Medical Principles and Practice

The Prevalence of Attention Deficit Hyperactivity Symptoms in Schoolchildren in a Highly Consanguineous Community

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Abstract

Objective: The objective of the present study was to find the prevalence of attention deficit hyperactivity (ADH) symptoms in a sample of primary schoolchildren in Qatar and investigate the behaviour of the children with and without ADH symptoms in a highly consanguineous community. *Subjects and Methods:* A total of 2,500 primary school students, aged 6–12 years, were randomly selected from the government primary schools, and 1,869 students (947 boys and 922 girls) gave consent to participate in this study. An Arabic questionnaire was used to collect the sociodemographic variables and a standardized Arabic version of the Conners' Teacher Rating Scale for ADH symptoms. *Results:* Of the 947 boys, 158 (16.7%; 95% confidence interval, CI, 14.4–19.2) and of the 922 girls, 50 (5.4%; 95% CI 4.1–7.1) scored above the cut-off (≥15) for ADH symptoms, thus giving an overall prevalence of 11.1% (95% CI 9.7–12.6). The children who had higher scores for ADH symptoms were in the age group of 6–9 years. Children who had higher scores for ADH symptoms had a poorer school performance than those with lower scores (p = 0.002). Two hundred (96.2%) children with ADH were disobedient, 126 (60.6%) noisy and hyperactive, 76 (36.5%) very cranky, 78 (37.5%) troublesome and 79 (37.9%) nervous. The logistic regression identified socio-economic condition, number of children, school performance and poor relationship between parents as the main contributors to ADH. Although the univariate analysis showed a significant relationship (p = 0.010) between ADH symptoms and consanguineous parents, logistic regression did not support this association (p = 0.075). This suggests that consanguinity has no impact on ADH children. *Conclusion:* The study revealed that ADH is a common problem among schoolchildren. The children with higher scores for ADH symptoms had a poorer school performance than those with lower scores. A significant difference exists between the behaviour of children with and without ADH.

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Introduction

During the last few decades, many reports have raised concern about childhood hyperactivity and inattentiveness [1]. Attention deficit hyperactivity (ADH) disorder may affect all aspects of a child's life. ADH is a common disorder in school age children [2]. It is one of the leading causes of academic underachievement in school as well as disruptive behaviours. The symptoms of ADH are caused by a neurological dysfunction within the brain, and the underlying physiological mechanism which causes ADH is still not thoroughly understood and remains under scientific study [3]. There is limited information about this phenomenon among non-western cultures, in particular in the Arab region [4].

Qatar has one of the highest rates of consanguinity (54%) in the world with 34.8% of marriages between first cousins and 13.4% between those related more distantly. It was important to identify whether the high prevalence rate of ADH in children could be related to the highly consanguineous community [5]. During the last decade, evidence has accumulated indicating that symptoms of ADH persist into adulthood in 30–70% of children diagnosed as having the disorder [6, 7]. Children with ADH may have functional impairment across multiple settings including home, school and social relationships. ADH has also been shown to have long-term adverse effects on academic performance, vocational success and social-emotional development [3]. Among children, ADH is associated with an increased risk for accidents [8]. As they grow older, children with untreated ADH, in combination with conduct disorders, experience drug abuse, antisocial behaviour and injuries of all sorts. Prospective studies also indicate that children affected by ADH are at a high risk of developing co-morbid disorders as well as impaired social adjustment [9].

Epidemiological studies have yielded various rates of ADH symptoms ranging from 3.2 to 17% [10]. The potential difference in the prevalence of ADH in western and non-western countries is related to biological, cultural and family factors [11]. Also, the variation in prevalence rates is due to the difference in the diagnostic criteria. Conners' Teacher Rating Scale (CTRS) is a popular instrument in the study of childhood hyperactivity [12]. Hence, in this study, the CTRS was used to evaluate ADH symptoms. The CTRS was used because teachers may be more accurate in their judgements in ratings of schoolchildren with regard to hyperactive symptoms (conduct disorder or hyperactivity).

The objective of the present study was to find the prevalence of ADH symptoms in a sample of primary schoolchildren and investigate the behaviour of the children with and without ADH symptoms in a highly consanguineous community.

