

Attention-deficit Hyperactive Disorder in Pre-Primary School Aged Children Jeddah, Saudi Arabia

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Abstract

Background: Attention deficit hyperactivity disorder (ADHD) is one of the leading psychiatric disorders found commonly among the young children. ADHD is a state which renders the child unable to control their behaviour with difficulty in attention and social interactions, hyperactivity and impulsiveness.

Objectives: To estimate the prevalence of ADHD among pre-primary school aged children in the city of Jeddah, Saudi Arabia between April and June 2016.

Methods: The estimation of prevalence was based on Vanderbilt ADHD diagnostic rating scale. The report is based on the evaluation of both parents and teachers with the later acquired a judgement about the individual child's behaviour.

Results: The results showed that according to parents, 6.7%, 13.1% and 10.1% of the participants were suffering from AD, HD and ADHD respectively. According to teachers, 5.9%, 8.6% and 7.7% of the participants were suffering from AD, HD and ADHD respectively. According to both parents and teachers together, the prevalence rate of ADHD symptoms was 3.1% which was almost consistent with the world-wide prevalence rate. Male child was more affected than female child. Correlation test showed there is no significance between the child's gender and the three conditions; AD, HD and ADHD. Paired samples test done for response given by the parent's and teacher's showed statistically significant values.

Conclusion: There is a large discrepancy in the prevalence of ADHD symptoms in preschool children according to evaluation by parents and teachers, our study indicates that there is a significant number of children affected with ADHD at the pre-school age. The epidemiological data will help in early diagnosis of ADHD which will help in prevention and control of ADHD symptoms in children.

Keywords: Attention Deficit Hyperactivity Syndrome; Vanderbilt Rating Scale; Pre-Primary School Children

Introduction

Mental health is an essential part of child's overall health and has an intricate interactive association with their physical health and their ability to succeed at school, work and in the society. There are myriad of features that can impact a child's mental health status, in both positive and negative way. Many previous studies about the young children's psychological health have raised concern in the last few decades, especially hyper-activity and inattentiveness [1].

Attention deficit hyperactivity disorder (ADHD) is one of the most common neurobehavioral condition found in children [2,3]. It is a chronic state which has an impact on social and academic performance as well as health in general [4]. ADHD is defined by the Diagnostic Statistical Manual 5 (DSM-5) as a "persistent disorder of inattention and/or hyperactivity-impulsivity that interferes with functioning or development" according to the behavioural presentation ADHD is divided into the inattentive type, hyperactive type and combined

type [5]. ADHD disturbs the child's capabilities in all areas of their surroundings. It is because of complications with cognitive efficiency, control of behaviour, and communications with family, teachers, and fellow students. Other secondary difficulties interrelated with ADHD includes problems in learning, difficulty in peer acceptance, low self-confidence and little self-efficacy, aggression and noncompliance leading to unfortunate social and academic results [6,7]. They may also have increased trouble with the personal aspects of the school time with fellow students and teachers. They may be struggling more than other students with organizing, problem-solving, recess, riding school bus, seeking help, and self-encouraging [8-10].

There are several literatures showing that the young children with ADHD have difficulties in interacting with their family members including parents. They have trouble attending to demands and preventing impetuous responses and therefore they are not as much of responsive to parental desires as compare to children lacking ADHD problem [11]. According to Mackee., *et al.* a child showing ADHD behaviour may provoke unproductive, negative or undesirable parenting from mother or father or both [12]. In addition to early detection those children with ADHD needs understanding and support from all people around them [13].

The prevalence of ADHD varies among population, and it has increased significantly during the last decade. The ADHD worldwide-pooled prevalence has been estimated to be 5.29%. However variations in prevalence figures occur both within and between countries depending on a number of factors including diagnostic criteria used, age, gender, socioeconomic status and urban living [14].

It is known that ADHD persists through adolescence and adulthood and 15 - 80% of children diagnosed with ADHD continue to have the disorder in adulthood [15].

Diagnostic criteria changed in 2013 with DSM-5, including shifting the age of onset from age 7 to age 12, reducing the number of symptoms required for diagnosis of individuals 17 years of age and older [16].

