Full Length Research Paper

Correlates of Attention Deficit/Hyperactivity Disorder (ADHD) Among Children in a Clinical Psychiatric Center in Northern Nigeria

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Abstract

The aim of the study was to determine the correlates of Attention Deficit Hyperactivity Disorder (ADHD) among children aged 6 to 12 years in a clinical psychiatric center in Northern Nigeria. The Diagnostic and Statistical Manual, 4th Edition (DSM-IV) of the American Psychiatric Association was used to diagnose ADHD among the study participants. Statistical analysis was carried out using the SPSS 17.0 to determine the correlates of ADHD among the study participants. In univariate analysis, single/divorced parents (p=.008), mother's smoking (p=.003) and drinking (p=.007) while pregnant, modes of delivery other than vaginal birth (p=.029), starting school at the age of 5 years (p=.013) were associated with ADHD. In multivariate analysis, single/divorced parents (p=.005) while pregnant, modes of delivery other than age of 5 years (p=.029) were significant predictors of ADHD. Correlates of ADHD identified included single/divorced parents, mother smoking while pregnant, mode of delivery and age of 5 years at start of school. The correlates were similar to those in developed world. Knowledge of these associations will allow for the institution of comprehensive preventive strategies to reduce the prevalence of ADHD.

Keywords: ADHD, Risk factors, Correlates, Children.

INTRODUCTION

The American Psychiatric Association's Diagnostic and Statistical manual of mental Disorder text revised (2002) defined Attention Deficit Hyperactivity Disorder (ADHD) as consisting of at least six symptoms of inattention or six symptoms of Hyperactive/Impulsivity for six months or more, being inconsistent with the developmental level and requires its onset before the age of seven years. In addition, there must also be observed impairment in two or more settings (typically in the home and at school) and symptoms should not be caused by other conditions. The combination of both symptoms of Inattention and Hyperactivity/Impulsivity in a patient is referred to as ADHD combined type. ADHD may be further grouped into two subtypes: ADHD Predominantly Inattentive Type, ADHD Predominantly Hyperactive Type.

ADHD is one of the most studied of the childhood psychiatric disorders in both the psychosocial and medical literature as well as the most common neurobehavioral disorder of childhood (American Academy of Child and Adolescent Psychiatry, 2007; Rowland *et al.*, 2002). ADHD exerts a significant effect on peer relationship and academic performance of the sufferer. It also has immense psychosocial impact on parents and the society at large (Harpin, 2005).

ADHD is more prevalent among boys rather than girls across all age groups (Skounti, 2007). A study in Nigeria reported a similar male to female ratio of 2:1 for all the sub-types of ADHD with the exception of

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hyperactive/impulsive which was more common in girls (Adewuya and Famuyiwa, 2007).

Several variables such as socio-demographic, family, nutritional, perinatal and school variables have been associated with ADHD in both clinical and community samples of children. Most studies have reported cases within the age range of 6-11years (Skounti, 2007; Canino et al., 2004). Kashala et al. (2006) in Kinshasha, Congo reported that early age at start of school was associated with ADHD. The male predominance in the prevalence of ADHD holds true across all age groups (American Psychiatric Association, 1994). Family burden and stress have been well documented among families of children with ADHD. Fischer (1990) delineated these as occurring along four lines: increased stress reported by parents, parental psychopathology, parental marital discord and a problematic child to parent interactions. Other documented family characteristics include low level of social support and family dysfunction (Keown et al., 2002), family history of ADHD, major depressive disorder or antisocial behaviors (Barkley et al., 1990), low income and low socioeconomic class (Adewuya and Famuyiwa, 2007), and family's urban residence and being on welfare support (Szatmari, 1989). However, two recent studies argued that urban residence and family's perception of poverty, rather than actual low income, were the significant correlates of ADHD (Canino et al., 2004; Bauermeister, 2007).

Contributory parental factors include: maternal alcohol consumption and/or smoking cigarette during pregnancy (Autti-Ramo, 2000; Milberger *et al*, 2002), maternal history of psychiatric illness and paternal history of excessive alcohol use (Scahill *et al.*, 1999). Perinatal factors like prematurity and low birth weight have been shown to have significant correlates with ADHD (Szatmari *et al.*, 1999; Thapar *et al.*, 2007; Micks *et al.*, 2007). A study by Amor and his colleagues (2005) suggested that neonatal complications are more frequent in children with ADHD compared with their counterparts without ADHD.

