THE PREVALENCE OF ATTENTION DEFICIT HYPERACTIVITY DISORDERS IN A CLUSTER OF PRIMARY SCHOOLS IN THE AYAWASO SUBMETRO, ACCRA, GHANA

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Abstract

Background: Attention deficit hyperactivity disorder (ADHD) is a heterogeneous group of disorders characterized by a high level of inattentive, hyperactive and impulsive behaviour that begins in childhood. It is developmentally inappropriate and impairs the functional life of the affected child at home and at school. Although ADHD is a very common childhood developmental disorder, it is not given the attention it deserves in childhood disorders in Ghana. Children affected by ADHD present with numerous psychosocial problems in the communities they live, wherever they find themselves, and in later life. These psychosocial problems include substance, child and sexual abuses. They also present a range of psychiatric and behavioural disorders e.g. suicides and homicides. They are prone to becoming school dropouts, armed robbers and prostitutes. The present study looked at the prevalence of ADHD in a cluster of primary schools in Accra, Ghana. This study is expected to give evidence for early secondary prevention.

Methods: Using random sampling, 18 primary schools were selected from 58 primary schools in the Ayawaso sub metropolitan area in Accra, Ghana. Six out of the eighteen primary schools refused to take part in the study for various reasons. The final cohort of pupils, were from 12 schools with a total population of four hundred and four (404). Their ages ranged from 5 to 9 years. Parents, guardians and teachers were asked to complete the rating scores of symptoms of ADHD by Corners which is based on DSM-IV. The study also assessed the educational status of guardians and parents from the questionnaires.

Results: The total number of ADHD males and females was forty (40) and thirty seven (37) respectively. The prevalence of ADHD in the males and female cohorts were ten percent (10%) and nine-point one percent (9.1%) respectively, making a total prevalence of nineteen-point one percent (19.1%).

Conclusion: The prevalence of ADHD in the selected primary schools was nineteen-point one percent (19.1%). The study also showed that lower socio-educational status may be a positive risk factor for ADHD.

Key Words: Prevalence rates, ADHD, selected primary schools, Ayawaso Sub Metro, Accra

Introduction

Attention deficit hyperactive disorder (ADHD) is a heterogeneous group of disorders characterized by a high level of inattentive, hyperactive and impulsive behaviour that begins in childhood. It is developmentally inappropriate and impairs the functional life of the affected child at home and at school[1].

Indeed, attention deficit hyperactive disorder (ADHD) is the most common of the childhood developmental disorders which may persist into adolescence and adulthood[2]. Children who are affected by this disorder present medical and psychosocial problems in the community they may find themselves later in life. These problems include substance abuse, child and sexual abuse, suicides and homicides, school dropouts, difficulties with relationships, prostitution, armed robbery and many other criminal activities[3].

The International Consensus Statement on ADHD (2002)[4] observed that children with ADHD have few or no friends, poor performance at work and are likely to experience teenage pregnancy and sexually transmitted diseases. They are more likely to be involved in multiple road accidents due to over speeding. As adults, they mismanage their lifes and endanger the lifes of others. The prevalence of ADHD is reported to range from two percent (2%) to twenty percent (20%) in grade-school children[5]. However, a more conservative figure is 3-5% of elementary school children. ADHD is more common in boys than girls with a lower gender ratio of 3 to 1 and a higher ratio 5 to 1.