The disorder is associated with increasing rates of comorbidity over the age span. Oppositional Defiant Disorder (ODD) and Conduct Disorder (CD) are the most common reported cooccurring disorders in school aged children with ADHD with rates at about 50% and 20% respectively [17,18].

As many as 25 - 50% of students with ADHD are also diagnosed with a co-occurring learning disorder; more if difficulties with writing and fine motor skills are included [8-10].

With ADHD being one of the leading psychiatric diagnoses in children, medical experts and pharmaceutical companies have become very focused on the treatment of ADHD over the years, as well as on the decrease of related symptomology. Special education laws have begun to recognize ADHD as a qualifying disability, there has been an increase in the number of advocacy groups, and mental health professionals have been encouraged to participate in continuing education programs regarding the diagnosis [13].

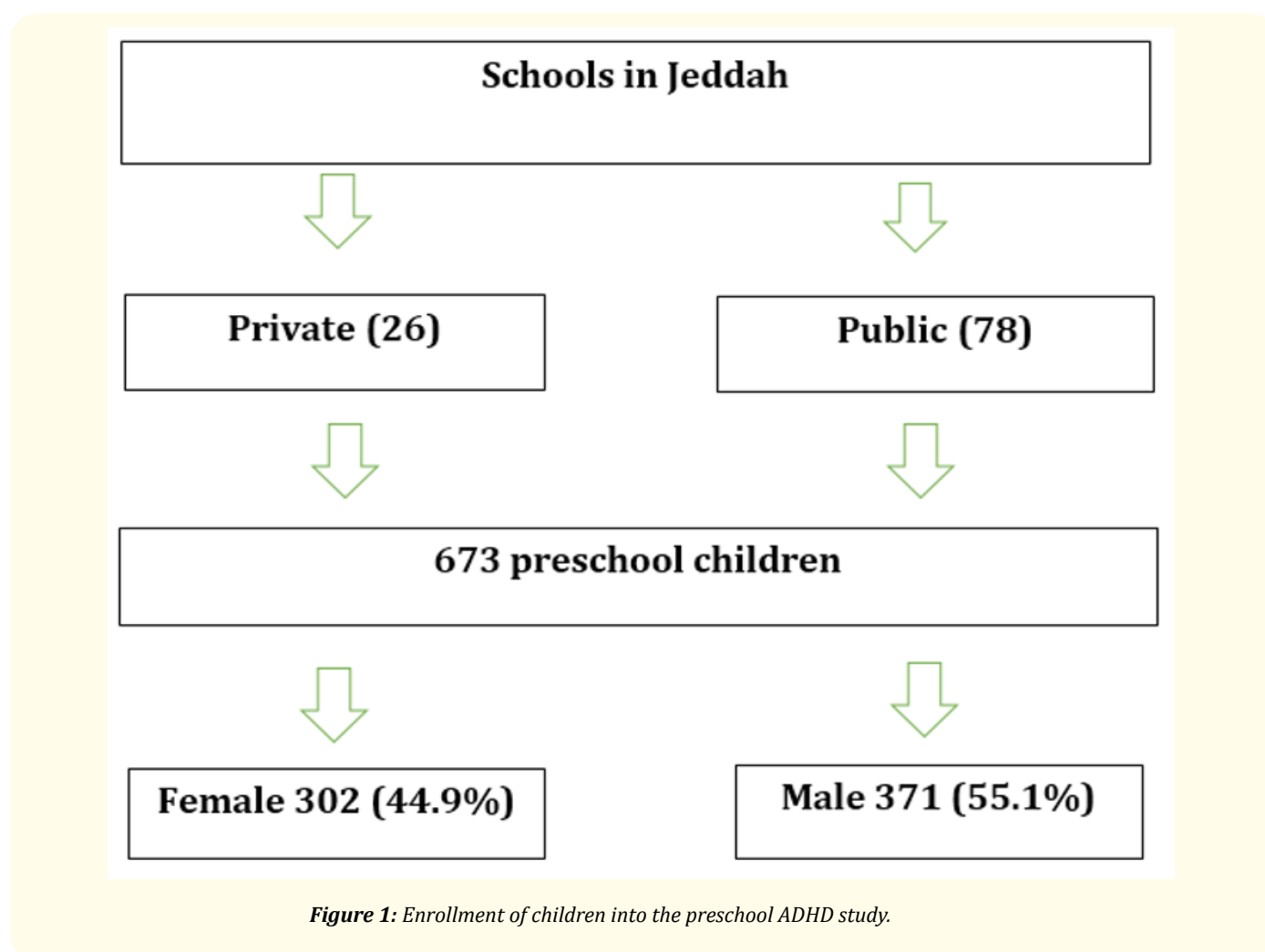
There are three well-established evidence-based treatments for ADHD: behavioural modification, medication using psychostimulants and combination of both. The current American Academy of Paediatrics guidelines established in 2011, recommend that for preschool-aged children (4 - 5 years of age) with ADHD, the primary treatment is behavioural parent training and/ or behavioural teacher training, and medication come as the secondary choice for treatment. These recommendations are consistent with current guidelines from the American Academy of Child and Adolescent Psychiatry for younger children [19].