In this study, we hypothesized that the correlates of ADHD among the study population would be different from those found in the developed world because of cultural and demographic differences. As data from Sub-Saharan Africa are lacking, this study aimed to describe the correlates of Attention Deficit Hyperactivity Disorder (ADHD) among children in a clinical setting in Northern Nigeria.

METHODOLOGY

Study setting

The study was conducted over a period of six (6) months

(from February to August, 2010) in the Child Psychiatry Clinic of the Aminu Kano Teaching Hospital (AKTH) in Kano, Northern Nigeria. The clinic runs twice every week and caters for an average of 15 children, both new and old cases on each clinic day. The clinic is the referral center for most patients in northern Nigeria.

Sample size

The study sample size (sample population to be screened for ADHD) was calculated using the formula for sample size calculation in cross-sectional with provision made for attrition and results precision. We used the prevalence of ADHD from a study in Ethiopia which reported ADHD risk of 2.84 among children in urban areas compared to those living in the rural areas (Ashanafi et al 2000). Based on this prevalence, we got a sample size of 42. However, the sample size was increased to 88 in other to account for the lowest reported prevalence rate in the African literature of 1.1% (Gureje *et al*, 1994). Thus a total of 88 eligible children were studied.

Survey instruments

A socio-demographic questionnaire was administered to the respondents by one of the authors to obtain information on socio-demographic, family, nutritional, perinatal and school variables of the participants.

Case-ness was established by a trained psychiatrist – utilizing a semi-structured interview based on the DSM-IV criterion of the diagnosis of ADHD. In keeping this criterion, the diagnosis of ADHD was made when the symptoms exhibited by the patients in the clinic were corroborated by the informants to be also occurring at home, or at school based on information obtained by the informants from the school teachers.

Recruitment, Consent/Assent and Data Collection

Before the commencement of the study, clearance and permission to conduct the study were obtained from the Ethical and Scientific Committee of Aminu Kano Teaching Hospital, Nigeria and the Human Research Ethics Committee of University of Cape Town, Republic of South Africa.

All children within the age range of 6-12 years presenting at the child psychiatry clinic of the AKTH in Kano, Nigeria and whose parents/guardians consented to participate were included; the child was required to assent to participation. Children outside the age range 6-12 years, those who were unaccompanied by a parent/guardian, or who came to clinic with a fellow minor were excluded from participating in the study for ethical reasons. Those whose parents refused to consent were also excluded. Children with severe psychosis, who were severely ill and those with autism, deafness, blindness or mental retardation were similarly excluded. Similarly, those with serious physical illness accompanying their psychiatric illness were also excluded. Anonymity, confidentiality and secure storage of the data were ensured.

Data analysis

Data entry and analysis were carried out using the Statistical Package for Social Sciences version 17.0 software (SPSS-17). Frequencies and cross-tabulation of variables were generated to check for data entry errors and missing values. The relationship and significance of association between ADHD and socio-demographic variables were tested by calculating odds ratios. Multiple logistic regression analysis including all variables with a p value < .05 on univariate analysis were performed to account for confounders and other independent variables. The level of significance was set at 0.05, and two-tailed.

RESULTS

The 88 participants had a mean age of 8.42 years (range 6.3 - 11.9) with a standard deviation (SD) of 1.6. Majority of them were boys (66; 75%) and within the age range 6-9 (66; 75%). Majority of the respondents (64; 72.7%) were mothers. Other socio-demographic characteristics of the respondents and their family backgrounds are presented in Tables 1 and 2 respectively. The number of cases determined by clinical assessment was 20 (22.7%), out of which 14 (70%) were males and six (30%) were females.

