

Attention Deficit Hyperactivity Disorder (ADHD) among Male Primary School Children in Dammam, Saudi Arabia: Prevalence and Associated Factors

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ABSTRACT

Attention Deficit Hyperactivity Disorder (ADHD) is one of the most common mental disorders that develop in children and becomes apparent in the preschool and early school years. Several family and maternal-related factors were shown to be associated with ADHD. The aim of the present study was to determine the prevalence of ADHD and associated family and psychosocial factors among male primary school children in Dammam city, Saudi Arabia. A sample size of 1287 students aged 6-13 years in 67 government and 10 private primary schools was selected by multistage systematic random sampling. Data was 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. The majority of the boys were from government schools (83.0%), were of age 6-9 years (40.5%) and of Saudi nationality (80.7%). The overall prevalence of combined ADHD was 16.4%, with a prevalence of 12.4% for hyperactivity-impulsivity and 16.3% for inattention disorders respectively. The study also revealed a variety of family factors to be significantly associated with the development of ADHD. The prevalence of each subtype of ADHD was higher if the child was the 6th one in the family. The prevalence of hyperactivity-impulsivity disorder was significantly higher among children living with single parents than those living with both parents (25.0% vs. 12.2% respectively; $\rho =0.016$). Inattention was significantly higher among those who had bottle feeding

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than breastfeeding (21.2% vs. 14.4% respectively; $p=0.03$). Conclusion and recommendations: several approaches directed to the child, family, the primary health care services, the school, and the community should be implemented to reduce the prevalence and incidence of ADHD.

Key words: *Attention deficit hyperactivity, primary school, prevalence, family factors, maternal factors*

INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) is one of the most common mental disorders that develop in children and becomes apparent in the preschool and early school years. It is persistent and debilitating inattention, over activity, and impulsivity.⁽¹⁾ The predominant three subtypes are inattention, hyperactivity-impulsivity and combined inattentive/hyperactive-impulsive subtype (combined ADHD).⁽¹⁻³⁾ It is also the most frequently occurring mental health disorder in children.^(2,4) 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 health care setting was developed. According to these collaborative guidelines, the diagnosis of ADHD should be based on information obtained from parents, school, and health professionals who may have been consulted, along with an interview and examination of the child.^(1,2)

Epidemiologic information on ADHD is scarce because few population-based studies have been done and partly because of changing diagnostic criteria overtime.⁽⁵⁾ ADHD manifests in approximately 4-12% of children between the ages of 6 and 12 years.^(6,7) Several studies estimated a prevalence of ADHD of 4-8% in USA⁽⁸⁾, 7.6% to 9.5% in Korea⁽⁹⁾, 10-20% in India⁽¹⁰⁾, and 29.7% in United Arab Emirates.⁽¹¹⁾ Data about prevalence of ADHD in

Saudi Arabia were scarce. Abolfotouh (1997) assessed behavior disorders among 305 school boys aged 8-12 years in Abha, south-western Saudi Arabia.⁽¹²⁾ He found a prevalence 13.4% behavior disorders and 6.9% of children showed traits of antisocial behavior. Al Haidar (2003)⁽¹³⁾ in his review of 416 case records of patients up to 18 years of age who attended a psychiatric clinic at a university hospital in Riyadh, Saudi Arabia reported that 105 (25.5%) were diagnosed as ADHD, either as the only diagnosis 53 (12.7%), or in combination with other psychiatric disorders 53 (12.7%).

Several family-related factors such as high birth order, large family size, and living with single parent were shown to be associated with ADHD symptoms.^(12,14-16) Abolfotouh⁽¹²⁾ in his study of 305 school boys in Saudi Arabia found that large families of four or more children were 2.5 times more likely to have children with a behavior disorder as compared to small families and that high birth order children (fourth or more) were 3.2 times more likely to have a behavior disorder than low birth order children. Maternal factors such as low birth weight and artificial infant feeding have also been shown by some studies to be significantly associated with ADHD.^(17,18) Children with ADHD have been shown to be at increased risk for a broad range of negative outcomes, including depression, school failure and dropout, learning disabilities, conduct disorders in children and adults, failed relationships, workplace underachievement, substance abuse and low self-esteem in adults.⁽¹⁹⁾ The aim of this study was to determine the prevalence of ADHD among male primary school children in Dammam city, Saudi Arabia and to identify possible associated family and psychosocial factors.

