

Attention Deficit Hyperactivity Disorder (ADHD): Is it a Health Problem among Male Primary School Children

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Objective: The aim of this study was to determine the prevalence of Attention Deficit Hyperactivity Disorder (ADHD) among male primary school children.

Design: Cross-sectional study.

Setting: Male primary schools, Dammam, Saudi Arabia.

Method: One thousand two hundred and eighty-seven students, aged 6-13 years, in 67 government and 10 private primary schools were selected by multistage systematic random sampling. Data were collected using two types of questionnaires: the modified Arabic version of the Attention Deficit Disorders Evaluation Scale (ADDES) school version, and Parents' questionnaire to diagnose the three main subtypes of ADHD namely: inattention, hyperactivity-impulsivity, and combined ADHD.

Result: It was found that the majority of the boys were from government schools (83.0%), aged 6-<9 years (40.5%) and of Saudi nationality (80.7%). One thousand two hundred and sixty-eight out of 1287 completed all parts of the questionnaire concerned with diagnosing all the three types of ADHD. The overall prevalence of combined ADHD was 16.4% (208), 12.4% (157) hyperactivity-impulsivity and 16.3% (207) inattention disorders respectively. The study also revealed a variety of socioeconomic factors to be significantly associated with the development of ADHD. These included parents' low level of education, mother's occupation, and low socioeconomic status.

Conclusion: In this study, the overall prevalence of ADHD was higher than previous studies in Saudi population. ADHD prevention and control should be an integral part of the primary health care (family medicine) system. Education and training programs for parents, school teachers, and caregivers regarding different aspects of ADHD should be established.

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Attention Deficit Hyperactivity Disorder (ADHD) is a disorder of childhood and adolescence characterized by a pattern of extreme pervasive, persistent and debilitating inattention, overactivity, and impulsivity¹. There are 3 major different subtypes of ADHD: predominantly inattentive subtype, predominantly hyperactive-impulsive subtype, and combined inattentive/hyperactive-impulsive^{1,2,3}. ADHD is one of the most prevalent chronic health disorders affecting school age children². It is also the most frequently occurring neuro-psychiatric disorder in children^{2,4}. Epidemiologic information on ADHD is scarce partly because few population-based studies have been done and partly because of changing diagnostic criteria over time⁵. ADHD manifests in approximately 4-12% of children between the ages of 6 and 12 years^{6,7}. Several studies estimated the prevalence of ADHD, in USA 4-8%, Korea 7.6% to 9.5%, India 20% , and Emirates 29.7% in United Arab⁸⁻¹¹.

Family physicians are well-equipped to diagnose and treat most cases of ADHD⁴. In fact, family physicians may be the most appropriate group of specialists to manage this disorder because they have the most comprehensive understanding of its wide-ranging impact on both the patient and the family¹². The diagnosis of ADHD is based on criteria specified by the Diagnostic and Statistical Manual of Mental Disorders Fourth Edition (DSM-IV)^{1,2}. A set of guidelines for the diagnosis of ADHD and its treatment in the primary care setting was developed^{1,2}. According to these collaborative guidelines, the diagnosis of ADHD should be based on a synthesis of information obtained from parents, school reports, and health professionals who may have been consulted, along with an interview and examination of the child^{1,2}.

Children with ADHD have been shown to be at increased risk for a broad range of negative outcomes, including depression, school failure and dropout, conduct disorder and failed relationships. Adolescents with ADHD are at risk of workplace underachievement, substance abuse and low self-esteem¹³. Proper diagnosis and effective treatment can dramatically improve their ability to function successfully in the classroom setting, to relate to family members and friends, and to develop a positive sense of self^{3,12}.

Two major modalities of treatment are available for treatment of ADHD: behavioral interventions and pharmacotherapy. However, multimodality treatment that includes both is often considered optimal¹².

The aim of the present study was to determine the prevalence of ADHD among male primary school children in Dammam, Saudi Arabia.