Even though the causes of ADHD are unknown, there are numerous associated findings which may be etiologically significant. Recently, a gene has reliably been demonstrated to be associated with ADHD and currently there are more than twelve different scientific teams worldwide in search of more genes which may be associated with ADHD. The recently demonstrated

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genetic basis is reported to be a rare chromosome deletion and duplication known as Copy Number Variant (CNV) which is associated with increased risk of different neurodevelopmental disorders such as autism, schizophrenia, intellectual disability, and recently ADHD. Since these Copy Number Variants (CNV) are rare, it raises the possibility that mutation may be associated developmentally with ADHD[6,7]. Langley et al[8] have also reported significant amount of Copy Number Variants (CNV) to be more common in children with ADHD than those without the disorder. There is also greater concordance of ADHD in monozygotic than dizygotic twins. It has been noted that siblings of hyperactive parents have twice the risk of having ADHD as compared to the general population. Thapan et al[9] have observed that the heritability from twin studies ranges from 0.5-0.9 and there is also a five-fold increase in first degree relatives. Biedermann et al[10] reported that biological parents of children with ADHD have a higher risk of developing ADHD than adoptive parents. ADHD also has long been thought to be a result of minimal or subtle brain damage during prenatal, perinatal and post natal periods of early life[5].

Neuro-physiological studies have also shown dysfunctions in certain parts of the brain. These areas include the frontal lobe with its connections to the basal ganglia and the central cerebral aspect of the cerebellum. These areas also show less reaction to brain activity on electrical stimulation. Neuro-imaging studies have shown some areas of less metabolic activity when compared to a control group[11,12]. Several indirect lines of evidence suggest that abnormalities of dopamine transmission occur in ADHD. There is an increasing complication of D_4 dopamine receptor in the causation of ADHD[13]. Environmental risk such as low birth weight, maternal alcohol consumption during pregnancy, nicotine, lead, idiosyncratic reaction to certain food substances, additives, colouring and preservatives have also been implicated as a cause of ADHD[14]. In short, the etiology of ADHD is highly complex and still poorly understood with genetic, epigenetic, neurobiological, environmental and psychosocial factors all contributing.

ADHD is an important area of childhood disorder to investigate because of the behavioural problems which may occur later in life. The present study was to evaluate the prevalence of ADHD in selected primary schools. Permission was also sought from the ethical committee of the Ministry of Education, District office, Accra.

Materials

The study evaluated the prevalence ADHD in Ayawaso Sub metro area in Accra, Ghana. Ayawaso Sub metro consists of five electoral areas; namely Abelemkpe, Dzorwulu, Roman Ridge, Airport Residential area, Okponglo and Legon. All primary schools in the above locality with pupils aged between five years and nine years were included in the study. After random selection of one in every three schools, eighteen (18) schools were obtained. The ages of the pupils ranged from five years to nine years. Of the 18 primary schools, fourteen were privately owned, four were public schools, five participating private schools declined to take part in the study and one address of the public school could not be located. The cohorts were therefore from 12 schools (four public and eight private). After a workshop on ADHD with parents, guardians and teachers, a modified version of DSM-IV by Corners (1969)[15] on ADHD symptoms were administered to parents, guardians and teachers. The parents, guardians and teachers were taught how to evaluate and score the behaviour on the questionnaire. This was done for two hours daily for three days. At the end of the workshop, research assistants were satisfied with the evaluation and scoring of the parents, guardians and teacher's assistance.

Research Settings and Methods

According to the 2009 estimated residential population, Ayawaso West has the lowest population density in Accra Metropolitan Assembly survey, with 1851.7 people per square kilometer, reflecting the large land surface area and the small resident population of about 70, 667, with 37,065 being males and 33,602 being females. Ayawaso west is a large and first class residential area and thus is well planned. It has well developed infrastructure and spacious landscaped properties. According to the 2010 Ghana citizens report survey, 64% of households in Ayawaso West have their children attend private basic schools while 36% attend public basic schools.

All registered primary schools in circuits 21 and 22 of the Ayawaso sub metropolis were demarcated for sampling purposes. All schools that had pupils that fell within the age ranges of 5-9 years qualified for inclusion in the study. Teachers, parents and guardians of pupils at every school also participated in the research. The selected schools cut across all residential areas or neighborhoods existing in the Ayawaso sub metropolis. Table 2[a] provides insight into the different sectors of schools represented in the sample. Random sampling technique of one (1) out of every three (3) schools was used. Eighteen (18) schools were selected out of the fifty-eight (58) schools.

