Original Article

Access this article online	
Quick Response Code:	**Website:** www.annalsafrmed.org
	DOI: 10.4103/1596-3519.82065

Community survey of attention-deficit/hyperactivity disorder among primary school pupils in Benin City, Nigeria

E. A. Ambuabunos, E. G. Ofovwe, M. O. Ibadin

Department of Child Health, University of Benin/University of Benin Teaching Hospital, Benin City, Nigeria

Correspondence to: Dr. Micheal O. Ibadin, Department of Child Health, University of Benin/University of Benin Teaching Hospital, Benin City, Nigeria. E-mail: mikobadin@yahoo.com

Abstract

Background: Attention-deficit/hyperactivity disorder (ADHD) is a common childhood neuro-developmental condition with early onset. ADHD affects children worldwide. However, there is a variation in the prevalence across different countries. In Nigeria, there is paucity of information on the prevalence. To provide the relevant information, a cross-sectional study was conducted between February and August 2006 among 1473 public primary school pupils aged 6–12 years selected systematically among pupils in Egor Local Government Area of Edo State.

Materials and Methods: All the 1473 pupils were screened with the Disruptive Behavior Disorder (DBD) Rating Scale to identify children who had ADHD symptoms as contained in the DSM -IV. Such children were compared with randomly selected controls. The academic records of both the groups were also compared.

Results: The prevalence of ADHD was 7.6%. The prevalence was higher in boys (9.4%) when compared to girls (5.5%) (P = 0.003). Of the three different subtypes of ADHD, the predominantly inattentive subtype (ADHD-I) was the most prevalent (47.3% of the ADHD population) followed by the combined type (ADHD-C; 31.3%), while the least prevalent was the hyperactive/impulsive subtype (ADHD-HI; 21.4%). There was no statistically significant difference in the prevalence of ADHD amongst the different age cohorts.

Conclusion: The prevalence of ADHD was relatively high when compared to the figures available for other countries. For this reason, there is a need to pay increased attention to this condition in Nigeria. Community screening under the umbrella of the School Health Program could be of assistance.

Keywords: Attention deficit, Benin City, children, disorder, hyperactivity, Nigeria

Résumé

Background: Attention-defi cit/hyperactivité (TDAH) est une commune neurodéveloppementaux enfance condition avec précoce. TDAH touche les enfants dans le monde entier. Cependant, il y a un variation de la prévalence dans différents pays. Au Nigéria, il y a peu de renseignements sur la prévalence. Pour fournir l'information pertinente, a effectué une étude transversale entre février et août 2006 parmi les 1473 élèves de l'école primaire publique âgés de 6 à 12 ans sélectionné systématiquement chez les élèves en Egor zone du gouvernement Local de Edo État.

Matériaux et procédés: Tous les élèves de 1473 ont été testés avec les troubles de comportement perturbateur (DBD) Échelle de cotation pour identifier les enfants qui ont des symptômes du TDAH tel qu'il figure dans le DSM -IV. Ces enfants ont été comparés aux témoins choisis au hasard. Les dossiers académiques des deux le groupes ont également été comparées.

Résultats: La prévalence du TDAH était de 7,6%. La prévalence était plus élevée chez les garçons (9,4%) quand par rapport aux filles (5,5%) (P = 0,003). Des trois différents sous-types de TDAH, la prédominance sous-type inattentif (TDAH-je) a été suivie de la plus répandue (47,3% de la population de TDAH) par le type combiné (TDAH-C; 31,3%), tandis que les moins répandues était l'hyperactif/impulsif sous-type (TDAH-HI; 21,4%). Il n'y avait pas statistiquement signifi cant différence dans la fréquence des TDAH parmi les cohortes d'âge différentes.

Conclusion: La prévalence du TDAH était relativement élevée par rapport à la chiffres disponibles pour les autres pays. Pour cette raison, il est nécessaire d'accorder une attention accrue à cette condition au Nigéria. Communauté de dépistage dans le cadre du programme de santé scolaire pourrait être de assistance.