Subjects and Methods

This cross-sectional study was conducted in the government primary schools in the State of Qatar where the curriculum of the schools has been upgraded to a higher standard according to the modern system. The survey was done among schoolchildren between 6 and 12 years of age during the period from October 2006 to January 2007 in order to ensure that each class teacher had enough time to know and observe the student's behaviour and his/her academic performance. An Arabic questionnaire was used to collect the sociodemographic variables such as age, gender, nationality, level of education, occupation of parents or behaviour of children, and it was completed by the parents of the students. The types of behaviours that were reported were obedience, noisiness, high activity, nervousness, crying for any reasons and creating problems. Another standardized Arabic version of the CTRS was used to evaluate ADH symptoms [8, 13–15]. This form of rating is done by a teacher rating scale to examine children's behaviour at school.

To secure a representative sample of the study population, the sampling plan was stratified with proportional allocation. Stratification allowed both urban and semi-urban areas to be proportionally represented. The list of names of government schools was obtained from the Office of the Director of General Education, Ministry of Education. Government schools were segregated according to the sexes. There were 45,000 children enrolled in 52 government primary schools for boys and girls that are located in 21 different districts of Qatar. To fulfil the objective of the current study, the estimated sample size was 2,500 students. From the total of schools, 8 boys' schools and 8 girls' schools were randomly selected. During the first stage, one school from each district was randomly selected, thus overcoming the so-called 'cluster effect'. Then the 16 schools were put in one pool, and the names were randomly selected. Similarly, the classrooms and schoolchildren were selected in the second and third stages using the same simple random sampling procedure, finally resulting in the selection of 2,500 students who were a true random sample of the study population. All students who were present in these selected classrooms were included in the study, provided that they met the inclusion criteria of this study. Out of 2,500 students approached, a total of 1,869 students gave their consent to participate in the study. This constituted 4.2% of all the governmental primary-school children enrolled in Qatar during the study year of 2006/2007. The gender distribution of the actual participants was 947 boys and 922 girls.

The CTRS was used to screen ADH symptoms among children. Teacher rating scales [14] are also an important part of the evaluation and diagnosis. They provide necessary information about the child in the school setting. The teacher also becomes a secondary source of judging the behaviour of the child relative to his/her peers [15]. The CTRS has been widely used in different cultures and languages, and its reliability and validity have been

well established [12]. This report from Hong Kong showed a fairly high sensitivity and specificity. The survey instruments were tested on 100 randomly selected students in different schools and validated in this way in the United Arab Emirates and Qatar [8, 13].

The CTRS contains 10 items for each of which the teacher was asked to indicate the degree of applicability to the child being assessed and which were scored as follows: not at all = 0; just a little = 1; much = 2, and very much = 3. For each child, we added the item-specific scores to obtain the total scores. As recommended, the maximum score was 30 and the minimum was 0. If the score of the child was from 0 to 9 or from 10 to 14, the child was classified as having mild or moderate ADH symptoms, respectively. The child who scored 15 or higher in the CTRS was considered to have a high score for ADH symptoms, which might reflect the presence of ADH disorder. The parents completed the second questionnaire which included the sociodemographic variables such as age, gender, nationality, level of education and occupation. The literate parent of the children completed the questionnaire. In cases where both parents were illiterate, the children were excluded. In this survey, mostly mothers (75%) completed the questionnaire. Also, children from the same nuclear family were excluded. Thus, only one child per family participated in the study. Non-Qataris are expatriates working in Qatar, and they were mostly from Middle East and Far East Asian countries. Non-Qatari children from Arab countries only were included in the study. The relationship of the consanguineous parents was recorded. Consanguinity was defined as marriages between relatives, either first or second cousins.

Student's t test was used to ascertain the significance of differences between mean values of two continuous variables and confirmed by the non-parametric Mann-Whitney test. A χ^2 analysis was performed to test for differences in the proportion of categorical variables between two or more groups. Kruskal-Wallis one-way analysis of variance was used for comparison of several group means. Multiple logistic regression analysis using the forward inclusion and backward deletion method was used to asses the relationship between dependent (ADH symptoms) and independent variables and to adjust for potential confounders and orders the importance of risk factors (determinant) for ADH. $p < 0.05$ was considered as the cut-off value for significance.