Table 1: A table representing the total number of private and public schools in both circuits of Ayawaso Sub metropolis

Circuits	Public Schools	Private Schools	Total
21	6	18	24
22	8	26	34
Total	14	44	58

Table 1 shows the total number of private and public schools in both circuits. Circuit 21 has six public schools and eighteen private schools making a total number of schools in the circuit twenty-four. Circuit 22 has eight public schools and twenty-six private schools making thirty-four. Thus, the total number of private and public schools in the two circuits was fifty-eight (58).

Table 2[a]: A representation of the number of schools selected

Category	Number	Percentage (%)
Public	4	22.2
Private	14	77.8
Total	18	100

Table 2[a] represent the number of schools selected from the two sector schools. The number of public schools selected was four representing (22.2%) while the number of private schools selected was fourteen representing 77.8%.

Table 2[b]: Shows the actual number of schools which participated in the research

Category	Number	Percentage (%)
Public	3	25%
Private	9	75%
Total	12	100%

There were three public schools (25%) and nine private schools (75%) which took part in the project, after the decline of five (5) private schools and one (1) public school whose address could not be located.

Research Instrument

The guideline used for the diagnosis of ADHD was the Teachers' and Parents' check-list by Corners[15]. which is a modified form of Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV). The DSM-IV requires for ADHD diagnosis, evidence of inattention and/or hyperactivity-impulsivity (combined-symptoms). For the purpose of this study, parents' and teachers' check-list was used. It is mainly based on the DSM-IV guideline.

This DSM-IV guideline includes six or more symptoms of inattention and/or six or more symptoms of inattention and hyperactivity-impulsivity to be noticed six or more months prior to assessment, and also the inattention and hyperactive-impulsive symptoms to be noticed prior to 6 years of age. It also requires a persistent pattern of inattention and or hyperactivity-impulsivity that is more frequently displayed and is more severe than is typically observed in individuals at comparable level of development. The guideline also requires some impairment from these symptoms to be present in at least two settings and there must be clear evidence of interference with developmentally appropriate social, academic or occupational functioning. It further requires that the symptoms do not occur in a pervasive developmental or other psychotic disorder, or are not accounted for by another mental disorder. The study did not cover social, academic and occupational functions of the cohorts. The investigation only dealt with prevalence rate and socio-educational levels of cohorts' parents and guardians.

Corners'[15] symptoms of ADHD which was administered is categorized into a checklist; the teachers' checklists and the parents'/guardians' checklists. Ten critical items are scored in one of four categories: not at all (0), just a little (1), pretty much (2), or very much (3). The critical items scored on the teachers' checklist include; restless in the squirmy sense, demands must be met immediately, distractibility or attention span problem, disturbing other children, restless, always "up and on the go", excitable and impulsive, fails to finish things that he starts, childish and immature, easily frustrated with efforts, and difficulty in learning.

The ten critical items scored on the parents'/guardians' checklist include; excitable and impulsive, difficulty in learning, restless in the squirmy sense, restless "always up and on the go", denies mistakes or blames others, fails to finish things, childish or immature, distractibility or attention span a problem, mood changes quickly and drastically, and easily frustrated in efforts.

The maximum score is thirty (30) points. Scores for children with ADHD vary with age, but a score of eighteen (18) for boys or fifteen (15) for girls supports the diagnosis of ADHD. These symptoms must have been noticed by respondents before the age of six (6) prior to evaluation and scoring. The age range of cohorts for the research was 5-9years.

Research Procedure

The research was approved by the ministry of education and as such there was cooperation from the sub metropolitan area of primary schools involved. The researchers received a list of registered schools within Ayawaso that had pupils within the age range of 5-9 years. This list contained both private and public schools as illustrated in Figure 1.