METHOD

A sample size of 1287 school boys was selected according to the estimated average prevalence of ADHD of 9%; computer package "EPI INFO" version 6 was used¹⁴. A multistage sampling technique was used. In the first stage, eight government and two private schools were selected using systematic random sampling technique. In the second stage, six classes were selected from each school comprising first to sixth grade using

simple random sampling technique. There were variable responses for different questions.

Data were collected using two types of questionnaires:

1. The modified Arabic version of the Attention Deficit Disorders Evaluation Scale (ADDES) school version¹⁵. The original ADDES questionnaire was translated into Arabic language by the first author and then re-translated into English to ensure correct meaning of questions and to validate the questionnaire. The questionnaire consisted of two parts: Part I was concerned with measuring inattention and consisted of 29 questions. Part II was concerned with measuring child's hyperactivity-impulsivity and consisted of 31 questions. All the 60 questions were used to diagnose combined ADHD.

The questionnaire were filled by the teachers. A scoring system was used, defined as follows: Does not engage in the behavior (0), One to several times per month (1), One to several times per week (2), One to several times per day (3) and One to several times per hour (4). The mean \pm 1 standard deviation (SD) was calculated for each student to diagnose ADHD. The cut-off points used for diagnosis were $11.50 \pm 2.34 = 9.16$ for the inattention, $11.45 \pm 1.98 = 9.47$ for the hyperactivity-impulsivity disorder, and $22.95 \pm 3.90 = 19.10$ for the combined ADHD. Socioeconomic status was defined as high, middle and low using a scoring system which combined fathers' education, occupation and family income.

2. Parents' questionnaire: This questionnaire was filled by the student's parents at home. It consisted of two parts: Part I was concerned with determining the student's behavior inside the home. Part II was concerned with objective measurement of the child's behavior using a behavior scale of 34 items which is being used by the Psychiatry clinic at King Fahd Hospital of the University, and has been previously validated. The prevalence was estimated from 1268 boys who completed all parts of the questionnaire concerned with diagnosing all the three types of ADHD.

Written permission for the study was sought from school authorities and parents. Students who were diagnosed having ADHD were advised to consult their health care providers. A pilot study was conducted in a primary school in Dammam city on 30 students to test the Arabic version of the questionnaire, and these cases were excluded from the study. Data collected were checked for accuracy and completeness and were coded and entered into the Statistical Package for Social Sciences (SPSS) software version 11.5 and Chi-square (χ^2) test was used for statistical analysis. P-value was set to be significant at a level <0.05 throughout the study¹⁶.

RESULT

The response rate for different questions ranged between 91.8% (1182 boys) and 99.9% (1286 boys). Table 1 shows the socioeconomic characteristics of school boys. The majority of the boys were from government schools (83.0%), their age ranged 6-<9 years (40.5%) and the majority were of Saudi nationality (80.7%). More than half of the boys were of middle socioeconomic status. This was expected as in 47.6% of them their fathers had secondary and university education.

Table 1: Socioeconomic Characteristics of School Boys in Dammam

Socioeconomic Data	No.*	%
School type: (n=1286)		
Government	1067	83.0
Private	219	17.0
Age group (in years): (n=1268)		
6-<9	513	40.5
9-<11	378	29.8
11-13	377	29.7
Nationality: (n=1287)		
Saudis	1038	80.7
Non-Saudis	249	19.3
Socioeconomic status: (n=1182)		
High	328	27.7
Middle	643	54.4
Low	211	17.9
Fathers' education: (n=1274)		
Illiterate	150	11.8
Primary/intermediate education	517	40.6
Secondary/university education	607	47.6
Mothers' education: (n=1279)		
Illiterate	315	24.6
Primary/intermediate education	494	38.6
Secondary/university education	470	36.7

* Number and percentage refer to respondents.

Table 2 shows that the overall prevalence of combined ADHD was 16.4%, hyperactivity-impulsivity 12.4% and inattention disorders 16.3%. School boys aged 9 to less than 11 years show high prevalence for the three types of disorders compared to other age groups. School boys of age groups 11-13 years had the lowest prevalence of all three disorders.