Results

The sociodemographic characteristics of the subjects are shown in table 1. Of the 1,869 children, 1,138 (60.9%) were Qataris. Of the fathers, 1,698 (90.9%) were employed, while only 553 (29.6%) mothers were employed. Of the fathers and mothers, 482 (29.6%) and 604 (32.3%) were illiterate, respectively. Half of the schoolchildren were from the middle socio-economic group (USD 1,370.00–2,740.00 per month), followed by the children from the high-income group (>USD 2,740.00 per month).

The prevalences of ADH symptoms among the subjects by sociodemographic characteristics and school performance are given in table 2. The data revealed that 158 (16.7%) boys (95% confidence interval, CI, 14.4–19.2) and 50 (5.4%) girls (95% CI 4.1–7.1) scored above the cut-off point of ≥15 for ADH symptoms, thus giving an overall prevalence of 11.1% (95% CI 9.7–12.6). The differences between the boys' and girls' scores were statistically significant (p < 0.001). Children who had higher scores for ADH symptoms were in the age group 6–9 years (13.9%) compared to those aged 10–12 years (9.2%), and the difference was statistically significant (p < 0.001). Also there was a statistically significant difference between children scoring above and below the cut-offs in relation to age, gender, ethnicity, consanguinity and favourable relationship between parents (p < 0.001). Two hundred and twenty-eight (26.5%) of the consanguineous children had moderate and higher scores for ADH symptoms. Children who had higher scores for ADH symptoms were judged by teachers as having a poorer performance than those with lower scores (p = 0.002).

The comparison of the behaviour of children with and without ADH is given in table 3. Among the behavioural patterns, 96.2% of the children with ADH were reported to be disobedient, 60.6% noisy and hyperactive, 36.5% very cranky, 37.5% troublesome and 37.9% nervous. The children without ADH were reported to have fewer behavioural problems than the children with ADH. There was a significant difference between children with and without ADH for disobedience, making noise and crying for anything; p values ranged from 0.002 to 0.014.

The logistic regression analysis to assess predictors for ADH is shown in table 4. The logistic regression identified socio-economic condition, number of children, school performance and poor relationship between parents as the main contributors to ADH. Other variables like occupation of parents, educational level of parents, parity and consanguinity did not show any significant contribution to ADH.

Discussion

The prevalence rate (11.1%) of ADH in Qatar is within the range of 6.1–19.0% reported for the United Arab Emirates, the USA, the UK, Canada and China [8, 13, 16]. There is a significant variability of ADH prevalence estimates around the world, but higher rates of 10.8–19.0% are reported in western countries. The differences could be attributed to the methodologies used in these studies, thereby making it difficult to have an adequate comparison. It is true that the presence of symptoms does not

Table 1. Sociodemographic characteristics of the studied subjects by gender

Variables	Gender		Total	p value
	boys (n = 947)	girls (n = 922)	(n = 1,869)	
Age group				
6–9 years	381 (40.2)	381 (41.3)	762 (40.8)	0.631
10–12 years	566 (59.8)	541 (58.7)	1,107 (59.2)	
Nationality of student				
Qatari	558 (58.9)	580 (62.9)	1,138 (60.9)	0.078
Non-Qatari/Arabs	389 (41.1)	342 (37.1)	731 (39.1)	
Occupation of father				
Teacher/officer	381 (40.2)	437 (47.4)	818 (43.8)	<0.001
Army/police	58 (6.1)	87 (9.4)	145 (7.8)	
Professional/manager	321 (33.9)	275 (29.8)	596 (31.9)	
Businessman	55 (5.8)	59 (6.4)	114 (6.1)	
Handicraftsman	18 (1.9)	7 (0.8)	25 (1.3)	
Not working	114 (12.0)	57 (6.2)	171 (9.1)	
Occupation of mother				
Housewife	690 (72.9)	626 (67.9)	1,316 (70.4)	<0.001
Teacher/officer	174 (18.4)	243 (26.4)	417 (22.3)	
Businesswoman	30 (3.2)	12 (1.3)	42 (2.2)	
Professional/manager	22 (2.3)	21 (2.3)	43 (2.3)	
Army/police	15 (1.6)	10 (1.1)	25 (1.3)	
Retired/manual work	16 (1.7)	10 (1.1)	26 (1.4)	
Educational level of mother				
Illiterate	328 (34.6)	275 (29.8)	603 (32.3)	
Primary	206 (21.8)	198 (21.5)	404 (21.6)	
Intermediate	210 (22.2)	161 (17.5)	371 (19.9)	<0.001
Secondary	76 (8.0)	201 (21.8)	277 (14.8)	
University and above	127 (13.4)	87 (9.4)	214 (11.4)	
Educational level of father				
Illiterate	236 (24.9)	246 (26.7)	482 (25.8)	0.011
Primary	220 (23.2)	166 (18.0)	386 (20.7)	
Intermediate	152 (16.1)	144 (15.6)	296 (15.8)	
Secondary	164 (17.3)	206 (22.3)	370 (19.8)	
University and above	175 (18.5)	160 (17.4)	335 (17.9)	
Socio-economic status/income				
<1,370 USD	138 (14.6)	217 (23.5)	355 (19.0)	<0.001
1,370–2,740 USD	484 (51.1)	462 (50.1)	946 (50.6)	
>2,740 USD	325 (34.3)	243 (26.4)	568 (30.4)	

