive cases on these scales were further subjected to detailed psychiatric interview by senior psychiatrist and the final diagnosis of ADHD and comorbid disorder was confirmed according to the DSM–IV TR criteria. Complete information thus collected was entered in a personal information performa. Statistical Package for the Social Sciences (SPSS) 22 software was used for statistical analysis. Data are presented in the frequency table as percentages. Statistical analysis was performed according to the scoring technique of the written scale. Prevalence has been calculated as a percentage using the study sample as the denominator and the number of the affected children as the nominator. Chi-square was preformed to test the association between ADHD and the socio-demographics. Difference was considered significant when p-value was < 0.05.

Results

Sociodemographic details of total children

Out of total 1000 children, 579 (57.9%) were males and 421(42.1%) were females. Children were divided into 3 age groups. There were 270 children (27.0%) in the age group of 6-8 years compared to 234 children (23.4%) in the age group of 9-10 years and 496 children (49.6%) in the age group of 11-12 years. Children were divided into 5 socioeconomic groups based on Kuppuswami Scale. It was found that 107 children (10.7%) belonged to Class I (Upper) while 238 children (23.8%) belonged to class II (Upper Middle). 383 children (38.3%) belonged to Class III (Lower middle), 211children (21.1%) were from class IV (Upper lower) and 61 Children (6.1%) belonged to Class V (Lower).
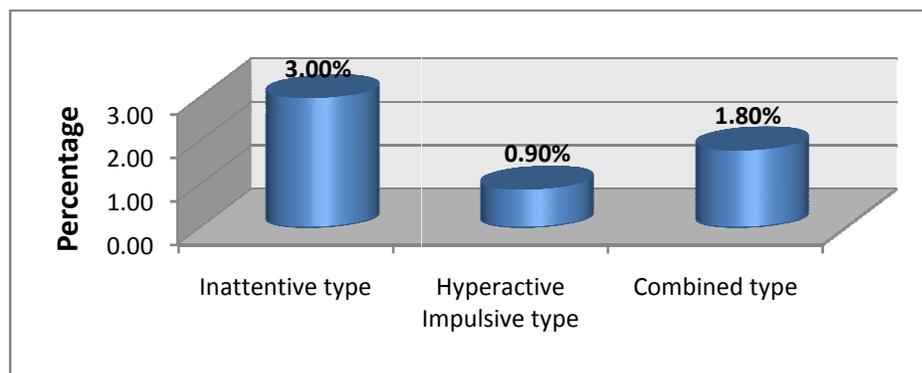
Prevalence of ADHD

After first stage, out of total 1000 children, 109 (10.9 %) children were considered screening test positive (based on the score obtained as per the teachers). On detail evaluation of these 109 children by senior psychiatrist (stage second), only 57 children were diagnosed to be suffering from ADHD. So, the prevalence of ADHD among primary school children was 5.7%. [Figure-1] The remaining 52 children were excluded as they were not fulfilling the ADHD criteria. 23 children were not fulfilling the 6 months duration criteria, 18 children were not having persistent and pervasive pattern of ADHD symptoms and rest of the 11 children were not fulfilling 6 or more than 6 diagnostic criteria's.