Logistic regression analyses showed that maternal smoking (p <0.01, O.R = 25.62, 95% C.I = 2.18 – 300.88) and drinking (p <0.01, O.R = 8.50, 95% C.I = 1.55 - 46.64), age at start of school (p <0.05, O.R = 9.17, 95% C.I = 1.72 - 48.91), mode of delivery other than spontaneous (p <0.05, O.R = 0.51, 95% C.I = 0.30 - 0.89) and single/divorced parents (p<0.01, O.R = 0.37, 95% C.I = 0.16 - 0.84) contributed a factor of 25, 8, 9, 0.5 and 0.4 times respectively to the development of ADHD. See Table 4

DISCUSSION

To our knowledge, this is one of the few studies that have studied the correlates of ADHD in Africa, and the only one of its kind conducted in the Northern part of Nigeria. The study found that children with ADHD were more likely to come from single/divorced parents, birth deliveries that were by modes other than spontaneous vertex delivery, started school by age 5 years, and having mothers who drank alcohol and/or smoked cigarettes during the index pregnancy. Other commonly reported socio-demographic factors such as family size and maternal discord were not found to be associated with DSM IV ADHD symptoms in this study.

More than two-thirds of the participants were boys aged 6 to 9 years. This finding agrees with most previous studies, underlining the risk of ADHD in this age group (Scahill et al., 1999; Busch et al., 2002). The typical male preponderance was also noted in this study. The male to female ratio in this study was lower than Cuffe, Moore and McKeon study (2005) and higher than the study by Adewuya and Famuyiwa (2007) in Nigeria that reported 2:1 from their community sample. The reports of male preponderance might be due to referral bias as males are more likely to present with more externalizing symptoms (such as hyperactivity and aggression) than females, which made it easier to be recognized and referred for treatment (Sciutto et al., 2004). However, according to Biederman et al (2000), the risk of ADHD is the same for boys and girls.

The only family variable of ADHD in this study that was found to be positively correlated with ADHD was having parents who were divorced or being a child of a single parent. This finding was in agreement with the report by Biederman et al. (1995) from a similar study who found that reduced family cohesion, chronic conflict and parental psychopathology are associated with ADHD. Reduced family cohesion and chronic conflict may adversely affect marital or partner relationship resulting in the dissolution of the marriage. Divorce is permissible in the culture and religion of majority of people in Northern Nigeria and it may explain this finding. The study did not find marital discord as a correlate of ADHD which was in contrast to the findings of Rutter and his colleagues (1975), in their study of the prevalence of psychiatric disorder in London. They reported six indices of adversity namely: severe marital discord, low social class, large family size, parental criminality, maternal mental disorder, and foster placement (Biederman et al., 1995) as being important correlates of ADHD and other mental conditions among children. This is further supported by findings from Fischer (1990). The reason for this might be because people in the study setting would not like to discuss issues about their marriage with strangers, even if they were medical practitioners, for cultural reasons. Similarly, this study did not find the following family variables to be correlated with ADHD; family size, parental education, father's social class, parent's psychiatric illness, family history of psychiatric illness and fathers drinking. This was again, in contrast with the

	Frequency (n=88)	Percentage (n=100%)
Age group in years		
6-9	66	75
10-12	22	25
Gender		
Male	66	75
Female	22	25
Age at start of school(Yrs)		
4	8	9.1
5	75	85.2
6	5	5.7
History of class repeats		
No	45	51.1
Yes	43	48.9
History of school suspension/School expulsion		
No	50	56.8
Yes	38	43.2
Subject receiving extra or remedial lesson		
No	30	43.2
Yes	50	56.8

Table 2. Sociodemographic Variables of Parents and family factors

	Frequency (n=88)	Percentage (n=100%)	
Respondents			
Child's mother	64	72.7	
Child's father	17	19.3	
Both parents	7	8	
Residents			
Rural	44	50	
Urban	44	50	
Family size			
1-2 children	10	11.4	
3-5 children	29	33	
>5 children	49	55.7	
Marital status			
Married	62	70.5	
Divorced	20	22.7	
Parent dead	6	6.8	
Marital discord			
No	45	51.1	
Yes	43	48.9	
Educational background of Father			
Primary level	27	30.7	
High school level	34	38.6	
Above high school level	27	30.7	
Educational background of Mother			
Primary level	51	58	
High school level	31	35.2	
Above high school level	6	6.8	
Occupational status of father (social class)*			
Class i	10	11.4	