Figures in parentheses are percentages.

necessarily imply diagnostic status. However, the CTRS has been widely used in different cultures for the detection of ADH symptoms in the general population. This study is a preliminary step to assess the existence of ADH symptoms in the community and then to conduct a large-scale study to evaluate the prevalence of ADH using diagnostic interviews in the future.

ADH is a chronic disorder which may impact upon many aspects of an individual's life including academic performance, social skill problems and parent-child relationship [7]. The causes of ADH are not entirely clear; it is believed that the disorder is caused by biological factors [17]. The children with ADH normally have two problem areas: academic performance and achievement [18], consistent with the findings of our study.

Our finding that more children in the age group of 6–9 years (13.9%) had a high score (≥15) for ADH symptoms than in that of 10–12 years (9.2%) is similar to the

Table 2. Prevalence of ADH symptoms among the studied subjects by sociodemographic characteristics and school performance

Variables	Mild (score 0–9; n = 1,434)	Moderate (score 10–14; n = 227)	High (score ≥15; n = 208)	p value
Age group				
6–9 years	525 (68.9)	131 (17.2)	106 (13.9)	<0.001
10–12 years	909 (82.1)	96 (8.7)	102 (9.2)	
Gender				
Boys	632 (66.7)	157 (16.6)	158 (16.7)	<0.001
Girls	802 (87.0)	70 (7.6)	50 (5.4)	
Nationality				
Qatari	898 (78.9)	128 (11.2)	112 (9.8)	0.018
Non-Qatari/Arabs	536 (73.3)	99 (13.5)	96 (13.1)	
Consanguinity				
Yes	633 (73.5)	118 (13.7)	110 (12.8)	0.010
No	801 (79.5)	109 (10.8)	98 (9.7)	
Socio-economic status/income, USD				
>2,740	288 (81.1)	38 (10.7)	29 (8.2)	0.049
1,370–2,740	732 (77.4)	112 (11.8)	102 (10.8)	
<1,370	414 (72.9)	77 (13.6)	77 (13.6)	
Number of children				
<5	571 (73.7)	97 (12.5)	107 (13.8)	0.028
5–8	754 (78.8)	115 (12.0)	91 (9.5)	
>8	109 (81.3)	15 (11.2)	10 (7.5)	
Multiple marriages				
Yes	216 (74.7)	31 (10.7)	42 (14.5)	0.116
No	1,218 (77.1)	196 (12.4)	166 (10.5)	
Good relationship between parents				
Yes	1,401 (80.3)	194 (11.1)	149 (8.5)	<0.001
No	33 (26.4)	33 (26.4)	59 (47.2)	
Parents living together				
Yes	1,328 (77.3)	206 (12.0)	185 (10.8)	0.147
No	106 (70.7)	21 (14.0)	23 (15.3)	
Performance at school				
Excellent	280 (79.1)	44 (12.4)	31 (8.5)	0.002
Very good	452 (77.7)	64 (11.0)	66 (11.3)	
Good	313 (74.3)	56 (13.3)	52 (12.4)	
Average	125 (69.4)	20 (11.1)	35 (19.4)	
Below average	118 (62.4)	26 (13.8)	45 (23.8)	

Figures in parentheses are percentages.