Figure-1: Prevalence of ADHD in primary school children
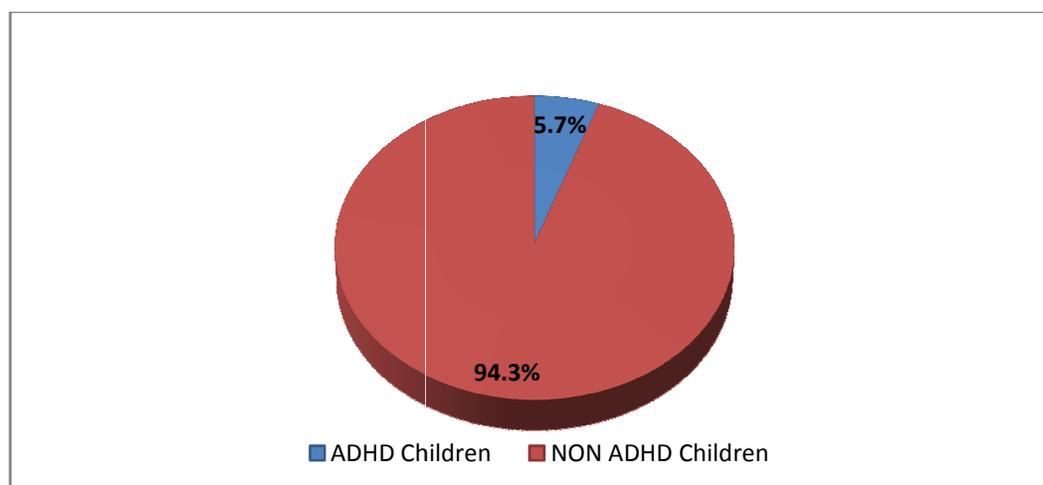
Distribution and prevalence according to type of ADHD

In this study, the most common type of ADHD was inattentive type, seen in 30(52.63%) children followed by combined type, seen in 18 (31.58%) children. Hyperactive Impulsive type was seen only in 9 (15.79%) children. Prevalence for Inattentive, Combined and Hyperactive Impulsive type of ADHD was 3%, 1.8% and 0.9% respectively. [Figure-2]

Figure-2: Prevalence of ADHD Types

Table-1: Sociodemographic variables of ADHD cases

|	Total No. of Children screened	No. of ADHD Cases	Distribution of ADHD Cases (%)	Prevalence (%)	
Total	1000	57	100	5.7	
Age groups (years)					$\chi^2 = 8.696$; p-value= 0.0129
6-8	270	20	35.09	7.41	
9-10	234	20	35.09	8.55	
11-12	496	17	29.82	3.43	
Gender					$\chi^2=4.38$; p-value= 0.036
Male	579	41	71.9	7.08	
Female	421	16	28.1	3.80	
Socioeconomic status					
Upper	107	3	5.3	2.80	$\chi^2 = 8.116$; p- value = 0.087
Upper middle	238	18	31.6	7.56	
Lower middle	383	22	38.6	5.74	
Upper lower	211	7	12.3	3.32	
Lower	61	7	12.3	11.47	

Age wise stratification of ADHD

Children with ADHD were also stratified on the basis of their age into three groups. Prevalence of ADHD was found to be highest among the children of 9-10 year of age group (statistically significant). [Table-1]

Gender difference

ADHD was more prevalent in the males than in the females (statistically significant). Total no. of males selected were 579, 41 of them had ADHD. Prevalence of ADHD in the males was 7.08%. Total no of females selected were 421, 16 among them had ADHD. Prevalence of ADHD in the females was 3.80%. Among the 57 children identified as having ADHD, 71.9% (41) were males and 28.1% (16) were females. [Table-1, Figure-3]

Figure-3: Prevalence of ADHD according to gender
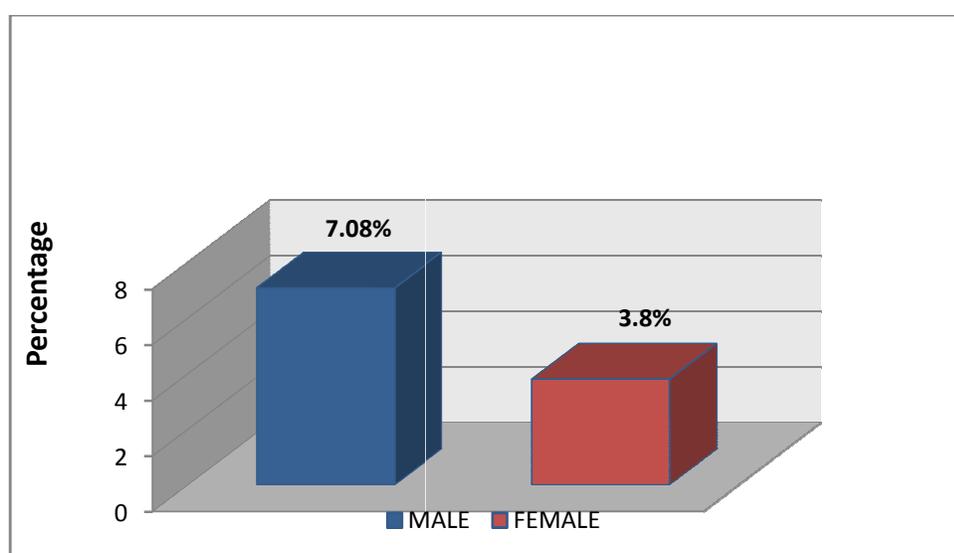
Socioeconomic class‑wise stratification of ADHD