This study was thus conceptualized to provide the data to find out the prevalence rates of ADHD in preschool aged children from Saudi Arabia. This report is based on the evaluation of both parents and teachers. Few studies on ADHD have been done previously in this region. Therefore, the data obtained from the study has the potential of increasing our knowledge on the developmental epidemiology of ADHD in the region of Saudi Arabia.

Subjects and Methods

Participants

The study was conducted in Jeddah city, West of the Kingdom of Saudi Arabia. Both private and public schools were included in the study. In total, 104 schools were randomly recruited for this study which include 78 public and 26 private schools. The evaluation was conducted on a total of 673 pre-school aged children (4 - 6 years) including their parents and teachers (Figure 1). All parents participated are father or mother of the child, none of them was a guardian, and all the participants were Saudis. The present study was conceptualized and conducted from April to June 2016. The time period was carefully chosen on the basis of the fact that the teachers had by then acquired quite a firm judgment about the individual child's behavior.



Study design and instrument

The study was based on Vanderbilt ADHD diagnostic rating scale [20,21]. This scale has two versions, Vanderbilt ADHD Diagnostic Teacher Rating Scale (VADTRS) and Vanderbilt ADHD Parent Rating Scale (VADPRS). VADTRS is fairly a simple tool which apply the DSM-IV standards for ADHD [21].

The teacher’s version of scale (VADTRS) includes 35 question and the parent’s version (VADPRS) includes a total of 47 questions. For each participating student, the respective teacher and parents completed one set of questionnaires of VADTRS and VADPRS respectively. To indicate their perception about the children’s levels of ADHD, teachers and parents rated on a scale of 0 to 3. The ratings of the scale were: 0 = Never; 1 = Occasionally; 2 = Often; 3 = Very often. A score of 2 or 3 for every question is measured to be a positive endorsement. The cutoff was set at minimum 6 positive items in at least one cluster of intention or hyperactivity impulsiveness. Each participating student had to complete two questionnaires, which on completion was returned otherwise incomplete questionnaires were excluded from this study.

Further, cross tabulation of the above study for gender of the participants was done for the three parameters: AD, HD and ADHD. Also, Pearson correlation and t-test were done for the three parameters AD, HD and ADHD and the participant gender. Paired sample test was also done and between teacher’s and parent’s responses in case of AD, HD and ADHD.

Results

This study described the results for ADHD for preschool aged children in Saudi Arabia based on the evaluation of both parents and teachers. A total of 673 children were selected for the study from 104 randomly selected schools including 78 are public and 26 private school. This report contains three different types of analysis, first is the frequencies for all variables including gender, AD, HD and ADHD for both parents and teachers, the second type is a tabulation for the main findings by gender and the third type is a correlation and differentials tests for AD, HD and ADHD for parents and teachers.

Data characteristics and frequencies

Both male and female children were recruited for the study of preschool age group. Of the total study participants 55.1% of the children were males and 44.9% were females. Table 1 showed the sample distribution according to the gender of the pre-school aged children.