MATERIAL AND METHODS**Study Design and sampling:**

This was a cross-sectional study conducted in male primary schools in Dammam city, the capital of the Eastern Province, Saudi Arabia. The target population consisted of 25594 school boys' ages 6-13 years in a total of 77 primary boys' schools in Dammam city (67 government and 10 private schools). A sample size of 1287 boys was selected according to the estimated average prevalence of ADHD of 9%⁽²⁰⁾, using the computer package "EPI INFO version 6". A multistage sampling technique was used to select the sample. In the first stage eight government and two private schools were selected out of 67 government and 10 private primary schools respectively 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 Collection Methods:

Data was collected using two types of questionnaires:

1. The modified Arabic version of the Attention Deficit Disorders Evaluation Scale (ADDES) school version after getting the permission from Hawthorne Educational Service Inc., Colombia, United States of America.⁽²¹⁾ The original ADDES questionnaire was translated into Arabic language, then re-translated into English and reviewed by a professor of psychiatry to ensure correct meaning of questions. 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

questionnaires were filled by the teachers of the students in the sample after being given verbal and written instructions and trained thoroughly on how to fill the questionnaire.

The same scoring system and cut-off points used in the original English questionnaire were applied. 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 reach a provisional diagnosis of ADHD. The cut-off points used for provisional 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.

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, Al Khobar, Saudi Arabia, and has been previously validated. The prevalence was estimated from 1268 boys (out of 1287 boys included in the study) who completed all parts of the questionnaires concerned with diagnosing all the three subtypes of ADHD". Socio-economic status was defined as high, middle and low by using a scoring system which combined father's education, father's occupation and family income.

Written permission for the study was sought from school authorities and the parents of school boys. Students who showed high scores in ADDES scale 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, its logistics application and the way of analyzing the data and these cases were excluded from the study.

Statistical Analysis:

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.⁽²²⁾ Descriptive statistics for all studied variables and Chi-squared (χ^2) test were used and P-value level <0.05 was considered significant throughout the study.

RESULTS

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

The overall prevalence of combined ADHD was 16.4% as shown in table (2), with a prevalence of 12.4% for hyperactivity-impulsivity and 16.3% for inattention disorders respectively. School boys of age groups 9 to less than 11 years show a statistically significantly higher prevalence for the three subtypes of disorders than boys of other age groups. School boys of age groups 11-13 years had the lowest prevalence of all three disorders.

Table (1) : Sociodemographic Characteristics of School Boys in Dammam, Saudi Arabia.

Sociodemographic 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
Socio-economic 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 refer to respondents

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

Type of disorder	Total no. with disorder (n=572)	Overall prevalence percent	Prevalence percentage by age group						ρ -value (χ^2 test)	
			6 to <9 years		9 to <11 years		11-13 years			
			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	13.5	0.021	

Table (3) shows some of the family factors which were associated with the three subtypes of ADHD. Birth order was statistically significantly associated with ADHD. The prevalence of each subtype of disorder was higher if the child was the 6th one in the family compared with the first-born child (23.3%, 18.1%, and 21.1%, vs. 10.4%, 8.4%, and 10.4% respectively). It was also found that the larger the family size (≥ 9 children) the higher was the prevalence of all three ADHD subtypes, with statistically significant differences. The study also revealed that the prevalence of hyperactivity-impulsivity disorder was statistically significantly higher among children living with single parents than those living with both parents (25.0% vs. 12.2% respectively; $\rho=0.016$). Inattention and combined ADHD were also higher among single-parents children, although the differences were not statistically significant.

