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Manar Al Azzam[1], Mohammed Al Bashtawy[1], Ahmad Tubaishat[2], Abdul-Monim Batiha[3] and Loai Tawalbeh[2]

ABSTRACT The purpose of this study was to determine the prevalence of attention deficit hyperactivity disorder (ADHD) symptoms among school children in Jordan and the probable associated risk factors. This was a cross-sectional descriptive study and simple random sampling was used to select 480 students, aged 6–12 years, from government primary schools in Mafraq City, Jordan. Data were collected using the modified Arabic version of the Attention Deficit Disorder Evaluation Scale (ADDES) school version and parental questionnaire. Prevalence rates within the inattentive, hyperactive–impulsive and combined subtypes were 10.83, 9.58 and 20.21%, respectively. Increased family size and being male were both associated with increased prevalence of ADHD symptoms. The study revealed that ADHD is common among Jordanian school children. The government should establish education programmes to increase awareness of ADHD.

Prévalence du trouble de déficit de l’attention avec hyperactivité (TDAH)

parmi des enfants d’âge scolaire en Jordanie

RÉSUMÉ La présente étude a pour objectif de déterminer la prévalence des symptômes du trouble de déficit de l’attention avec hyperactivité (TDAH) parmi des enfants scolarisés en Jordanie, ainsi que les probables facteurs de risque associés. Une étude descriptive transversale ainsi qu’un sondage aléatoire simple ont été utilisés afin de sélectionner 480 élèves, âgés de 6 à 12 ans, dans des écoles primaires gouvernementales de la ville de Mafraq, en Jordanie. Les données de l’étude ont été collectées en utilisant la version scolaire modifiée de l'échelle d'évaluation du trouble de déficit de l’attention (ADDES) en langue arabe et un questionnaire destiné aux parents. Les résultats ont montré que les taux de prévalence du sous-type inattentif, du sous-type hyperactif/impulsif, et du sous-type combiné étaient de 10,83 %, 9,58 %, et 20,21 % respectivement. Le fait d'être une famille nombreuse et d’être de sexe masculin était associé à une prévalence accrue des symptômes de TDAH. L’étude a révélé que le TDAH était répandu parmi les élèves scolarisés en Jordanie. Le gouvernement devrait mettre en place des programmes éducatifs afin de sensibiliser sur les aspects du TDAH.

[1]Department of Community and Mental Health Nursing, Faculty of Nursing, Al al-Bayt University, Al-Mafraq, Jordan (Correspondence to: M. Al Azzam: alazzam@aabu.edu.jo). [2]Department of Adult Health Nursing, Al al-Bayt University, Al-Mafraq, Jordan.
[3]
Department of Adult Health Nursing, Faculty of Nursing, Philadelphia University, Amman, Jordan.

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Introduction

Attention deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder characterized by core symptoms of hyperactivity, inattention and impulsivity, affecting children across all socioeconomic strata and ethnic and regional groups (1,2). Forty to sixty percent of children with ADHD have comorbidity such as anxiety, depression and learning disabilities (1). Fifty percent of ADHD cases are associated with disruptive and aggressive behavioural characteristics as seen in oppositional defiant disorder and conduct disorder (3). ADHD may serve as a developmental precursor to increasingly problematic behavioural outcomes, because children with ADHD are at significantly higher risk of being involved with substance abuse, delinquency and persistent problems with social relationships, as well as academic and job performance difficulties (1,4–6).

The emotional and behavioural problems associated with ADHD may interfere with nearly every aspect of a child's life, including family and sibling relationships, peer relationships, academic performance, planning, and task completion (1,3,7). ADHD has a significant lifelong impact on a person's emotional, social and cognitive functioning.

Factors that contribute to the aetiology of ADHD are still under investigation (1,8). Various approaches have been used to try to explain the aetiology, including biological, neuro-psychobiological, trauma-based, and environmentally based models, or a combination of these. It is reported that several child, family and environmental risk factors might increase the severity of ADHD symptoms (3). These factors include low socioeconomic status, living in economically stressed neighbourhoods, poor family functioning, family size, age, and gender. ADHD is a complex disorder, with genetic and environmental risk factors contributing to its onset (1,9).

ADHD is one of the most common neurodevelopmental disorders of childhood, with a worldwide prevalence ranging from 2.2 to 17.8% (10). The variability in prevalence might be due to several factors, such as study methodology, diagnostic criteria, populations studied, sample size, cultural perceptions, and informants (e.g., respondents to questionnaires) (1,6,9,10). Moreover, the literature indicates that the reported rates might vary depending on the source of the information (1,3,11).