Mots clés: Protection defi cit, ville du Bénin, enfants, trouble, hyperactivité, Nigeria

Introduction

Attention-deficit/hyperactivity disorder (ADHD) is the most common neurobehavioral disorder of childhood.[1] The National Institute of Health (NIH) in the United States estimates that ADHD affects between 3% and 5% of all children.[1,2] Children with ADHD may experience significant functional problems such as educational underachievement, increased incidence of physical injuries, troublesome interpersonal relationships with family members and peers and low self-esteem.[2,3]

Early recognition and management of children with ADHD can redirect their educational and psychosocial development.[1] Studies done in various parts of the world have emphasized the importance of ascertaining the prevalence of ADHD in different sub-regions.[2,4] The prevalence of ADHD has been shown to vary from country to country and even within a country, from region to region.[2,4] The prevalence also varies with the diagnostic method used. In assessing the prevalence, a community surveillance approach is preferred. In such settings, teachers and other care givers are sensitized to the presence of the disorder and thus empowered to identify possible cases. Besides, there is paucity of data on the prevalence of ADHD in Nigeria and other African countries.[4,5]

If the prevalence of ADHD in the sub-region is known and the burden of the condition on the child, the family and society is identified, health professionals, relevant government bodies and non-governmental agencies could be sensitized to the presence of the disorder. Perhaps, by identifying and helping these children, the school drop-out rate could be reduced. It is also desirable to know its contribution to educational underachievement.

Materials and Methods

The study was a descriptive, cross-sectional one, undertaken between February 2006 and August 2006, in Egor Local Government Area (LGA) of Edo State. Egor has 10 geopolitical wards with a population of 229,681.[6] Population of children aged 6–12 years is estimated to be 54,808 with almost equal male (27,895) and female (26,913) representation.[7] The inhabitants' social status cut across different strata. Their occupation varies from trading in food stuffs, wears and miscellaneous items, to farming, civil service and small entrepreneurial jobs.

Only pupils in the public primary school, aged 6–12 years, were included in the study because of incomplete data or wrong school addresses of the private schools from the State Ministry of Education. Primary school attendance is compulsory nationwide. In this study, nonetheless, teacher's rating of the child was required for the diagnosis of ADHD, making school population suitable. The age group 6–12 years was chosen because most prevalence studies were done in this age group,[2] and moreover, the AAP specifically recommends DSM-IV for this age group.[1] School community was studied here as some features of ADHD are only made apparent when a child is in an environment that demands increased mental task as in the school. The 2nd and 3rd terms were chosen to ensure that the teachers had spent a long enough time with the pupils to attest to their individual behavior.

Ethical consideration

Ethical clearance was obtained from the Ethical Committee of the University of Benin Teaching Hospital (UBTH), Benin City. Permissions to carry out the study were also obtained from the Primary School Local Education Authority, State Ministry of Education and the Local Government Council. Informed consents were obtained from the head teachers and class teachers of the selected schools.

The parents or guardian of the children interviewed gave written informed consent for the study. Subjects were excluded from the study for the following reasons: indeterminate age, decline of consent by parent(s)/guardian, history of overt mental sub-normality, seizure disorder or other gross neurological defect(s) that could interfere with their rating and where the pupils had spent less than a full term (approximately 3 months) in the class as at the time of assessment.

Methods

Instruments

The DSM-IV requires that a child meets some specified criteria before he or she is diagnosed as having ADHD.[8] The Disruptive Behavior Disorder

(DBD) Rating Scale described by Pelham and co-workers[9] as well as questionnaires for parents' and teachers' interviews were used in the study.

Selection of subjects

Study subjects were selected from participating schools using multi-stage random sampling technique. The sample frame was drawn from 9 (30%) out of the 31 public schools in the local government area by simple random sampling method. There are six class levels in the schools, which is primary 1–6. Each class in the schools contained three arms (i.e. primary 1a, 1b and 1c). To ensure adequate representation of the various cohorts, the sample size of 1500 pupils was shared equally amongst classes 1–6. Thus, 250 pupils (1500 ÷ 6 = 250) were to be selected from each class of all the schools combined together by cluster sampling method. Since the classes were suitable clusters of homogeneous population, all the classes were listed in order of population ranking and classes selected using table of random numbers. All the pupils in the selected arm of the class were recruited if they met the inclusion criteria.