The prevalence rate in each socioeconomic class was identified which is shown in the Table-1. Prevalence of ADHD cases was highest in children from Lower socioeconomic class (11.47%). The family history of ADHD was negative in all the 57 children.
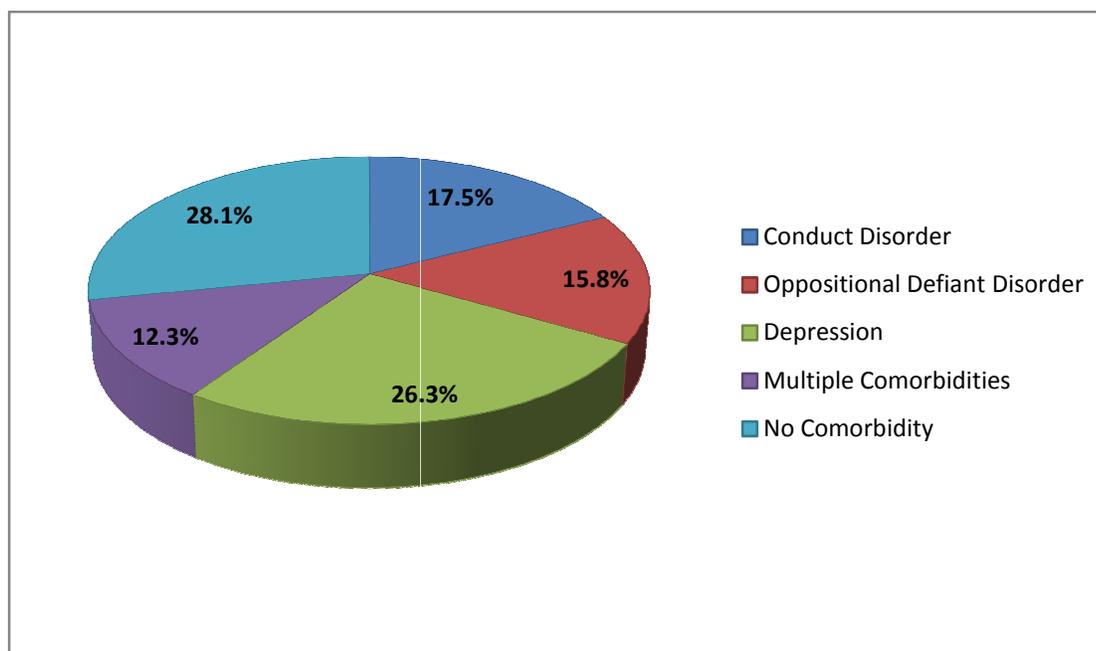
Co‑morbidity in ADHD

In this study 41 (71.9%) ADHD children had one or more co-morbid conditions. The most common co-morbid disorder was depression which was seen in 15 (26.3%) children, followed by

Conduct Disorder 10 (17.5%), Oppositional Defiant Disorder 9(15.8%). Multiple comorbidities found in 7 (12.3%) children. [Figure-4]

Figure-4: Frequency of Co-morbidities in ADHD

Discussion

The prevalence of ADHD in this study was found to be 5.7%, which is consistent with that of several studies which showed a wide range of prevalence rates between 5% and 12%. Similar results were found in various Indian studies in which Prevalence ranges from 1.6 to 14% [9-11]. In this study most common type of ADHD was inattention type, which is consistent with that of several studies which showed similar results [12, 13].