In Arab countries there has been a shortage of studies addressing children's behavioural problems in general and ADHD in particular (8). The prevalence of ADHD symptoms in Arab countries varies considerably between 1.3 and 16% (8,12–14), although these rates were based on a limited number of studies that used different methods. For example, Richa and colleagues (14) conducted a study of 1000 Lebanese school children aged 6–10 years using the ADHD Rating Scale – IV School Version. They found prevalence of 3% for ADHD inattentive subtype, 12% for hyperactive–impulsive subtype and 17% for ADHD combined subtype. Jenahi and colleagues (13) used the Attention Deficit Disorders Evaluation Scale (ADDES) to investigate the prevalence of ADHD among 1009 Saudi students aged 6–15 years. They found prevalence of 2.1% for ADHD inattentive subtype and 5.6% for hyperactive–impulsive subtype.

The main purpose of the current study was to determine the prevalence of ADHD symptoms among school children in Jordan. We also aimed to identify possible risk factors related to the symptoms associated with ADHD. It is hoped that the current study will provide baseline information that may help teachers, parents, healthcare professionals and policy-makers to

design comprehensive strategies to enhance awareness of ADHD. Also, the study may be a preliminary step toward launching a large community-based study that might help to develop awareness and intervention programmes to deal with affected individuals and their families.

Methods

Research design

This was a cross-sectional descriptive study to assess the prevalence of ADHD among school children in Jordan, together with the associated risk factors. The study was conducted at schools in Mafraq City, Jordan from February to April 2014. Mafraq is located 80 km north of the capital Amman. It has nearly 127 830 residents. There are 30 governmental schools listed in the city, with a total of 19 000 students (15). The study was approved by the Institutional Review Board of Al al-Bayt University, Mafraq.

Study population

The target population was school children aged 6–12 years. A list of the primary schools in Mafraq City was obtained from the Ministry of Education. A random sample of 6 schools was chosen. Six classes, 1 from each grade in each school, were chosen using systematic random sampling to ensure representativeness of all classes of the same grade. Proportional allocation of the sample was used when choosing the children so that the sampling fractions were equal.

The sample size was determined using the following formula:

$$N = Z2\ 1 - \alpha/2 \times P\ (1 - P) / d2$$

where N is minimum sample size; Z2 1 − α/2 is the confidence level at 95%; P is the expected prevalence of ADHD symptoms among school-aged children (0.5%); and d is the margin of error at 0.05% (4). The minimum sample size needed was 400 students, but, to allow for non-responses and uncompleted questionnaires, we increased the sample size to 500 students.

Exclusion criteria

All students in the selected classes were eligible to participate in the study, except for children who were not Jordanian. This was because non-Jordanian children may have been refugees with other diagnoses that could have interfered with ADHD symptoms. We also excluded children with chronic physical illness and those attending special educational classes to

compensate for learning disabilities, because the diagnosis of ADHD is often comorbid with other diagnoses such as learning disabilities.

Study instruments

Two instruments were used to assess the main variables. The modified Arabic School Version of ADDES was used to measure the prevalence of ADHD symptoms (Appendix 1). Permission to use the instrument was obtained from Hawthorne Educational Service (Colombia, MO, USA). The questionnaire contained two parts: Part I consisted of 29 questions that measured inattention; and Part II comprised 31 questions that measured hyperactivity–impulsivity. All 60 questions were used to diagnose combined ADHD. The same scoring procedure, as outlined in the original manual, was used by the authors.

The Arabic version of the instrument was established by translation and back translation and the content validity was checked by a panel of experts who were interested in the research topic. The instrument was piloted with 30 students who were not included within the main sample, before the data collection process began, to assess the clarity and appropriateness of items and to test the readability of the instrument among a Jordanian sample. The results indicated that the instruments were clear and readable. The findings also showed that Cronbach's α was 0.93.

An Arabic questionnaire was devised to collect relevant sociodemographic data for the present study, including children's age, birth order, number of siblings, parents' educational level, family mental health history, and consanguinity.

Data collection and procedures

After obtaining IRB approval, 2 research team members visited the schools and explained the aims and methods of the study to the head teacher, in order to obtain permission to distribute the study forms. A letter of invitation to participate in the study was sent to the children's parents and the head teachers. The letter explained the aims and methods of the study, name and contact information of the chief researcher, and that participation was voluntary. All participants' rights about anonymity and confidentiality were protected. The head teachers were instructed to fill out the modified Arabic school version of ADDES after they had received appropriate training. Parents were instructed to fill out the demographic data questionnaire.

Data analysis

The completeness and accuracy of the study data were checked and then coded, entered and analysed using SPSS version 22. Descriptive statistics were used to describe the sample

characteristics and to assess the prevalence of ADHD symptoms. The χ2 test was used to assess whether there was a significant association between ADHD symptoms and demographic data. P

Results

Demographic characteristics

Four hundred and eighty out of the 500 questionnaires were completed and available for analysis, yielding a response rate of 96%, representing 250 (52.08%) boys and 230 (47.92%) girls. Demographic characteristics are shown in Table 1 . There were 2 age groups of 6–9 and 10–12 years, with a mean (standard deviation; SD) of 9 (1.9) years. The number of siblings were grouped into 1–3, 4–6 and > 6, with a mean of 4.6 (3.2) and median of 5.

