

Attention Deficit Hyperactivity Disorder in A Rural Area of Sohag Governorate

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Received: January, 2016 Accepted: March, 2016

Abstract

Background: Attention deficit hyperactivity disorder (ADHD) is a rising public health problem affecting child quality of life. **Objectives:** To estimate the prevalence and identify socio-demographic risk factors of attention deficit hyperactivity disorder (ADHD) among primary school children in a rural area of Sohag governorate. **Methods:** A cross-sectional community based study design was carried out in two villages of Sohag governorate using structured interview questionnaire. To identify children with probable ADHD a validated questionnaire based on Diagnostic and Statistical Manual of Mental disorders, 4th Edition (DSM IV) was used. It includes a parent's and a teacher's copy. **Results:** This study included 854 primary school students in two villages of Sohag governorate. The prevalence of probable ADHD was 9.6%. The prevalence of ADHD was significantly associated with low socioeconomic level, higher birth order, male gender, smoker father, consanguineous parents, family history of ADHD, low birth weight, artificially fed children and pupils living with single parent. **Conclusion and recommendations:** ADHD is prevalent among primary school pupils in rural areas of Sohag governorate. Efforts are required to control associated risk factors of ADHD and reduce its prevalence.

Key Words: ADHD, Prevalence, Risk factors, Rural Sohag

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Introduction

Attention deficit hyperactivity disorder (ADHD) is defined as an active and impulsive behaviors and persistent lack of attention which are more than expected as it is usually seen in children of the same age.¹ ADHD is considered the most common neuro-developmental disorder of young children that constitute a public health problem.² ADHD is divided into hyperactive/impulsive, inattentive and combined types. Its diagnosis is based on criteria specified by the Diagnostic and Statistical Manual of Mental Disorders Fourth Edition (DSM"IV).³ A child showing 6 signs or more of the nine criteria of inattention or 6 signs or more of the nine criteria of hyperactivity-impulsivity in at least two

occasions (school, home or other environments) is known to be suspected to have ADHD.⁴

ADHD has adverse effects on educational, cognitive, emotional, behavioral and social functions. Affected children are at risk of bad academic performance, academic failure, grade repetition, school withdrawal, bad friendships, family relationships and depression, anxiety, aggression, drug abuse at an early age, law-breaking and exclusion from peers.^{4,5}

Children with ADHD do not obey instructions of their parents, impulsively acting, irritable and unstable emotionally. They need more attention by their

teachers at school and they are unable to perform their homework at home.¹

Moreover, it was found that symptoms of ADHD continue during adulthood for 30-70% of children with this disorder.⁶ Many studies found genetic, environmental factors and psychological traits and disorders played a role in the etiology of ADHD.⁷

The prevalence rate of ADHD among children varies widely all over the world ranging from 1% to 20%.⁸ The worldwide prevalence rate of ADHD was 5.3%.⁹ In Arab countries the reported rate was between 1.3% to 34.5% and in Egypt it was between 6% to 19.7% for children and youth.¹⁰

There is lack of studies about the prevalence and risk factors of ADHD among primary school children in rural areas of Sohag governorate. Therefore, this study was conducted to address this issue.

The general objective was to promote proper health status of children in rural areas of Sohag governorate.

Specific objectives were to estimate the prevalence of ADHD among primary school children in a rural area of Sohag governorate and to identify the familial and socio-demographic risk factors of ADHD among primary school children in a rural area of Sohag governorate.

Methods:

Study design: A cross-sectional community-based study was carried out.

Sample size: Sample size was calculated using EPI INFO version 3.5.1 (2008). Sample size calculation was based on prevalence of ADHD of 6.9% ($P = 0.069$).¹¹ With a power of 80% and confidence level of 95% and a design effect of 2, the sample needed for the study was 548 students. The sample was increased to 854.

Study site: The study was conducted in Naza Al-Baharia village (Juhina District) and Banja village (Tahta district). Both villages are located in the western and

northern part of Sohag governorate. They had an estimated population of 36,500 people. Primary schools in both villages contains 4100 pupils in the academic year 2016/2017. The target population of this study was primary school children from 1st to 6th grade in these villages.