Table 2: Prevalence of Attention Deficit Hyperactivity Disorders by Age Groups among Primary School Boys in Dammam, Saudi Arabia (n=1268)

Type of disorder	Total no. with disorder	Overall prevalence percent	Prevalence percentage by age group						P-value (x² test)
			6-<9 years		9-<11 years		11-13 years		
			n = 513		n = 378		n = 377		
			No	%	No	%	No	%	
Combined ADHD	208	16.4	78	15.2	81	21.4	49	13.0	0.005
Hyperactivity-impulsivity	157	12.4	56	10.9	63	16.7	38	10.1	0.009

Inattention	207	16.3	78	15.2	78	20.6	51	13.8	0.021
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There was a statistically significant association between fathers' education and all three types of ADHD as shown in Table 3. School boys whose fathers were illiterate or only read and write had a significantly higher prevalence of all three types of ADHD compared with those whose fathers had secondary or university education (23.3% vs. 11.7% & 14.7% vs. 9.9% and 24.0% vs. 10.5%, respectively). Similarly high prevalence was observed for boys whose mothers were illiterate or only read and write.

Table 3: Attention Deficit Hyperactivity Disorders among School Boys by Socioeconomic Variables in Dammam, Saudi Arabia

Sociodemographic factors	Total no. of children	Type of disorder					
		Combined ADHD		Hyperactivity- impulsivity		Inattention	
		No.	%	No.	%	No.	%
Fathers' education:							
Illiterate/read & write	150	35	23.3	22	14.7	36	24.0
Primary/intermediate	517	108	20.9	79	15.3	111	21.5
Secondary/university	607	71	11.7	60	9.9	64	10.5
<i>P-value (x²-test)</i>		<0.001		0.018		<0.001	
Mothers' education:							
Illiterate/read & write	315	65	20.6	47	14.9	67	21.3
Primary/intermediate	494	100	20.2	75	15.2	99	20.0
Secondary/university	470	49	10.4	39	8.3	45	9.6
<i>P-value (x²-test)</i>		0.002		0.002		0.001	
Fathers' occupation:							
Professional	362	48	13.3	40	11.0	45	12.4
Middle class & skilled laborers	505	89	17.6	66	13.1	92	18.2
Lower class & unskilled laborers	381	71	18.6	49	12.9	68	17.8
<i>P-value (x²-test)</i>		N.S.*		N.S.		N.S.	
Mothers' occupation:							
Housewife	1081	194	17.9	148	13.7	192	17.8
Working mother	192	19	9.9	12	6.3	18	9.4
<i>P-value (x²-test)</i>		0.005		0.004		<0.001	
Socio-economic status:							

High	328	35	10.7	29	8.8	36	11.0
Middle	643	121	18.8	90	14.0	119	18.5
Low	211	43	20.4	28	13.3	42	19.9
<i>P-value (x²-test)</i>		0.002		N.S.		0.005	

* N.S. = Non Significant

School boys whose fathers' occupations were of lower class and unskilled laborers had a high prevalence of all three types of ADHD, although the differences were not statistically significant. School boys whose mothers were housewives had high prevalence of all three ADHD types compared to those whose mothers were working as shown in Table 3. The prevalence of combined ADHD and inattention were statistically significantly associated with socioeconomic status. The proportion of school boys with combined ADHD and inattention were significantly higher among families with low socioeconomic status than those with high socioeconomic status (20.4% vs. 10.7% and 19.9% vs. 11.0% respectively; $p=0.002$ and 0.005 respectively).

DISCUSSION

The personal characteristics of the studied population reflected the pattern of school boys in Saudi Arabia as the majority of schools were government and the Saudi boys' outnumbered non-Saudis. The majority of school boys were of high and middle socioeconomic status.