ADHD prevalence

The prevalence of ADHD in Mafraq City among school-age children was 40.62%, and the percentage of each subtype is shown in Table 2 . There was a significant association between the children's age and prevalence of ADHD symptoms [P value (χ2 test) = 0.008] (Table 2). The prevalence of the 3 subtypes of ADHD decreased with increasing age. There was a significant association between the number of siblings and prevalence of ADHD [P value (χ2 test) Table 3). Table 4 shows the association between gender and prevalence estimates of ADHD. The prevalence estimate of all 3 subtypes of ADHD was significantly higher among boys [P value (χ2 test) Table 5).

Discussion

The purpose of the current study was to assess the prevalence of ADHD symptoms among school children in Mafraq City, Jordan and to identify the potential associated risk factors. We found high prevalence rates of combined ADHD of 20.21%, hyperactivity–impulsivity of 9.58% and inattention of 10.83%. These rates were higher than those reported in other studies (6,13,14,16). For example, in Turkey, a study of 1508 schoolchildren aged 6–14 years showed a prevalence of 8% for combined ADHD, 20% for inattentive subtype and 14.3% for hyperactive–impulsive subtype (6). In another cross-sectional study of ADHD in Nigeria among 487 school children, there was a prevalence of 3.08% for combined ADHD and inattentive subtype and 2.05% for hyperactive–impulsive subtype (15). These differences could be because estimates of the prevalence of ADHD worldwide vary, depending on the study methodology, diagnostic criteria, populations studied, sample size, cultural perceptions, informants, and instruments used. In the current study, the only source of behavioural

assessment was the teachers, which could explain the high prevalence of ADHD symptoms. If we had had multiple sources of assessment (e.g., teachers, parents and health professionals), the prevalence might well have been lower.

Our results revealed that the rate of ADHD symptoms decreased with age, and the symptoms were mostly noticeable among children aged 6–9 years. For many children, ADHD behaviour is not noticed until they enter elementary school. Experts have tried to explain this by stating that almost all toddlers and preschool children exhibit behaviour or symptoms that exemplify ADHD as part of their normal development. In order to diagnose a child with ADHD, the symptoms should be present before the age of 12 years, and the child must show evidence of several symptoms in ≥ 2 settings (e.g., at home, school or work; with friends or relatives; or in other activities) (1,3).

Our results are comparable to those of other studies conducted in Arab countries, which have shown that ADHD is more noticeable among children aged 6–9 years and the symptoms start to regress after 11 years (8,12,13,17).

The current study indicated a significant association between the number of siblings and the prevalence estimates of the 3 subtypes of ADHD, for which lower rates have been reported among children in small families compared to children in large families. These results are in line with the findings of studies conducted in Saudi Arabia, Kuwait and Qatar (8,12,13,17,18), and could be explained by the fact that children in large families receives less care, which results in behavioural problems being observed more often among these children.

We found a significant gender difference in the prevalence of the 3 subtypes of ADHD, with a higher prevalence in boys, which is consistent with the literature, with ratios ranging from 2:1 to 9:1 (8,11–13,17,18). One commonly accepted explanation for the observed difference is that, in general, boys are more likely to exhibit aggressive and antisocial behaviour compared to girls (1).

The present research was a preliminary study that indicated that ADHD might be a problem among school children in Jordan. Our findings could be used as a guide for further investigations of ADHD in Jordan since there has been a dearth of related studies to date. Future studies should involve large randomized samples from all areas of the country to enable generalization of the results. Moreover, such findings should help to create health programmes to increase awareness of parents, teachers, policy-makers, school nurses and healthcare

professionals about ADHD, particularly with regard to the signs, symptoms, causes and consequences.

The present study had some limitations, which means that the results must be considered with caution. First, the study sample was not representative of the population of school children in Jordan as a whole. Second, we used a screening tool and no attempt was made to establish a clinical diagnosis among the study sample. Future studies should involve screening and diagnosis in order to identify the symptoms of ADHD among school children. Third, the prevalence of ADHD was based on information that was obtained from a single source (school teachers). Future research should involve teachers, parents and health professionals to confirm the diagnosis of ADHD.

In conclusion, this study is one of the earliest efforts to assess ADHD among school children in Jordan. The prevalence reported suggests that ADHD is more common in school children in Jordan than in other parts of the world. Furthermore, the current study showed that a variety of sociodemographic factors were significantly associated with development of ADHD, including children's age and gender, and family size.

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