Before the commencement of the research, introductory letters from the researchers and the ministry of education were sent to selected schools, unfortunately due to wrong address listing, one of the selected public schools couldn't be located. Out of the 17 remaining schools, 5 private schools were unable to participate. The data collected was therefore based on 12

schools in the sub metro. The researchers conducted workshops for parents, teachers and guardians in selected schools that were willing to participate in the research. The workshops provided basic education on ADHD and the role teachers, parents and guardians play in the proper and accurate ADHD diagnoses. The workshops also educated them on treatments options and ways to manage ADHD. The participating schools submitted a list of their pupils whose ages ranged from five (5) to nine (9) years. From the list submitted, the researchers selected one out of every three pupils. The total number of cohorts for the study was four hundred and four (404). Table 3 represents a list of willing participants and the number of randomly selected pupils in respective schools. To maintain the privacy of the schools participating, they are lettered A-L.

Table 3: A representation of the number of selected pupils in participating schools

School	Number of selected pupils	Sector
A	30	Public
B	9	Private
C	44	Public
D	25	Private
E	53	Private
F	20	Private
G	24	Private
H	11	Private
I	23	Private
J	60	Private
K	71	Private
L	34	Public
Total	404	

Table 3 shows the number of selected pupils in participating schools. There was a total of twelve sector schools (A to L) of which three were public sector schools. The total number of pupils selected for the research was four hundred and four pupils (404).

The parents' checklists or questionnaires were given to every parent or guardian of each selected pupil or participant. In addition to this, the parents were also given a questionnaire to determine their socio-educational status and the options included: tertiary educational level (A), secondary educational level (B), basic educational level (C) and others not mentioned above (D). Concurrently, the teachers' checklists were also given out to teachers of selected pupils. After a period of 3-6 weeks, the checklists were then collected from parents, in most cases the fathers and mothers (if they are single), guardians and the teachers. The checklists were then scored and tabulated.

Results

Data obtained from the scores of the checklists were summarized in table 4[a]. Raw data were converted into percentages. Table 4[a] clearly shows the number of diagnosis of ADHD in both the male and female cohorts in the twelve participating schools (A-L).

Diagnosis was made if both parent's, guardian's and teacher's scores were above the cut-off point for ADHD on the questionnaire.

Table 4[a]: A representation of suspected cases of ADHD based on respondents scores

School	Cases of Suspected ADHD (males)	Cases of Suspected ADHD (females)	Total	(%)
A	1	2	3	3/30= 10
B	3	0	3	3/9= 33.3
C	2	1	3	3/44= 6.8
D	2	0	2	2/25= 8
E	4	5	9	9/53= 16.9
F	5	3	8	8/20= 40
G	1	3	4	4/24= 16.7
H	0	1	1	1/11= 9.1
I	2	3	5	5/23= 21.7
J	9	5	14	14/60=23.3
K	4	10	14	14/71 19.7
L	7	4	11	11/34=32.4
Total	40	37	77	77/404=19.1

There were forty males (40) and thirty seven (37) females with suspected diagnosis of ADHD. The total number of pupils with suspected cases of ADHD is seventy seven (77). This represents 19.1% of the total number of selected pupils. Ten percent (10%) were

males and nine point one percent (9.1%) were females. There was no female suspected cases of ADHD in sector schools B and D and no male suspected cases of ADHD in sector school H.

Primary school C has the lowest (6.8%) cases of ADHD with the highest level of tertiary education of the parents and guardians. This is followed by primary school D which has 8.0% of ADHD cases and also has parents and guardians with tertiary level of education. Primary schools H and A have 9.1% and 10% respectively with cases of ADHD, with basic educational levels of parents and guardians. Primary schools G and E have 16.7% and 16.9% of cases respectively with surprisingly high tertiary level of education in both schools. The following schools (K, I, J, L, and F) with high numbers of suspected cases of ADHD had parents with basic or lower levels of education.

Table 4[b]. Shows primary schools, the respective percentage of suspected cases of ADHD diagnosis in increasing order and the level of educational status of the parents and guardians.