Assessment

A two-stage procedure was employed to identify pupils who met the DSM-IV criteria for the diagnosis of ADHD.[8] The first procedure involved screening of all selected pupils using the DBD rating scale as completed by the class teacher. This was to identify those who have the ADHD symptoms.[8] The second stage involved interviews with the teachers and parents of the identified children to confirm if they met the DSM-IV criteria for diagnosing ADHD. The identified pupils (those with ADHD symptoms) were also examined in this second stage. The procedure yielded three categories of children.

1. Those with ADHD symptoms but who did not meet all the DSM-IV criteria following interview and physical examination.
2. Those who met all the DSM-IV criteria for the diagnosis of ADHD (cases).
3. Those who did not belong to any of the above two categories.

Prior to commencement of the study, a pilot study had been conducted in a primary 2 class of one of the schools not selected for the main study.

Stage II

Pupils who met the ADHD symptoms criteria from the DBD screening were visited in their various classes. For each pupil identified, the teacher was interviewed to obtain more information relating to the DSM-IV criteria, using a teacher interview

questionnaire designed for the purpose. The parents of the pupils with ADHD symptoms were also interviewed using a questionnaire designed for that purpose. The major languages spoken in the area studied are "Bini" and "English"; however, modified English called "Pidgin English" is spoken by over 90% of the population. The interviewers consisted of one of the authors, AAE, and two other research assistants. The research assistants were intern doctors who were rotating through the Neurology Unit of Child Health Department, UBTH, and had adequate training on ADHD, use of DBD and DSM-IV criteria. Both of them speak Bini and Pidgin English fluently. The questionnaires were completed by researcher or the assistants and the information was obtained from the parents in English, Pidgin or Bini, depending on which one the parents are comfortable with.

The interview of the teachers and parents for a particular child was done by different researchers. Where the parents could not be reached, the child's primary care giver was interviewed. Classification of the parents' socioeconomic status was based on the method described by Olusanya and co-workers.[10]

Diagnosis of attention-deficit/hyperactivity disorder

This was based on the following:
1. The child having the number of symptoms required by the Diagnostic and Statistical Manual of mental disorders fourth edition (DSM-IV) from the teacher's DBD ratings.
2. At least one of the symptoms being confirmed by parents as also present at home.
3. Onset of the symptom occurring not later than the age of 7 years and persisting for at least 6 months, plus impairment of functioning at school and at home.

The children were also examined for gross neurological signs. The method described by Fabiano and co-workers[11] was used for determining impairment of functioning.

Data handling and analysis

The DBD ratings of individual pupils were entered into Microsoft Excel Sheet for sorting and cross-checking the accuracy for subjects who met the DSM-IV criteria for the diagnosis of ADHD, and those who did not were sorted and copied to a separate sheet to facilitate examination. The data were exported to the Statistical Package for Social Science Software (SPSS version 13) for calculation of frequency distributions and creation of contingency tables. The data were sorted by age.

Data from the teachers' and parents' questionnaires

were also entered into Excel sheets. Chi-square test or Fisher's exact test as appropriate was used to test for differences between groups. *P*-values <0.05 were interpreted as indicative of statistical significance.

Results

General characteristics of subjects

DBD ratings were obtained for 1,512 pupils. However, the data for only 1,473 (97%) pupils, which met the inclusion criteria, were analyzed. Of the 1,473 pupils, 784 (52.2%) were males and 689 (46.8%) were females, giving a male to female ratio of 1.1:1. The distribution of the subjects by age group and gender is as shown in Table 1. The mean age of the population was 9.3 ± 2.0 years.

Prevalence of attention-deficit/hyperactivity disorder

Out of the 1,473 pupils screened, 201 had ADHD symptoms. Of the 201 pupils, 112 (55%) met the full DSM IV criteria for the diagnosis of ADHD. This gave a prevalence of 7.6%.

Gender-specific prevalence

Males with ADHD were 74 out of 784, giving a prevalence of 9.4%, whereas females were 38/689, giving a prevalence of 5.5%. The gender difference in prevalence was statistically significant ($P = 0.006$; 95% Cl 1.19–2.66).

Prevalence of subtypes of attention-deficit/hyperactivity disorder

The most prevalent subtype of ADHD was the predominantly inattentive subtype (ADHD-I), followed by the combined subtype (ADHD-C), while the least prevalent was hyperactivity/impulsive subtype (ADHD-HI). This is presented in Table 2.

This pattern was similar in both males and females. There was no significant association between gender and the prevalence of the various subtypes of ADHD ($P = 0.890$).