Attention-deficit (AD) rating result according to parents and teachers

The result of AD analysis according to parents showed that 6.7% of the children has Attention-deficit disorder. The children scored more than or equal to 12 on the rating scale. From the parent’s perspective majority of the children i.e. 93.3% are normal and scored 0 or less than 12 on the rating scale. Further, AD analysis according to teachers showed that 5.9% of the children has Attention-deficit disorder. The children scored more than or equal to 12 on the rating scale. From the parent’s perspective majority of the children i.e. 94.1% are normal and scored 0 or less than 12 on the rating scale. Table 1 represents the results of AD according to parents and teachers respectively.

	Parents		Teachers	
	Frequency	Percent	Frequency	Percent
Less than 12	628	93.3	633	94.1
More than or equal 12	45	6.7	40	5.9
Total	673	100.0	673	100.0

Table 1: Distribution of study participants for AD according to parents and teachers separately.

Hyperactive disorder (HD) rating result according to parents and teachers

The result of HD analysis according to parents showed that 13.4% of the children has Hyperactive Disorder. The children scored more than or equal to 12 on the rating scale. From the parent’s perspective majority of the children i.e. 86.6% are normal and scored 0 or less than 12 on the rating scale. Further, HD analysis according to teachers showed that 8.6% of the children has Hyperactive disorder. The children scored more than or equal to 12 on the rating scale. From the parent’s perspective majority of the children i.e. 91.4% are normal and scored 0 or less than 12 on the rating scale. Table 2 represents the results of AD according to parents and teachers respectively. Data showed that the percentage is quite higher than the AD analysis.

	Parents		Teachers	
	Frequency	Percent	Frequency	Percent
Less than 12	615	91.4	615	91.4
More than or equal 12	58	8.6	58	8.6
Total	673	100.0	673	100.0

Table 2: Distribution of study participants for HD according to parents and teachers separately.

Attention deficit-hyperactive disorder (ADHD) rating result according to parents and teachers

The result of ADHD analysis according to parents showed that 10.1% of the children has ADHD. The children scored more than or equal to 24 on the rating scale. From the parent’s perspective majority of the children i.e. 89.9% are normal and scored 0 or less than 24 on the rating scale. Further, ADHD analysis according to teachers showed that 7.7% of the children has ADHD. The children scored more than or equal to 24 on the rating scale. From the parent’s perspective majority of the children i.e. 92.3% are normal and scored 0 or less than 24 on the rating scale. Table 3 represents the results of AD according to parents and teachers respectively.

	Parents		Teachers	
	Frequency	Percent	Frequency	Percent
Less than 24	605	89.9	621	92.3
More than or equal 24	68	10.1	52	7.7
Total	673	100.0	673	100.0

Table 3: Distribution of study participants for ADHD according to parents and teachers separately.

AD, HD and ADHD rating result according to both parents and teachers

The child will be considered as Attention-deficit (AD) or a Hyperactive disorder (HD) if both parent and teachers scored him or her 12 or above and will consider as normal if parent or teachers scored him or her less than 12 on the scale. Also, the child will be considered as Attention-deficit Hyperactive disorder (ADHD) if both parent and teachers scored him or her 24 or more and will considered as normal if parent or teachers scored him or her less than 24 on the scale.

AD analysis according to both parents and teachers

The result of AD analysis according to both parents and teachers showed that 1.6% of the children are affected from AD. The children scored more than or equal to 12 on the rating scale. From the both parent’s and teacher’s perspective majority of the children i.e. 98.4% are normal and scored 0 or less than 12 on the rating scale. Table 4 represents the results of AD according to both parents and teachers.

HD analysis according to both parents and teachers

The result of HD analysis according to both parents and teachers showed that 4% of the children are affected from HD and scored more than or equal to 12 on the rating scale. From the both parent’s and teacher’s perspective majority of the children i.e., 96% are normal and scored 0 or less than 12 on the rating scale. Table 4 represents the results of AD according to both parents and teachers.

ADHD analysis according to both parents and teachers

The result of ADHD analysis according to both parents and teachers showed that 3.1% of the children are affected from ADHD and scored more than or equal to 24 on the rating scale. From the both parent’s and teacher’s perspective majority of the children i.e. 96.9% are normal and scored 0 or less than 24 on the rating scale. Table 4 represents the results of ADHD according to both parents and teachers.