Instrument: Data collection was performed by using structured interview questionnaires. Two types questionnaires were used for data collection, household and ADHD questionnaires: (1) The household questionnaire includes the socio-demographic characteristics of the pupils (age, gender, family residence, education and occupation of the parentsetc). Households were classified into high, middle and low socio-economic levels by using El-Gilany, et al. 2012 score.¹² This score has 7 domains with a total score of 84. Higher score indicates higher socio-economic level. Households were classified into three levels relative to each other with the higher one third [218 (33.3%) households] constituted the high socio-economic level and the middle and lower thirds constituted the middle and lower socio-economic levels respectively. (2) The second questionnaire was a scale to identify children with probable ADHD. This scale was developed by El-Noby, 2005.¹³ It was based on DSM IV for ADHD, and validated (Cronbach's $\alpha = 0.7$) in Egypt. This scale was used by a previous study conducted in Qalyoubia governorate in Egypt.¹⁴ This scale has a teacher copy and a parent copy. Each of them contains 24 items. Responses to questions were doing the behavior rarely coded as 1, or doing the behavior occasionally coded as 2 or doing the behavior always coded as 3. The maximum score for either parent and teacher copy of ADHD questionnaire is 72. In order to decrease the number of false positive cases, this study considered the child probably having ADHD when he/she has a score of 48 or more in both parent and teacher's copy of ADHD

questionnaires (a total score of ≥ 96 for probable ADHD child). Scholastic achievement of the pupils was classified into high, middle and low according to evaluation of pupil's teacher.

The tool used by this study is a screening one and not diagnostic, therefore children found positive by this study are considered as probably having ADHD.

Procedures: Permission to conduct this study was obtained from the directorate of education in Sohag governorate. List of all houses of the villages was obtained from the Rural Health Units. A total of 854 houses were visited. All eligible children (6-12 years) in the selected houses were included. Systematic random sampling technique was used. The first house was selected randomly, and then every third house of both villages was included in this study.

Data collection was performed at home at first. All households containing eligible children (6 -12 years) in the selected houses were included in the study. Collection of socio-demographic data of the household was performed by interviewing either parent (mostly mother) at home. Then a parent's copy of ADHD questionnaire was filled for each eligible child. Three trained female data collectors (recent graduate of faculty of nursing) collected the required household data under strict supervision of the researcher.

All children who were subjected to data collection at home were subjected to a teacher's copy of ADHD questionnaire at school to be filled by the school teacher of the child.

Data collection was between start of September to the end of November, 2017.

Exclusion criteria: Children with known neurological disease (by asking parents and teachers) and children below 1st grade and above 6th grade primary school pupils.

Statistical analysis: Data entry, cleaning and analysis was done by using SPSS

program, version 16. Frequencies were reported as percentages; comparisons between frequency-based data were performed using χ^2 -test. Continuous variables were compared using two-tailed independent-sample t-tests. For all comparisons, the statistical level of significance was set at $P < 0.05$. Multivariate logistic regression analysis was performed for significant variables.

Ethical considerations: The study protocol was approved by the ethical review committee of Assiut faculty of medicine. The purpose of the study was explained to the school authorities, students and their parents. A written permission to conduct this was obtained from the directorate of education. The headmaster, all school teachers and administrators were invited to participate in this study. Also, a verbal consent was obtained from the students' parents and teachers before filling the questionnaire. They had the right to withdraw from the study at any time without any punishment. Parents of all children with probable ADHD were contacted by the researcher and advised to be furtherly evaluated by a psychiatric specialist for final and conclusive diagnosis.

Results

Table (1) shows socio-demographic characteristics of studied pupils. About one half (51.5%) were males. The mean age was 9.1 years. Regarding education of parents, 29.6% and 38.1% of fathers and mothers were illiterate. Employed fathers and mother constituted 28.5% and 26.5% respectively. About two thirds (63.9%) of families were nuclear. Prevalence of probable ADHD among studied children was 9.6%.

Table (2) shows prevalence of probable ADHD by sociodemographic characteristics of studied pupils. Male had higher prevalence (14.5%) of ADHD ($P = < 0.001$). The prevalence of probable ADHD is higher (12.1%) among children with illiterate or read and write fathers

Table (1): Socio-demographic characteristics of primary school pupils under study in rural areas of Sohag Governorate, 2017.