This study revealed a high prevalence of combined ADHD of 16.4%. This prevalence was higher than the study done at King Saud University, Riyadh of 12.6%¹⁷. A hospital-based study of case-records of 416 patients less than 18 years old in King Khalid University Hospital, Riyadh, diagnosed 12.7% as having ADHD¹⁸. This prevalence was also higher than the study done in Qatar among 1541 primary school students 6-12 years using Conners' Classroom Rating Scale for ADHD. It showed a prevalence of 14.1% for ADHD symptoms among boys and 4.4% among girls respectively¹⁹. A retrospective review of 356 ADHD cases ages 7-12 years registered in a children's hospital in Egypt applied DSM-IV and Conners' Developmental approach to evaluate the diagnostic accuracy of ADHD. Diagnosis of ADHD was confirmed in 283 children (211 boys and 72 girls). Most cases were associated with hyperactivity-impulsivity and inattention constituted 39% of ADHD cases²⁰.

In the present study, the ADHD prevalence was also higher than a similar study done in India among 5-12 years old which showed a prevalence of 15.5 %²¹. In the Indian study, the inattention subtype was predominant. A study in Germany found a prevalence of combined ADHD of 4.8%, hyperactivity-impulsivity alone was 3.9%, and inattention was 9%²². These figures were lower than those reported in our study, where the prevalence of hyperactivity-impulsivity and inattention subtypes were 12.4% and 16.3%, respectively. The possible reasons for the high prevalence of all three types of ADHD in the present study were: a) the study was a community-based compared with other studies which were conducted in psychiatric clinics or hospitals, b) the diagnosis of ADHD was based on a

screening tool for this disorder and not a diagnostic tool which resulted in a high prevalence.

The high prevalence of ADHD among age group 9 to <11 years was similar to Pineda et al study in Colombia among 450 school children which showed that ADHD symptoms were more frequent in 6-11 year old males²³. The results of this study were higher than the Iranian study which used both parents' and teachers' Conners' Rating Scales²⁴. The prevalence rates using parents' scale were 4% for age 8 years, 6% for age 9 years, and 5% for ages 10, 11 and 12 years. On the teachers' scale the prevalence rates were 4% for age 8 years, 5% for 9 years, 4% for ages 10 and 11 years, and 3% for 12 years old²⁴.

This study showed a significant association between parents' education, socioeconomic status of the family and all three types of ADHD. Possible explanations for the high prevalence of ADHD in children of parents with low level of education include: a) parents with low level of education had poor knowledge of how to deal with children having ADHD and frequently lack several important parenting skills, b) parents with low level of education might be treating children having ADHD violently and aggressively which may reflect negatively on them and lead to increased symptoms of ADHD, c) on the other hand, high levels of parents' education, especially mothers' education, were found to reflect positively on better physical and psychological health of their children. This had been shown by several studies^{25,26}.

The lack of significant association of fathers' occupation with ADHD might be explained by the fact that in KSA, occupation does not reflect the educational level. Many fathers with high- and middle-level occupations had low level of education. The high prevalence of ADHD among children whom mothers were housewives was not consistent with the hypothesis that housewives are in a better position to look after their children at home both socially and psychologically. A high proportion of mothers of boys in this study were either illiterate or had primary/intermediate education, which puts more weight on education as a contributing factor. Further research is needed in this aspect to clarify the role of occupation.

CONCLUSION

This study shows a high prevalence of ADHD among school boys in Dammam. The study also revealed a variety of socioeconomic factors to be significantly associated with the development of ADHD. These included parents' low level of education, mother's occupation, and low socioeconomic status.

Recommendations

- 1. Several approaches should be implemented to reduce the prevalence and incidence of ADHD. These should be directed to the child, family, the primary health care services, the school, and the community throughout the developmental stages of the child and family's life.**
- 2. ADHD prevention and control should be properly integrated within primary health care (family medicine) services with unified guidelines for screening, early detection and management.**

3. Parent training programs should be developed to increase parenting skills. These should focus on increasing parents' skills in managing their child's behavior, facilitating social skills development, and encouraging parents' positive interaction with their child.

4. School teachers should be aware of the symptoms of ADHD for early referral and diagnosis. In addition, they should be trained on classroom management of ADHD children.

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