Age-specific prevalence of attention-deficit/hyperactivity disorder

The-age specific prevalence of ADHD is shown in Table 3. The prevalence of ADHD among the different age cohorts ranged from 5.3 to 9.4%. It was lowest in the 6 years age cohort, rose to a peak among the 9 years age cohort, then declined. However, the observed differences between the age groups were not statistically significant ($P = 0.691$).

In males, the prevalence was lowest among those aged 6 years (5.9%), rose to a peak among those 9 years of age (12.6%), and thereafter declined to 9.4% among those aged 12 years. However, in females, the prevalence of ADHD was lowest among those of 7 years of age (3.4%), peaked at the age of 10 years (8.2%), and declined to a much lower rate (3.8%) than that obtained in males at the age of 12 years.

Discussion

The prevalence of ADHD of 7.6% found in the study is comparable to the 8.7% reported from Ilesa, Osun State, in 2007 by Adewuya *et al*.[12] Both the studies used the DSM-IV criteria in arriving at the diagnosis of ADHD. Sample sizes are also comparable. However, this study differs from the Ilesa study as the tool employed in screening for ADHD symptoms in that study was the VADTRS. The VADTRS, unlike the DBD rating scale,

Table 1: Age and gender distribution of the study subjects

Age group (years)	Gender				Total	%
	Male		Female			
	No.	(%)	No.	(%)		
6–9	387	26.2	348	23.6	735	50.0
10–12	397	27.0	341	23.2	738	50.0
Total	784	53.2	689	46.8	1473	100.0

Table 3: Distribution of attention-deficit/hyperactivity disorder prevalence according to age

Age	Sample size (n)	Prevalence of ADHD	
		No.	(%)
6	190	10	(5.3)
7	175	12	(6.9)
8	167	13	(7.8)
9	203	19	(9.4)
10	267	24	(9.0)
11	220	18	(8.2)
12	251	16	(6.4)
Total	1,473	112	(7.6)

Group $\chi^2 = 3.893$; df = 6; $P = 0.691$, ADHD = Attention-deficit/hyperactivity disorder

Table 2: Distribution of attention-deficit/hyperactivity disorder subtypes by gender

Gender	ADHD-I	ADHD-HI	ADHD-C	Total
Male	35 (47.3)	15 (20.3)	24 (32.4)	74 (100.0)
Female	18 (47.4)	9 (23.7)	11 (28.9)	38 (100.0)
Total	53 (47.3)	24 (21.4)	35 (31.3)	112 (100.0)

Gender difference: $\chi^2 = 0.234$; df = 2; $P = 0.890$; Figures in parentheses are in percentage, ADHD = Attention-deficit/hyperactivity disorder

includes some aspects of psychometric evaluation. The psychometric aspects of VADTRS consist of a 7-item scale for anxiety and depressive symptoms. Anxiety and depression, unlike ADHD, are not classed as Disruptive Behavior Disorders in the DSM-IV, thus their symptoms are not included in the DBD rating scale.

Only few prevalence studies have used the full DSM-IV criteria. Most studies have reported prevalence rates based on the symptom criteria alone,[5,13] without considering the functional impairment criteria. Outside Africa, studies done in the United States by Wolraich *et al.*,[14] in Australia by Graetz *et al.*,[15] in Puerto Rico by Canino *et al.*,[16] and in Italy by Mugnaini *et al.*,[17] reported prevalence figures based on the full DSM-IV criteria. The prevalence rates from these countries are comparable to that found in the present study. These were 6.8%,[14] 6.8%,[15] 8.0%[16] and 7.1%,[17] respectively.

The prevalence rate obtained in the present study suggests that ADHD is as common in school age children in Nigeria as in other parts of the globe.

However, studies that used partial criteria based on symptoms with no functional impairment criteria had widely varied prevalence rates. In Colombia, for instance, Cornejo *et al.*[18] reported a prevalence of 15.8% using the Conner's rating scale, while in Taiwan, Wang *et al.*[19] reported a prevalence of 9.9% using the same rating scale among the Chinese. Similarly, the prevalence rates from the Australian[15] and Puerto Rican[16] studies where impairment criterion was not considered were 14.7% and 8.9%, respectively, using the same rating scale (DISC-IV). Generally, when the full DSM-IV diagnostic criteria for ADHD are applied, the prevalence figures tend to be lower and fairly uniform.[2] Walraich *et al.*[14] in the US reported that the prevalence rate in Tennessee County was 16.1% without the use of impairment criterion and 6.8% when impairment was taken into consideration.