Characteristics	N (%)
Gender:	
- Males	440 (51.5)
- Females	414 (48.5)
Age:	
- 6 –	322 (37.7)
- 9 –	327 (38.3)
- 12 – 14	205 (24.0)
Mean ± SD	9.1 ± 3.2
Father's education:	
- Illiterate	253 (29.6)
- Read and write	176 (20.6)
- Primary and preparatory	215 (25.2)
- Secondary and higher	210 (24.6)
Mother's education:	
- Illiterate	325 (38.1)
- Read and write	214 (25.0)
- Primary and preparatory	188 (22.0)
- Secondary and higher	127 (14.9)
Father's occupation:	
- Farmer	312 (36.5)
- Employee	244 (28.5)
- Unskilled worker	206 (24.1)
- Skilled worker	92 (10.8)
Mother's occupation:	
- House wife	627 (73.4)
- Employee	227 (26.7)
Family type:	
- Nuclear	546 (63.9)
- Extended	308 (36.1)
Socio-economic level:	
- High	285 (33.4)
- Middle	285 (33.4)
- Low	284 (33.3)
Presence of probable ADHD:	
- No	772 (90.4)
- Yes	82 (9.6)
Total	854

(P=0.012). Children with employed mothers, nuclear families, lower birth orders had lower prevalence of probable ADHD (6.4%, 8.1% and 6.1%) (P = 0.03, 0.02 and <0.001) respectively. Pupils with high socioeconomic level had lower prevalence of probable ADHD than those with middle and low socioeconomic level (5.6%, 8.4% and 14.8% respectively) (P <0.001).

Table (3) shows that pupils who live with only one parent, consanguineous parents and smoker fathers had higher prevalence of probable ADHD (20%, 12.7% and 11%) (P = 0.034, 0.007 and <0.001) respectively. Children with family history of ADHD, bad parent relationship and bad child-parent relationship and those with higher maternal age and low scholastic achievement had higher prevalence of ADHD (13.4%, 12.3%, 13.7% 12.1% and 17.5%) (P = 0.01, 0.022, <0.001, 0.014 and 0.007) respectively.

Table (4) shows that pre-term children and those with low birth weight had higher prevalence of probable ADHD (13.6% and 14.6%) (P = 0.012 and 0.002) respectively. Children with history of birth trauma, toxemia of pregnancy, artificial feeding had higher prevalence of probable ADHD (14.6%, 15.8%, and 12.4%) (P = <0.001, 0.012, and 0.029) respectively.

Table (5) shows logistic regression analysis for variables related to ADHD. Prevalence of ADHD was significantly associated with low socioeconomic level, higher birth order, male gender, smoker father, consanguineous parents, family history of ADHD, low birth weight, artificially fed children and pupils living with single parent.

Discussion

This population based studies included 854 primary school students distributed in two villages in Sohag governorate. The socio-demographic characteristics of study population reflects the characteristics of primary school children in rural areas of Sohag governorate.

The prevalence rate of ADHD among the studied students in this study was 9.6%. The reported rate in this study is higher than that reported by studies conducted in Menofia governorate, Egypt (2014)¹¹ (6.9% among 1,362 primary school students), El-Minia city, Egypt (2010)¹⁵ (6.5% among 4,223 preschool and school

Table (2): Distribution of ADHD among studied school pupils by socio-demographic characteristics in rural areas of Sohag governorate, 2017.

Characteristics	Presence of probable ADHD		P
	Yes (82)	No (772)	
Age:			
- 6 –	33 (10.2)	289 (89.8)	0.751
- 9 –	32 (9.8)	295 (90.2)	
- 12 - 14	17 (8.3)	188 (91.7)	
Gender:			
- Males	68 (14.5)	402 (85.5)	<0.001
- Females	14 (3.6)	370 (96.3)	
Father's education:			
- Illiterate / read & write	52 (12.1)	377 (87.9)	0.012
- Primary & prep.	20 (9.3)	195 (90.7)	
- 2ry and higher	10 (4.8)	200 (95.2)	
Mother's education:			
- Illiterate / read & write	55 (10.2)	484 (89.8)	0.562
- Primary & prep.	18 (9.6)	170 (90.4)	
- 2ry and higher	9 (7.1)	118 (92.9)	
Father's occupation:			
- Farmer	25 (8.0)	287 (92.0)	0.601
- Employee	15 (7.5)	189 (92.5)	
- Unskilled worker	21 (8.5)	225 (91.5)	
- Skilled worker	11 (12.0)	81 (88.0)	
Mother's occupation:			
- House wife	65 (11.1)	522 (88.9)	0.030
- Employee	17 (6.4)	250 (93.6)	
Family type:			
- Nuclear	42 (8.4)	496 (91.6)	0.020
- Extended	40 (11.6)	276 (88.4)	
Birth order:			
- 1 st	17 (6.1)	260 (93.9)	<0.001
- 2 nd – 4 th	26 (7.1)	341 (92.9)	
- ≥ 5 th	39 (18.6)	171 (81.4)	
Family size (Mean ± SD):	8.4 ± 4.1	7.2 ± 2.9	<0.001
Socio-economic level*			
- High	16 (5.6)	269 (33.4)	<0.001
- Middle	24 (8.4)	261 (33.4)	
- Low	42 (14.8)	242 (33.3)	
Total	82 (9.6)	772 (90.4)	