AD			HD			ADHD		
	Frequency	Percent		Frequency	Percent		Frequency	Percent
Normal	662	98.4	Normal	646	96.0	Normal	652	96.9
AD	11	1.6	HD	27	4.0	ADHD	21	3.1
Total	673	100.0	Total	673	100.0	Total	673	100.0

Table 4: Distribution of study participants for HD according to both parents and teachers.

Cross tabulation for gender of the participants

The AD, HD and ADHD analysis was done for both male and female pre-school aged children individually. According to our analysis there is a difference in behavioural pattern of male and female children. In case of AD, there is a slight difference in male and female children with attention deficit behaviour. 0.9% and 0.7% of male and female children was suffering from AD respectively. Analysis for Hyperactivity Disorder (HD) by gender showed that male tends to be suffering from HD more than female children. 2.5% and 1.5% of male and female participants was suffering from HD. Also, in case of Attention Deficit Hyperactivity Disorder (ADHD), the results showed that in males are affected more than females. In case of males 1.9% were affected by ADHD while in case of females 1.2% were affected.

Overall the study showed that all the three parameters i.e. AD, HD and ADHD affected mostly male child than the female child. Table 5 showed the data for percentage of male and female children affected from AD, HD and ADHD respectively.

Normal		Attention Deficit (AD)		Hyperactivity Disorder (HD)		Attention Deficit Hyperactivity Disorder (ADHD)	
		AD	Normal	HD	Normal	ADHD	
Child Gender	Female	44.1%	0.7%	43.4%	1.5%	43.7%	1.2%
	Male	54.2%	0.9%	52.6%	2.5%	53.2%	1.9%
Total		98.4%	1.6%	96.0%	4.0%	96.9%	3.1%

Table 5: Percentage of male and female participants affected by Attention Deficit (AD).

Correlation and T-Test for AD, HD and ADHD for parents and teachers

Correlation for AD, HD, ADHD and child gender

Pearson correlation was evaluated for child gender with AD, HD and ADHD. The data of correlation is considered significant at the 0.01 level. The result showed that there is no significant correlation between the gender of the child and the three parameters AD, HD and ADHD (Table 6). Therefore, gender is not a factor that affect the AD, HD and ADHD conditions in the child.

		Child Gender
Attention Deficit (AD)	Pearson Correlation	-.002
	Sig. (2-tailed)	.969
	N	673
Hyperactivity Disorder (HD)	Pearson Correlation	.032
	Sig. (2-tailed)	.404
	N	673
Attention Deficit Hyperactivity Disorder (ADHD)	Pearson Correlation	.024
	Sig. (2-tailed)	.526
	N	673

Table 6: Correlation between AD, HD, ADHD and child gender.

***Correlation is significant at the 0.01 level (2-tailed).*

Comparison between teacher’s and parent’s responses

Paired Samples Test for AD, HD and ADHD was done for data or response given by the parent’s and teacher’s for each child participant. The result showed that the difference in parent and teachers responses regarding Attention-deficit (AD), Hyperactive disorder (HD) and Attention-deficit Hyperactive disorder (ADHD) is statistically significant. The significant level in case of both AD and HD is 95%. ADHD is statistically significant with a significant level of 99%. Table 7 showed the result of paired sample test for AD, HD and ADHD respectively.

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
AD-parent/AD-teacher	.5179	5.3496	.2067	.1121	.9237	2.506	669	.012
HD-parent/HD-teacher	1.2066	6.6623	.2578	.7004	1.7127	4.681	667	.000
ADHD-parent/ADHD-teacher	1.4796	10.6035	.4118	.6710	2.2882	3.593	662	.000

Table 7: Paired samples test.

Discussion

ADHD has been acknowledged as a growing health problem worldwide [22] and numerous studies have discussed the prevalence of this disorder. ADHD is a chronic condition which can influence many facets of a child's life including academic presentation, social interaction abilities and even relationship of the parents with child [23]. The purpose of this prevalence study was to find the rate of ADHD symptoms in pre-primary school children based on evaluations by both parents and teachers in the city of Jeddah, Saudi Arabia. A systematic and detailed knowledge of ADHD symptoms in pre-primary school children is important for future management and prevention of the child coping with ADHD.