From our study we find that prevalence of ADHD in males is significantly higher than females the ratio being nearly 2:1. This finding is similar to that of previous studies which identified a similar gender difference with the ratios ranging from 10:1 in clinically referred sample and 3:1 in a community sample [14-17]. Similar results were seen in other Indian studies [18, 19]. This gender difference may be due to the fact that male children may be more vulnerable than female

children to environmental risk factors that cause ADHD and at least partly due to the fact that females present with different symptoms and they are less likely to have coexisting oppositional or disruptive behaviors.

There was a maximum prevalence of ADHD in the 9-10 years age group of children. This finding is consistent with the several previous studies [20, 21].

In this study prevalence of ADHD was seen highest in children from Lower socioeconomic class. These finding strengthen the fact that the poor socioeconomic background is one of the important risk factors for the development of ADHD [22]. This finding is similar to that of previous studies which identified a similar difference [23, 24]. Indian studies also quote that ADHD is highly prevalent in lower and middle socio-economic class [25].

In this study the most common comorbidity was depression followed by Conduct Disorder and Oppositional Defiant Disorder. It was also found that Conduct disorder and Oppositional defiant disorder were more common in Hyperactive Impulsive type of ADHD and depression was more common in Inattentive type of ADHD. This finding is similar to that of previous studies [26-30]. These results show that ADHD as a ``pure'' disorder is rare, even in the general population. Children with ADHD plus various kinds of comorbidity by far outnumber those with ADHD only.

Academic performance was poor in different domains (assessed clinically and on Vanderbilt scale) in majority of the children with ADHD, but due to government schools and government rules, none was failed in their exams. Although IQ level was not assessed, but clinically none of them had mental retardation.

There was a no significant difference between the Vanderbilt ADHD diagnostic Teacher's and Parent's rating score, the teacher's score being slightly higher than that of the parents. This

finding may be due to the fact that children spend a greater time in the school and the teachers may observe the children's behavior more intensely and parents may fail to identify the presence of ADHD in their children due to lack of awareness about the symptoms of ADHD.

There were several studies on the prevalence of ADHD. The major limitation of these studies was that the sample consisting of clinically referred cases. The advantages of the current study over the previous ones are that it consists of community sample which overcomes the above limitation, larger sample from three different schools including a wider age group of children aged between 6 and 12 years makes the sample more representative and this study follows the two stage design to obtain more accurate results.

Index study has following limitations: one would suspect ADHD children to be drop-outs from the school more often than not so that the true prevalence would probably be somewhat higher than our estimate. No particular tools/scales were used to rule out co-morbidities, inclusion and exclusion was done on clinical ground by qualified psychiatrist and the diagnosis of other comorbid disorders like specific learning disorders, tic disorder and OCD etc have not discussed in this study.

While conducting this study we have faced several challenges like, selection of schools; government verses private, poor number and attendance of children in government schools, difficulties in taking permission from principals of schools, difficulties in taking dates & time according to the teacher's convenience and time schedule of children and also to buy time from our department. Initially we have visited 4-5 private schools, where we got such information that most of the problematic children's were already excluded at different times in these schools. There after we decided to take only government schools. We took a list of govt. schools from education department and randomly selected 10 schools, where we found only 5-30 children at

times in different schools. Finally we chose 3 government schools with greater number of students from 3 different areas of Bikaner city as per our convenience to make a large sample size.

To conclude, the prevalence of ADHD in this study was found to be 5.7%, higher in males, 9-10 year of age group, and lower socioeconomic class. The most common type of ADHD was inattentive type, and the most common co morbid disorder was Depression. Children with ADHD typically underachieve academically, repeat grades, drop out of school, have difficulties with peer relationships, disrupt family functioning and a clear negative effect on the self-esteem, so it must be diagnosed at the earliest because thousands of children otherwise go undiagnosed, untreated and face long term consequences of the disorder. This study indicates the importance of early identification and thus helping in early intervention of this disorder.

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