Table (3) : Attention Deficit Hyperactivity Disorders among School Boys and Associated Family Factors in Dammam, Saudi Arabia.

Family factor	Total no. of children	Type of disorder					
		Combined ADHD		Hyperactivity-impulsivity		Inattention	
		No.	%	No.	%	No.	%
Birth order:							
1 st child	249	26	10.4	21	8.4	26	10.4
2 nd child	243	35	14.4	26	10.7	40	16.5
3 rd child	169	35	20.7	25	14.8	33	19.5
4 th child	215	35	16.3	25	11.6	33	15.3
5 th child	169	32	18.9	22	13.0	30	17.8
6 th child	232	54	23.3	42	18.1	49	21.1
p-value (χ^2 -test)		0.007		0.034		0.049	
Family size (no. of brothers and sisters):							
0-4	684	93	13.6	72	10.5	94	13.7
5-8	496	90	18.1	67	13.5	89	17.9
≥ 9	98	31	31.6	22	22.4	28	28.6
p-value (χ^2 -test)		<0.001		0.003		<0.001	
Living with both parents or single parent:							
Living with both parents	1231	203	16.5	150	12.2	202	16.4
Living with single parent	40	9	22.5	10	25.0	8	20.0
p-value (χ^2 -test)		NS*		0.016		NS*	

* NS = Not Significant

Table (4) shows some of the maternal factors which were sought to be associated with ADHD. There was no statistically significant association between duration of pregnancy and all three subtypes of ADHD, although combined ADHD and inattention were higher among children born pre-mature. The type and place of delivery were also insignificantly associated with ADHD. Although a high proportion of all three subtypes of ADHD were found among low-birth weight boys, however, this did not reach a statistical significance. A significantly higher

proportion of school boys with inattention was found among those who had bottle feeding than breastfeeding (21.2% vs. 14.4% respectively; $p=0.03$).

Table (4) : Attention Deficit Hyperactivity Disorders among School Boys and Associated Maternal Factors in Dammam, Saudi Arabia.

Maternal factor	Total no. of children	Type of disorder					
		Combined ADHD		Hyperactivity-impulsivity		Inattention	
		No.	%	No.	%	No.	%
Duration of pregnancy: (1279) ⁺							
Full-term	1238	205	16.6	157	12.7	200	16.2
Pre-term	41	9	22.0	4	9.8	11	26.8
p-value*		NS		NS		NS	
Type of delivery: (n=1279) ⁺							
Normal vaginal delivery	1181	197	16.7	149	12.6	192	16.3
Abnormal delivery	98	18	18.4	13	13.3	20	20.4
p-value*		NS		NS		NS	
Place of delivery: (n=1277) ⁺							
Hospital	1223	208	17.0	158	12.9	205	16.8
Home	54	5	9.3	2	3.7	6	11.1
p-value*		NS		NS		NS	
Infant weight at delivery: (n=1132) ⁺							
<2500 gm	48	12	25.0	7	14.6	11	22.9
2500-4600 gm	864	138	16.0	107	12.4	140	16.2
>4600 gm	220	33	15.0	25	11.4	30	13.6
p-value*		NS		NS		NS	
Type of infant feeding: (n=739) ⁺							
Breastfeeding	550	82	14.9	64	11.6	79	14.4
Bottle feeding	189	39	20.6	28	14.8	40	21.2
p-value*		NS		NS		0.03	

* Chi-squared test; NS = Not Significant

+ number refer to respondents

DISCUSSION

The demographic characteristics of the studied population reflected the pattern of school boys in Saudi Arabia as the majority of schools were governmental and the Saudi boys

outnumbered non-Saudis. The majority of school boys were of high and middle socioeconomic status. This might reflect the situation in Saudi Arabia.