Table 3. Comparison of the behaviour of the studied children with and without ADH symptoms

Variables	ADH (score ≥15; n = 208)	No ADH (score <15; n = 1,661)	Total (n = 1,869)	p value
Disobedient				
Yes	200 (13.5)	1,286 (86.5)	1,486 (100)	0.002
No	8 (2.1)	375 (97.9)	383 (100)	
Noisy/hyperactive				
Yes	126 (12.8)	856 (87.2)	982 (100)	0.014
No	82 (9.2)	805 (90.8)	887 (100)	
Cranky				
Yes	76 (11.7)	571 (88.3)	647 (100)	0.014
No	132 (10.8)	1,090 (89.2)	1,222 (100)	
Troublesome				
Yes	78 (12.9)	526 (87.1)	604 (100)	0.119
No	130 (10.3)	1,135 (89.7)	1,265 (100)	
Nervous				
Yes	79 (13.1)	526 (86.9)	605 (100)	0.147
No	129 (10.2)	1,135 (89.8)	1,264 (100)	
Any children like their teachers				
Yes	105 (11.0)	851 (89.0)	956 (100)	0.139
No	103 (11.3)	810 (88.7)	913 (100)	

Figures in parentheses are percentages.

Table 4. Logistic regression analysis to assess predictors for ADH disorder

Independent variables	Odds ratio	95% CI	p value
Socio-economic condition	1.713	1.24–2.37	0.001
Number of children	1.128	1.04–1.21	0.017
Poor relationship between parents	10.580	6.940–16.129	<0.001
School performance	1.253	1.071–1.467	0.005
Occupation of father	0.964	0.858–1.083	0.538
Occupation of mother	1.043	0.885–1.228	0.617
Education of father	1.061	0.914–1.230	0.437
Education of mother	1.003	0.859–1.171	0.971
Parity	0.983	0.905–1.067	0.679
Consanguinity	0.755	0.554–1.029	0.075

findings of Sharma et al. [19]. Equally, the finding that more boys than girls (3:1) had this disorder is consistent with a previous report [20].

The first-cousin intermarriage rate in Qatar is 34.8% [5], which was suspected to be related to the high prevalence rate of ADH in children (11.1%), but logistic regression analysis did not yield a significant association between consanguinity and ADH in children. However, the present study did find an association between ADH symptoms and both educational difficulties and school performance of the child. Children who had higher scores for ADH symptoms were judged by teachers as having a poorer performance than those with lower scores. These findings are consistent with other studies from different parts of the world applying behaviour ratings by parents and teachers [1].

Moreover, there was a significant difference between children with and without ADH for disobedience, making noise and crying for anything. 96.2% of the studied children with ADH were disobedient, and 60.6% were noisy and hyperactive. Children with ADH have difficulty paying attention and controlling their behaviour. These results are consistent with previous reports. White [21] found that children with unusually high activity and emotional reactivity may be more distractible and more impulsive and that they are frequently diagnosed as having ADH. ADH increases the risk of additional problems such as conduct and personality disorders, substance misuse, offending and impaired social adjustment in adulthood [22].

The logistic regression in our study showed that a poor relationship between parents and socio-economic condition were the main contributors for ADH. The poor parenting practices and other family environmental variables affect the children with ADH. In fact, generally children whose parents are divorced or not in a favourable relationship do not get proper attention and care from their parents, and this leads to a higher incidence of ADH symptoms [23, 24]. In a study conducted in the United Arab Emirates [13], there was a significant association between a higher score of ADH symptoms and children being raised by a single parent. The results of a study done in Israel suggest that children with ADH, who have a difficult temperament and difficulties in self-regulation, need supportive and organizing parenting which provides a lower incidence of ADH symptoms [25].

Conclusion

The present study revealed that ADH is found to be a common problem among schoolchildren. A significant difference in the behaviour reported by parents was found between children with and without ADH symptoms. The children with higher scores for ADH symptoms had a poorer school performance than those with lower scores. A poor relationship between parents was the main contributor to ADH in children.

Acknowledgements

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