Our study indicate there are significant number of children affected with ADHD even at the pre-school age. Our result showed that 6.7% and 5.9% of the participants were suffering from AD according to parents and teachers respectively. In case of HD, 13.4% and 8.6% of the participants showed the symptoms of HD according to parents and teachers respectively. Further, 10.1% and 7.7% of the participants showed the symptoms of ADHD according to parents and teachers respectively. According to both parents and teachers together the prevalence rate of ADHD symptoms was 3.1%. A number of literature are published which gives the estimate of the prevalence of ADHD in small children. A study in primary schools of Saudi Arabia for grades between 1 - 3 (7 - 9 years old) showed that the prevalence rate of ADHD was 2.7% [24] which is much less than what was found our present study. The study done by Hebrani P, *et al.* in Iran showed 12.3% of prevalence rate of ADHD in preschool-age children [25]. Another study from Iran, based on population epidemiological study data showed that 15% of preschool children assessed by their teachers and parents had symptoms of ADHD [26].

According to a meta-analysis done by Polanczyk, *et al.* the world wise pooled prevalence of ADHD was 3.4% which is almost consistent with our present study result with the prevalence rate of 3.1% according to both parents and teachers together [27,28]. According to the American Psychiatric Association (APA) the estimated range of ADHD the range is between 3-7% worldwide. On the international level, research has shown prevalence range of ADHD the between 2.2% and 17.8% [22,27-33]. The majority of studies reported the range between 4% to 10% and no significant statistical differences was found between North American and European prevalence rates [30]. Smith and Corkum (2007) reported prevalence rates of 3 - 5% for school aged children whereas McLeary (2002) found an adolescent prevalence range for children with ADHD to be between 3.4 - 7.3% [34,35]. Research by Biederman and Faraone (2005) stated that ADHD affects 8 - 12% of children worldwide [36]. Power, *et al.* reviewed numerous epidemiological studies and found ADHD prevalence rates between 1.7% - 16% [37], while Kakouros, *et al.* reviewed the available data and found an even wider range of prevalence rates for preschool aged children at 2 - 25% 2005 [38].

Further our study revealed that male participants are more affected than the female participants in case of all the three parameters, AD, HD and ADHD. Another study showed the frequency of symptoms among boys and girls was statistically significant in both assessments done both by parents and teachers ($P < 0.001$) [15]. But further detailed study has to be done to conclude a significant difference between the male and female child ADHD behaviour and symptoms.

Our results showed a significant result that the evaluation done by the parents was consistently higher than the evaluation by teachers. It showed that the prevalence rate may differ according to the observer. According to the study done by Meysamie, *et al.* the rate of prevalence was also high in case of the evaluation done by parent [15]. This data is also in agreement with the research performed on school children of Japan. The mean scores for the Child Behaviour Checklist (assesses behavioural and emotional problems) were higher in case of parent's evaluation than teachers in the Japanese children [39]. Again, another study showed the prevalence of ADHD symptoms was 31.1% and 4.3% according to parent and teacher survey respectively. The a ratio of prevalence was 7.2 [40]. This result is may be due to the fact that the child behaves much freely in their home and are much closer to their parents than the teachers. Another explanation for

this inconsistency in the result is that parents may evaluate their child's behaviour more attentively and strictly. Further, another explanation from a different approach can be that the analysis by parents of an atypical child's behaviour is difficult, therefore resulting in more false positives diagnosis in the parent assessment [39].

Pearson correlation test showed that there is no significance between the gender of the child and the three conditions; AD, HD and ADHD. Paired Samples Test for AD, HD and ADHD done for response given by the parent's and teacher's for questionnaire for each child participant showed statistically significant values.

The present study was done on small sample size but with wide range of participants from large number of schools. The study suggested that a large of participants showed symptoms of ADHD and needs further evaluation and counselling by both parents and teachers. This is necessary for better and healthy development of child's mental status. As the study was conducted only on Saudi children therefore the result may differ from the other studies done on children of Europe, Asia, region of Americas etc. The geographic region, sample representative, sample frame, diagnostic interview, and definition of functional impairment can be associated with significant variability across estimates of ADHD in small children.

Conclusion

In conclusion, further studies should be done on larger sample and these epidemiological data can help in early diagnosis of ADHD in children which will help in preventing further development of ADHD symptoms in children.

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