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 (1996) of 12.6%.⁽²³⁾ A hospital-based study of case-records of 416 patients less than 18 years old in King Khalid University Hospital, Riyadh (2003), diagnosed 12.6% as having ADHD.⁽¹³⁾ This prevalence was also higher than the study done in Qatar (2006) 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 respectively.⁽²⁴⁾ A retrospective review of 356 ADHD cases aged 7-12 years registered in a children's hospital in Delta region, 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 cases.⁽²⁵⁾

In the present study, the ADHD prevalence was also higher than a similar study done in India (2003) among children 5-12 years old which showed a prevalence of 15.5 %.⁽²⁶⁾ In this Indian study the inattention subtype was predominant. A study in Germany (1996) found a prevalence of combined ADHD of 4.8%, that of hyperactivity-impulsivity alone of 3.9%, and that of inattention of 9%.⁽²⁷⁾ These figures were lower than those reported in this 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 subtypes 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.

School boys of age groups 9 to less than 11 years show a statistically significantly higher prevalence for the three subtypes of disorders than boys of other age groups. School boys of age groups 11-13 years had the lowest prevalence of all three disorders. Pineda et al., (1999) in Colombia among 450 school children which showed that ADHD symptoms were more frequent in 6-11 year old males.⁽²⁸⁾ In an Iranian study (2004) of ADHD using both parents' and teachers' Conners' Rating Scales⁽²⁹⁾ , 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 old.⁽²⁹⁾

In the present study, the larger the family size (≥ 9 children) the higher the prevalence of all the three ADHD subtypes. This finding is similar to other studies which showed the association of ADHD symptoms with large family size.^(14,30) The prevalence of hyperactivity-impulsivity disorder was found to be statistically significantly higher in boys living with single parents. This result was similar to other studies.^(15,16,31) Parental separation and divorce had been shown to have negative effects on the child behavior such as inconsistent parenting, more punishment, violence, and criticism.^(14,16)

The finding that duration of breastfeeding and the type of delivery were not associated with the three subtypes of ADHD were consistent with several studies which showed that pregnancy and labor characteristics were not associated with

ADHD.^(32,33) However, a study of 196 children referred for suspected ADHD to a university hospital in Iceland (2006) showed a statistically significant increased risk for ADHD associated with several factors such as low birth weight, young age of the mother at the time of the child's birth and Caesarean section, compared with reference groups such as mean values in all of the community.⁽³⁴⁾

This study showed statistically insignificant higher proportions of all three subtypes of ADHD among low birth weight children. A hospital-based study of 122 ADHD cases and 119 controls among Thai children (2005) revealed that the number of ADHD cases who had a birth weight below 2,500 gm was 3.6 times higher than the number of control cases who had a birth weight below 2,500 gm ($p=0.03$).⁽¹⁷⁾ The same study showed a statistically significant association of pregnancy complications and emotional distress during pregnancy with ADHD. Other studies also show that low birth weight independently predicted ADHD after controlling for potential confounders.^(18,35) In the present study only inattention disorder was found to be statistically significantly associated with bottle feeding. A case-control study of 60 children with ADHD symptoms and 40 subjects of normal control group aged 4-11 years in Poland (2002) showed a statistically significantly difference in the mean duration of breastfeeding between ADHD cases and controls (0.45 years for cases vs. 0.55 years for controls respectively; $p<0.04$).⁽³³⁾

CONCLUSIONS AND RECOMMENDATIONS

From the results of the present study it can be concluded that the prevalence of ADHD among school boys in Dammam

city, Saudi Arabia was high. The study also revealed a variety of family and maternal factors to be significantly associated with the development of ADHD. These included high birth order, large family size, and living with single parent.

Therefore the following are recommended: 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. Parents' 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. School health services need to alert the school teachers to be aware of the symptoms of ADHD for early pick-up of suspected cases for referral and diagnosis. School teachers also need to focus on further skill development, including anger management and rewarding appropriate classroom behavior such as being friendly and polite behaving with classmates.

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