Table 2. Continue

Class ii	27	30.7
Class iii	30	34.1
Class iv	20	22.7
Class v	1	1.1
Family history of psychiatry illness (not in parents)		
No	62	70.5
Yes	26	29.5
History of excessive drinking by father (>3 drinks over the period of 6 months)		
No	79	89.8
Yes	9	10.2
History of mothers smoking during pregnancy		
No	34	38.6
Yes	54	61.4
History of mothers drinking during pregnancy		
No	20	22.7
Yes	68	77.3

* Fathers occupation using the social class classification by Borofka and Olatawara (1976) Skilled/social class I (e.g. highly skilled, professionals Doctors, Engineers) Intermediate/social class II (skilled professional (e.g. Technician, Nurses etc.)

Semi-skilled/ social class III (e.g. Junior Clerk, Driver etc) Unskilled/social class IV (Housewives, petty traders etc) Unemployed/social class V.

Table 3. Logistic Regressions for variables showing significant outcome on univariate analysis only.

Predictor	Odds ratio	95% CI	P-value
		(lower-upper)	
Marital status of parents (Single/Divorced)**	6.750	1.156 – 39.398	0.008
Mother smoking while pregnant (Yes)	0.211	0.70 – 0.631	0.003
Mother drinking while pregnant (Yes)	0.218	0.72 – 0.610	0.007
Mode of delivery (other than spontaneous)	3.189	1.081 – 9.398	0.029
Abnormal neonatal period (Yes)	0.566	0.193 – 1.662	0.219
Age at start of school (5 years)	0.150	0.011 – 2.055	0.013
Residence	0.595	0.066 - 5.361	0.059
Father's education	0.700	0.642 -2.035	0.575
Mother's education	3.636	0.636- 20.591	0.182
Marital discord (Yes)	0.147	0.761 – 6.192	0.125
Father's psychiatric illness (Yes)	0.872	0.720 - 9.355	0.582
Mother's psychiatric illness (Yes)	1.956	0.701 – 5. 454	0.152
Family psychiatry illness (Yes)	0.333	0.180 – 6.191	0.302
Parent's chronic illness (Yes)	0.324	0.022 – 7.201	0.135
Father's excessive drinking (Yes)	1.216	0.225 – 6.574	0.821
Hospital admittance (Yes)	0.368	0.119 – 1.132	0.062
Gender (Male)	1.009	0.981 – 1.037	0.548
Age (6-9 Years)	1.092	0.343 - 3.400	0.380
School grade	0.659	0.224 - 1.944	0.331
Patient receiving extra lesson	0.399	0.136 – 1.172	0.187
Child nutritional status (Malnourished)	2.700	0.633 – 11.509	0.094

"Variables in the brackets after each predictor are the highest impact variable of the predictors

Predictor	Odds ratio	95% Cl (lower-upper)	P-value
Marital status of parents (Single/Divorced)***	0.37	0.16 – 0.84	0.001
Mother smoking while pregnant (Yes)	25.62	2.18 - 300.88	0.004
Mother drinking while pregnant (Yes)	8.50	1.55 – 46.64	0.005
Mode of delivery (other than spontaneous)	0.51	0.30 - 0.89	0.018
Age at start of school (5 years)	9.17	1.72 – 48.91	0.029

Table 4. Logistic Regressions for variables showing significant outcome on multivariate analysis

Variables in the brackets after each predictor are the highest impact variable of the predictors

Findings of Rutter et al., (1975), earlier mentioned above. Biederman et al. (2002) also reported a contrary finding to this study, as they found a positive association between ADHD in children with Rutter's six indices of family adversity (1975). This study did not find such associations with family characteristics such as large family size and marital discord. In addition, Scahill et al. (1999) reported maternal history of psychiatric illness and paternal history of excessive alcohol use as significantly associated correlates of ADHD in children. Lack of positive association between the above factors and ADHD in this study might possibly be explained by the fact that the families in the study setting were characterized by extended family systems with strong family support to take care of children and adolescents from such families. This protective cultural mechanism might have masked the impact of family factors which would have been found in the studies by Biederman, Rutter and their colleagues.