*Using El-Gilany et al. score (2012).

children aged 4 -12 years), Assiut city, Egypt (2005)¹⁶ (6% among 1513 third grade primary school students). Also, the reported rate in this study is lower than that reported by studies conducted in Al Qalyobia governorate, Egypt (2017)¹⁴ (21.8% and 16.2% among 921 primary school children according to teacher and parent scale respectively) and Alexandria city, Egypt (1994)¹⁷ (19.5% among 501 first and second years of primary schools). Also, it is lower than that

reported among 600 children aged 5-12 years attending pediatric clinic of Menofia university hospital (Egypt)¹⁸ which was 19.7%.

In Arab countries the reported rate was between 1.3% to 34.5%¹⁰, The worldwide prevalence rate of ADHD was 5.3%.⁹

This shows that prevalence of ADHD shows high variability even within the same country. The difference in the prevalence rate reported by this study

and other studies in Egypt may be due to differences in age of the children under

study and differences in the sample size and tool and methodology of the study

Table (3): Distribution of studied primary school pupils by familial characteristics in rural areas of Sohag Governorate, 2017.

Characteristics	Presence of probable ADHD		P - value
	Yes (82)	No (772)	
Student live with:			
- Both parents	61 (8.6)	646 (91.4)	0.034
- Single parent	21 (20.0)	126 (80.0)	
Parents' consanguinity:			
- Yes	47 (12.7)	323 (87.3)	0.007
- No	35 (7.2)	449 (92.8)	
Smoker fathers:			
- Yes	55 (11.0)	347 (89.0)	<0.001
- No	27 (6.0)	425 (94.0)	
Parent's response to child mistake			
- Explain quietly	22 (7.5)	270 (92.5)	0.252
- Emotional violence	38 (10.0)	341 (90.0)	
- Physical violence	22 (12.0)	161 (88.0)	
Family history of ADHD			
- Yes	36 (13.4)	232 (86.6)	0.010
- No	46 (7.3)	540 (92.7)	
Family history of other mental diseases			
- Yes	36 (9.8)	332 (90.2)	0.076
- No	46 (9.5)	440 (90.5)	
Watching TV:			
- < 2 hours / day	36 (12.0)	265 (88.0)	0.084
- ≥ 2 hours / day	46 (8.3)	507 (91.7)	
Parents' relationship:			
- Good	37 (7.6)	450 (92.4)	0.022
- Bad	45 (12.3)	322 (87.7)	
Child-parent relationship:			
- Good	31 (6.4)	451 (93.6)	<0.001
- Bad	51 (13.7)	321 (86.3)	
Maternal age at birth:			
- > 35 years	51 (12.1)	370 (87.9)	0.014
- ≤ 35 years	31 (7.2)	402 (92.8)	
Scholastic achievement			
- High	26 (8.2)	291 (91.5)	0.007
- Middle	35 (8.4)	382 (91.8)	
- Low	21 (17.5)	99 (82.5)	
Total	82 (9.6)	772 (90.4)	

in addition to differences in the socio-demographic and cultural characteristics of the study population.

Alhraiwil, et al. 2015¹⁹ in their review about ADHD in Arab countries found that studies which used Conner rating scale for parents and teachers showed prevalence range of ADHD between 3.4% and 9.9%, on the other hand studies

which used clinical interviews (in Egypt) or self-reported questionnaire (in Iraq) showed prevalence range between 14.75% to 19.6%. This study depends on combined parent and teacher agreement (consensus) for detection of ADHD which yield lower prevalence than that reported by teachers or parents separately.²⁰

Table (4): Distribution of studied primary school pupils by some obstetric factors in rural areas of Sohag Governorate, 2017.

Characteristics	Presence of probable ADHD		P - value
	Yes (82)	No (772)	
Delivery mode:			
- Vaginal	49 (8.9)	501 (91.1)	0.355
- Caesarian section	33 (10.9)	271 (88.1)	
Pregnancy duration:			
- Full term	49 (8.0)	562 (92.0)	0.012
- Pre-term	33 (13.6)	210 (86.4)	
Birth weight:			
- Normal	48 (7.7)	573 (92.3)	0.002
- Low birth weight	34 (14.6)	199 (85.4)	
History of birth trauma			
- No	51 (7.9)	591 (92.1)	<0.001
- Yes	31 (14.6)	181 (85.4)	
Toxemia of pregnancy			
- Yes	19 (15.8)	101 (84.2)	0.012
- No	63 (8.6)	671 (91.4)	
Feeding during infancy:			
- Breastfeeding	42 (7.9)	490 (92.1)	0.029
- Artificial feeding	40 (12.4)	282 (87.6)	
Total	82 (9.6)	772 (90.4)	