Rank	Primary School	Percentage of ADHD Cases	Educational Levels of Parents and Guardians
1st	C	6.8%	Tertiary
2nd	D	8.0%	Tertiary
3rd	H	9.1%	Basic
4th	A	10%	Basic
5th	G	16.7%	Tertiary
6th	E	16.9%	Tertiary
7th	K	19.7%	Basic
8th	I	21.7%	Basic and Others
9th	J	23.3%	Basic
10th	L	32.4%	Basic
11th	B	33.3%	Tertiary
12th	F	40%	Others

It is surprising to note that primary school B, with 33.3% of cases, has parents and guardians with tertiary educational levels. Primary schools B and H have significantly few parents and guardians respondents, this may explain the surprisingly unexpected results of percentages of cases in these primary schools. There appears to be more cases of ADHD in primary schools K, I, J, L and F. The latter schools have the highest basic and other forms of educational levels. The only exception is school B which has significantly few respondents.

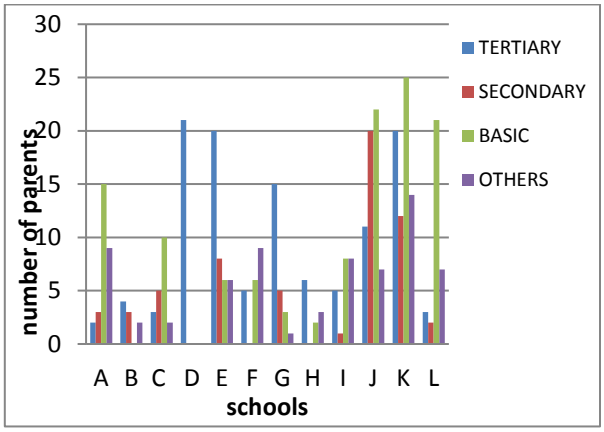

Fig 5: A chart representing the socio-educational status of the parents and guardians in each selected school

Figure 5 shows a chart representing the socio-educational status of parents and guardians. The highest level of tertiary parents and guardians is represented in primary school D which is followed by primary schools E and K. The highest level of secondary educational status is represented by primary school J followed by primary school K. The highest level of basic educational level is represented by primary school K followed by primary school J. The highest level of other educational status is represented in primary school K followed by primary schools A and F. There are no parents and guardians with basic level or secondary level of education in primary schools B and F respectively. Primary school F does not also have parents or guardians with secondary education. Primary school D does not also have any parent or guardian with secondary, basic or other form of educational status but has the highest parents and guardians with tertiary education.

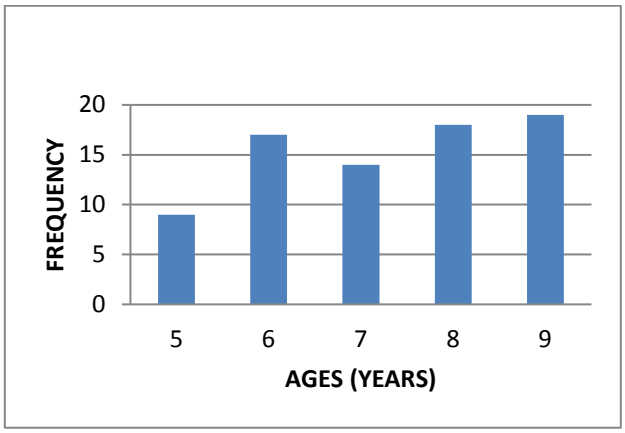

Fig 5b: A representation of the age distribution of the suspected cases of ADHD

Figure 5[b] shows the chart of age distribution of positive cases. The highest age group of pupils selected was nine years. This was followed by eight years old pupils and the lowest being five years old.