Nigeria was also cited by the WHO to have very poor maternal and perinatal health outcomes (World Health Organization, 2005). According to world health report 2005, maternal mortality rate is equal or more than 1000 per 100, 000 live births while perinatal mortality is 58.6 per 1000 per live births. This study found maternal drinking and/or smoking while pregnant with index patient and the modes of delivery other than spontaneous (e.g. caesarian sections, forceps delivery, vacuum delivery etc) were all associated with presence of ADHD. In one study, smoking was found to be associated with ADHD (Milberger et al., 2002). The protective nature of spontaneous vertex delivery may be accounted for by the fact that it carries less risk of hypoxic brain insult than other modes of delivery. Perinatal adverse events have been reported in the literature to be directly associated with a high prevalence of ADHD (Canino et al., 2004; Autti, 2000; Milberger et al., 2002; Scahill et al., 1999; Amor et al., 2005). Therefore, the very poor state of maternal and child health indices in the country further support the association found in this study. Our study did not find positive association between abnormal neonatal period and ADHD. This was in contrast to the study by Amor and his colleagues (2005) that reported neonatal

complications to be commoner among children with ADHD compared to those without ADHD. This might be due to the fact that most of our study participants only had minor illnesses during their neonatal period and were promptly treated.

Children who had started school by the age of 5 vears were found to have higher rates of ADHD. Others have reported similar findings in other climes (Kashala et al., 2006). We found that age 5 at start of school carried a 9 fold increase in onset of ADHD. Other variables studied such as school grade and receiving extra lesson or not were not found to be associated with ADHD. These school-related factors have been reported in the literature to be positively correlated in some studies but not in others. Bauermeister et al. (2007) found no evidence of increased poor grade achievement among children with ADHD while Barkley et al (1990) and Busch et al (2002) reported that school impairment, as evidenced by poor grades, higher needs for special tutoring sessions, repeated classes and school suspensions or expulsions were all associated with ADHD. School impairment may not be accounted for by ADHD only but also by co-morbid conditions like depression, conduct disorder, and intellectual disability. In this study setting, children receive extra lessons not because of poor academic standard but to give the parents respite at home by keeping the children gainfully engaged.

Place of residence did not contribute to ADHD prevalence, in keeping with other reports, although the majority of participants were recruited from urban areas (Canino *et al.*, 2004; Szatmari *et al.*,1989; Skounti *et al.*, 2007; Biederman *et al.*, 2000).

CONCLUSION/RECOMMENDATIONS

This study has significant implications for policy makers to initiate primary preventive measures that would be focused towards the reduction of identified risk factors in this study. A possible start could be via an improvement in antenatal care services. Clinicians working in the area should be alerted to the possibility of ADHD among children they treat, and where required prompt referrals should be made to centers with the required expertise and facilities, in order to prevent resultant complications such as poor academic performance, parental stress and social ostracization. This work has also highlighted a need for more epidemiological studies, especially community based surveys, involving various medical specialties, psychologists, sociologists, in order to generate baseline data about ADHD and indeed, other mental health conditions in children. This would be vital information for the planning and development of services targeted at the identified needs in this settings.

LIMITATIONS

The study was carried out on a clinical sample of participants which might not provide the true correlates of ADHD among children in the general population. Future studies should be carried out in community sample to avoid this limitation. Co-morbidities were not systematically excluded in the study, though the clinician interview made some attempt in this regards. It would have been more ideal to specifically screen for and exclude co-morbid conditions. The study did not also distinguish between the subtypes of ADHD, but rather focused on those who symptomatically had externalizing behaviours.

ACKNOWLDEGEMENT

The authors are grateful to all parents, Drs Muktar Gadanya and Faisal Saleh Dankishiya, those who assisted in the study in one way or the other and to the management of Aminu Kano Teaching Hospital. We are particularly thankful to the patients who accepted to participate in the study.

CONFLICT OF INTEREST

The authors hereby declare that no financial support was received from any company or individual to conduct this study.

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How to cite this article: Sale S, John Joska J (2014). Correlates of Attention Deficit/Hyperactivity Disorder (ADHD) Among Children in a Clinical Psychiatric Center in Northern Nigeria. Int. J. Med. Med. Sci. Vol. 1(6): 69-76