It is perhaps useful to point out here that previous prevalence studies from other African countries did not use the full DSM-IV criteria. The study done in South Africa by Mayer *et al.*[5] and in the Congo DR by Kashala *et al.*[13] both used the DBD rating scale. The prevalence rates obtained from these studies were 7.1% and 6.0%, respectively.

There was a significant gender difference in the prevalence of ADHD in the study, with a higher prevalence in males. Most community-based studies have relatively lower male to female ratios as opposed to studies using referral samples. The male to female ratios in some of the community-based studies are the following: Ilesa 2:112, Puerto Rico 2:1,[16] Australia 2:1,[15] and South Africa 2.3:1.[5] No gender differences were found in the studies reported from Spain in 2004[20] and 2007[21] and the Congo DR.[13]

Some authors have suggested that the higher prevalence ratio in hospital-based studies reflects referral bias.[22] They argued that boys rather than girls are more likely to be referred due to their hyperactivity and oppositional behaviors. The gender difference in this study was less obvious for the inattentive subtype and this finding is similar to what was reported by the Technical Review Committee of the US Department of Health and Human Services following the review of many publications.[2] The less obvious gender difference noted with the inattentive subtype may be attributed to the fact that girls usually have more of inattention and less of hyperactivity impulsivity.[22] In the present study, inattentive type was the most common of the subtypes.

No significant difference was found in the age-specific prevalence of ADHD in the current study. The prevalence was lowest at the age of 6 years and rose progressively to a peak at the age of 9 years. Although it is generally stated that the younger the child the more likely that he or she will be diagnosed as having ADHD, the lower prevalence rate observed in the younger age cohorts in this study might reflect the teacher's perception of their behavior. Younger children are normally expected to be more active and less attentive. Thus, teachers might be tolerant of such behaviors and not rate many of them as abnormal or "very much" on the DBD rating scale. Moreover, the academic demand in the early school age is relatively little, suggesting that the children's behavior may have little impact on their academic performances. These factors might contribute to the lower rates observed in younger children.

The studies from Puerto Rico[16] and Australia[15] found a decline in the prevalence of ADHD with increasing age. On the other hand, Graetz *et al.*[15] in Australia noted that within the age range of 6–12 years, no significant difference existed in the prevalence of ADHD. Similar trend was noted in the South African[5] study.

The findings in the present study are consistent with those contained in the Technical Review Committee report which observed no significant differences in the prevalence of ADHD within the age cohort 5–12 years. The lack of significant difference in age-specific prevalence in the age bracket 6–12 years as found in this and other studies[5,13] further supports

the recommendation that the AAP guidelines on ADHD should be restricted to children between the ages of 6 and 12 years only.[1]

It is of serious concern that despite the strict criteria used in defining ADHD, the prevalence obtained in the study is high. It is also important to note that in the studies carried out in America, Europe and Australia, subjects included those known to have ADHD and a number of them were in fact on treatment.[14,15,17] In contrast, none of the subjects in the present study had previously been so identified. Affected children are more likely to sustain physical injury or cause injury to others. Home accidents like hot water burns, drowning and accidental ingestion of harmful substances are also more likely in these "adventurous" children.

In conclusion, ADHD is as prevalent in Nigeria as it is in other parts of the world, with more males involved.

It is recommended that efforts be made at creating public awareness for ADHD, especially amongst teachers and parents. Besides, increased attention should be paid to the identification and management of such children with the aim of redirecting their social and academic lives. School health program may offer veritable avenue for the identification of such children.