Discussion

This study is an attempt to evaluate the prevalence of Attention Deficit Hyperactive Disorder in randomly selected primary schools in the Ayawaso sub metro. To our knowledge, this study is the first of its kind to be undertaken in Ghana. The prevalence rates of ADHD in the cohorts for both males and females were 19.1%, of this figure 10% was for males and 9.1% was for females. The prevalence rates of ADHD in the literature show a wide variation ranging from 2% to 20%[5]. A survey of 10,438 children between the ages of 5 and 15 in the U.K. found overall prevalence rates of 4.45% with 3.6% of boys and 0.85% of girls had ADHD[16]. In Columbia, the overall prevalence rates estimated for males and females were 32.1% of which 19.8% were for boys and 12.3% were for girls[17].

A systematic review of the literature on prevalence studies by Polanczyk and colleagues concluded that a great majority of the variability is due to the methods used, such as the way in which the symptoms were measured and the exact definition used. The variability may also be due to difference in the training of investigators and other humans factors[18]. It is therefore impossible to draw any firm conclusions from the large variation of studies on prevalence rates cited in the literature, since culture and cultural tolerance to ADHD symptoms and other socio-cultural factors and practices may affect the prevalence rates. Indeed, one study in the U.S using the same diagnostic procedure reported small but significant differences in prevalence between African-Americans (5.65%), Hispanics (3.06%) and Whites (4.33%)[19]. Such differences might however be explained by different cultural practices and tolerance to symptoms of ADHD. There may therefore be notably and significantly higher rates in people of African descent. It is likely that other social and cultural characteristics may have influenced our prevalence rates. Furthermore, a range of factors which adversely affect brain development during prenatal, perinatal and postnatal or early childhood may be associated with an increase in the risk of ADHD. These include maternal smoking[20] alcohol consumption[21] heroin abuse during pregnancy[22] very low birth weight[23] fetal hypoxia, brain injury, exposure to toxins such as lead and deficiency in Zinc[24].

Ghana is a developing nation with less developed antenatal, perinatal and postnatal facilities. Furthermore, access to these antenatal facilities may be difficult or non-existent. It is therefore likely that such less efficient and poorly developed services may lead to poor nutritional status especially the anaemias. Pregnancy may also be complicated by pre-eclamptic toxaemia (PET) leading to hypoxia and subsequent minimal brain damage of the fetus. Most pregnant women in Ghana may also not be aware of the negative effects of alcohol and other drugs on the fetus. The lack of perinatal facilities and access to health facilities lead to high rates of home deliveries by local native midwives or untrained elderly women. These factors may significantly contribute to higher risks for ADHD especially in the rural areas in Ghana through obstetric malpractices leading to minimal or subtle brain damage. The high prevalence rates of ADHD in this study may therefore partially be explained by the above negative factors in the care of pregnant women and babies in Ghana.

The effect of the educational status of parents or guardians as a risk factor for ADHD is clearly seen in Figure 5. Sector schools J and K show the highest diagnosis of ADHD of fourteen (14) pupils in each sector and eleven (11) pupils in sector school L. It is interesting to note that Table 5 shows the highest rate of basic educational levels in parents and guardian in the same sector schools (J, K and L). It therefore appears that basic school educational status of parents and guardians is a risk factor for ADHD. These findings are in keeping with Fletcher et al[25], who found that low maternal education could confer risk for more severe symptomatology of ADHD through a combination of environmental and biology factors. Furthermore, the relationship between ADHD and level of education is clearly exemplified in Table 4b. Even though there are few explained findings e.g. significantly few parents and guardians responses in primary schools B and H, there is a strong tendency for cases of ADHD with lower educational levels of parents and guardians. Primary schools I, J, L and F with low educational levels (basic and other education) have higher number (percentage) cases at the respective schools.