This study found a number of associated risk factors related to ADHD. Regarding **gender**, this study found significantly higher prevalence of ADHD among boys (14.5) than girls (3.6). This is consistent with results reported by studies conducted in Egypt^{11, 15,16,18}, Iran^{20,21}, Iraq²² and China.²³ On the other hand, studies conducted in Qalyobia¹⁴ and Alexandria¹⁷ (Egypt) found no significant differences between prevalence of ADHD among males and females.

The current study reveals no significant differences between prevalence of ADHD and **age** of the pupils. Similar result was reported by a study conducted in Menofia governorate, Egypt.¹¹ This disagreed with a study conducted in Qalyobia governorate, Egypt.¹⁴

Results of this study found that prevalence of ADHD is significantly associated with **family characteristics**. There is high prevalence among higher birth order ($\geq 4^{\text{th}}$), larger family size and low socio-economic level. Increasing

birth order may be associated with larger family size and older maternal age at birth. This is consistent with similar studies in Egypt^{11, 14, 15,17,18} and Saudi Arabia.²⁴ This is inconsistent with a study conducted in Assiut city (Egypt) which found no significant association between social level and presence of ADHD.¹⁶ On the other hand, a study conducted in Iraq²² found a significant association between ADHD and higher socio-economic level of the family.

This study found significant association between ADHD and parent's **consanguinity**. This is consistent with studies done in Menofia and Qalyobia governorates (Egypt).^{11, 14}

This study shows statistically higher prevalence of ADHD among children with **single parents**. This finding was similar to other studies in Egypt^{11,14,18}, and Saudi Arabia.²⁴ Separation of parents by divorce or travel or death is associated with negative impact on children's behavior, more violence and criticism.²⁴

Table (5): Odds ratio for correlates of ADHD among primary school children in rural Sohag governorate, 2017.

Variables	Odds ratio (95% CI)	P value
Socio-economic level (low)	8.71 (3.14-22.54)	<0.001
Birth order ($\geq 5^{\text{th}}$)	7.52 (2.67 – 21.34)	<0.001
Gender (male)	6.83 (2.59 – 18.01)	<0.001
Smoker father (yes)	4.57(1.74 -11.69)	<0.001
Parent consanguinity (yes)	4.55 (3.54 – 7.93)	0.001
Family history of ADHD (yes)	4.34 (3.35 – 7.66)	0.007
Birth weight (low)	3.62 (1.93 – 5.94)	0.010
Feeding during infancy (artificial)	1.52 (1.25 – 1.96)	0.002
Pupil live with single parent	1.42 (1.25 – 1.98)	0.029

Similar to previous studies^{14, 15,16,18,24}, this study shows that **artificial feeding** is associated with higher prevalence of ADHD. This may be due to deprivation of child from maternal contact and warm feelings during breastfeeding. This is in addition to the advantages of breastfeeding over the artificial feeding. According to the result of current study, **preterm birth** and **low birth weight** were significantly associated with higher prevalence of ADHD. Similar results were reported by studies in Egypt^{11,15,18} and Saudi Arabia.²⁴

The prevalence of ADHD was significantly associated with **family history** of ADHD and other mental health problems. This is in line with other studies conducted in Egypt.^{11,16,18}

In concordance with previous studies^{11,14,25}, current study found that father **smoking** was significantly associated with ADHD. Paternal smoking exposes the mother and newborn child to health hazards of passive smoking. Smoking during pregnancy is well known to result in low birth weight babies. Also, exposure to carbon monoxide of smoking during pregnancy could account for development of ADHD.²⁵

The present study shows lower **educational achievement** among pupils with ADHD than normal pupils. In line with this result, studies conducted in Alexandria, El Minia governorates (Egypt)^{15, 17} and Saudi Arabia.²⁴ This can be explained by higher activity and lack

of concentration by children with ADHD.

Conclusion and Recommendations:

ADHD is present among 9.6% of studied primary school children in rural areas of Sohag governorate. This rate is comparable with studies conducted in Egypt. A number of risk factors was significantly associated with ADHD. Efforts are required to control the modifiable associated risk factors of ADHD to decrease its prevalence. Early detection of ADHD has an important role in the prevention of negative impact on the child, his family and the community.

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