References

1. American Academy of Paediatrics Committee on Quality Improvement, Subcommittee on Attention-Deficit/ Hyperactivity Disorder: Clinical Practice Guideline: Diagnosis and Evaluation of the Child with Attention Deficit/Hyperactivity, Paediatrics, 2000:105:1158-69.
2. Green M, Wong M, Atkins D, Taylor J, Feinleib M. Diagnosis of Attention Deficit/Hyperactivity Disorder: Technical Review 3. Rockville, MD US Department of Health and Human Service. Agency for Health Care Policy and Research: AHCPR Publication; 1999.
3. DiScala C, Lescohier I, Barthel M, Li G. Injuries to children with attention deficit hyperactivity disorder. Paediatrics 1998:102:1415-21.
4. Polanczyk G, Lima DM, Horta BL, Biederman J, Rohde IA. The worldwide prevalence of ADHD: A systematic review and metaregression analysis. Am J Psychiatry 2007;164:942-8.
5. Mayer A. Attention Deficite/Hyperactivity Disorder among North Sotho speaking primary school children in South Africa: Prevalence and sex ratios. J Psychol Afr 1998:8:186-95.
6. Geopolitical Wards and Map of Egor Local Government Area. Engineering Section, Egor Local Government Headquarters, Edo State. 2003.
7. National Census 1991, Midyear Projected Value for 2005. National Population Commission, Akpakpava, Benin City, Edo State.
8. Diagnostic and Statistical Manual of Mental Disorders. 4th ed. Washington DC: American Psychiatric Association; 1994.
9. Pelham WE, Gnagy EM, Greenslade KE, Milich R. Teachers rating of DSM-III-R symptom for the disruptive behaviour disorders. J Am Acad Child Adolesc Psychiatry 1992;31:210-18.
10. Olusanya O, Okpere E, Ezimokhai M. The importance of social class in voluntary fertility control in a developing country. W Afr J Med 1985;4:205-11.
11. Fabiano GA, Pelham WE, Waschbusch DA, Gnagy EM, Lahey BB, Chronis AM, *et al.* A practical measure of impairment: Psychometric properties of impairment rating scale in sample of children with attention deficit hyperactivity disorder and two school based samples. J Clin Child Adolesc Psychol 2006;35:369- 85.
12. Adewuya AO, Famuyiwa OO. Attention deficit hyperactivity disorder among Nigerian primary school children. Prevalence and co morbid conditions. Eur Child Adolesc Psychiatry 2007;16:10-5.
13. Kashala E, Tylleskar T, Elgen I, Kayembe KT, Sommerfelt K. Attention deficit and hyperactivity disorder among school children in Kinshasa, Democratic Republic of Congo. Afr Health Sci 2005;5:172-81.
14. Wolraich ML, Hannah JN, Brown J. Comparison of the diagnostic criteria for attention deficit/hyperactivity disorder in a country-wide sample. J Dev Behav Pediatr 1998;19:162-8.
15. Graetz BW, Sawyer MG, Hazell PL, Arney F, Baghurst P. Validity of DSM-IV ADHD subtypes in a nationally representative sample of Australian children and adolescents. J Am Acad Child Adolesc Psychiatry 2001;40:1410-7.
16. Canino G, Shrout PE, Rubio-Stipec M, Bird HR, Bravo M, Ramirez R, *et al.* The DSM-IV rates of child and adolescent disorders in Puerto Rico: Prevalence, correlates, service use, and the effects of impairment. Arch Gen Psychiatry 2004;61:85-93.
17. Mugnaini D, Masi G, Brovedani P, Chelazzi C, Matas M, Romagnoli C, *et al.* Teacher reports of ADHD symptoms in Italian children at the end of first grade. Eur Psychiatry 2006;21:419-26.
18. Cornejo JW, Osio O, Sanchez Y, Carrizosa J, Sanchez G, Grisales H, *et al.* Prevalence of attention deficit hyperactivity disorder in Colombian children and teenagers. Rev Neurol 2005;40:716-22.
19. Wang YC, Chong MY, Chou WJ, Yang JL. Prevalence of attention deficit hyperactivity disorder in primary school children in Taiwan. J Formos Med Assoc 1993;92:133-8.
20. Cardo E, Servera-Bracelo M. The prevalence of attention deficit hyperactivity disorder, Rev Neurol 2005;40:1-5.
21. Cardo E, Servera M, Llobera J. Estimation of the prevalence of attention deficit hyperactivity disorder among the Standard population on the Island of Majorca. Rev Neurol 2007;44:10-4.
22. Root RW, Resnick RJ. An Update on the diagnosis and treatment of Attention Deficit/Hyperactivity Disorder in children. J Prof Psychol Res Pract 2003;34:34-41.