Tertiary education of parents or guardians therefore seems to be protective factor against ADHD. The effects of other educational status of parents or guardians on ADHD in the present study have been partially explained. However, there may be other unidentified factors operating. These factors may include positive emotional relationships with children, single parenthood, effect of other siblings and other family dynamics which may be the characteristics of these groups of parents and guardians. Indeed, Galera C. et al[26] noted that family factors such as socio-economic status, parental education and mental health of parents or guardians may confound the association between ADHD symptoms and academic performance. Sector schools C and D, with lowest cases of ADHD have the parents with highest educational status. These research teams found a strong association between attention deficit hyperactive disorder and socio-economic status. They also found that single-parent families and welfare benefits were also associated with children receiving treatment for attention deficit hyperactive disorder. This study is only focused on the prevalence and educational levels of the parents and guardians. Since the illiteracy rate of Ghanaian women may be high when compared to

developed countries, it is likely that this may account for the high prevalence rate of ADHD in Accra, Ghana.

Most studies on gender distribution have shown that ADHD affects males more than females. In the present study, the gender distribution ratio is 1:1. Indeed some researchers have reported of a ratio of 3 males to 1 female while others have a higher ratio of 5 males to 1 female. The present study showed no differences between the gender ratios. The discrepancies may be due to the age range of cohorts and the sizes of the cohorts in these studies.

Conclusion

ADHD appears to be prevalent in the Ayawaso sub-metro primary schools. Most parents, guardians and teachers who are not aware of the disorder may physically and psychologically punish ADHD pupils because of their behaviour. They may also be punished because of their poor intellectual performance especially in the classroom. This may lead to absenteeism from school and subsequent aimless roaming and formation of gangs. The latter may lead to antisocial behaviours like substance abuse disorder, teenage pregnancy, armed robbery and other criminal activities. This state of affairs may not augur well for the child's development, the family and the nation at large. All these behavioural disorders may be prevented by early identification and intervention by psycho education and drug therapy.

Limitation

The small number of cohorts may affect the prevalence of ADHD in this study. The results may therefore not be compared to that of (Ford et al 2003)[16] with cohorts of ten thousand (10,000). These findings therefore may not reflect the true prevalence rates of ADHD in Ghana. The study also relied on the information given by parents and guardians which might make the data collected from informants probably biased. Thus, reports from parents and teachers may be a reflection of the higher or lower tolerance to ADHD behaviour by the respondents (teachers, parents and guardians). It is also generally accepted that mental health of parents or guardians is a positive risk factor in development of ADHD[27] and it is likely that their perception of the behaviours of cohorts might also be biased. These biases might have been reduced as a result of the workshops on ADHD conducted by the research team in the respective schools with the respondents. There was no post-workshop evaluation. Furthermore, six of the selected schools were not able to participate in the study.

Clinical Implication

Indeed, it is likely that many children with ADHD are psychologically and physically punished by ignorant parents and guardians or teachers at homes and schools respectively for their behaviour. This will often lead to school phobia, absenteeism and school dropouts. They are also likely to be punished because of their poor intellectual and academic performance, since there is an association between ADHD and poor scholastic performances[28, 29]. Even though ADHD is prevalent in Ghana, there has not been any effort to assess its prevalence. Physicians, teachers, parents and guardians should be aware of the behaviours which may require full assessment for ADHD diagnosis. This will only be achieved through frequent workshops on ADHD with parents, guardians and teachers who form the Parents Teachers Association (PTA) of respective schools. Because of the multifactorial causes of ADHD, research in this area will be difficult but not impossible. Such study should include a follow-up of pregnant mothers throughout their antenatal, perinatal and postnatal periods, the lifestyles and habits of these women particularly with regard to alcohol intake and other substances. The mental state and the family dynamic of the parents or the guardians should be assessed. Their socio-educational status should also be assessed since this is also a risk factor for ADHD. The babies should be monitored from birth and followed up through their preschool years and to school until the age of 10 or 15years. It will also be borne in mind that ADHD may persist to adulthood with less hyperactivity[2]. Parents and guardians whose children are diagnosed of ADHD are assured of drug treatment and psycho-educational interventions.

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