

PREVALENCE AND RISK FACTORS ASSOCIATED WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER AND HYPERACTIVE-IMPULSIVE SUBTYPE

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Abstract- Attention deficit hyperactivity disorder (ADHD), also known as hyperkinetic disorder, is a neurobiological condition characterized by a persistent pattern of symptoms such as inattention, hyperactivity, apathy, impulsivity, and difficulty concentrating. In Morocco, there is no statistical data on the prevalence of this disorder in the Kingdom, except some researches of our Unit in the North West of Morocco, among children. Our objective is to study the link between ADHD with Hyperactivity and/or impulsivity type and socio-economic and cultural factors in children aged 12 to 16 in the city of west region (Sidi Slimane province, Morocco). Data for this study was collected through a questionnaire based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). The results reveal that 98.3% of the children were born vaginally, while 1.7% were born via caesarean section. Additionally, 63% of the pupils come from low socio-economic households, and 31.1% of them are experiencing academic difficulties. The prevalence of ADHD with Hyperactivity and/or impulsivity type in our sample is 6.72%. Notably, this neurobehavioral deficit was more common among boys (8.33%) compared to girls (3.77%). These preliminary results appear to be alarming. So, deeper investigations are needed.

Keywords: ADHD, Schoolchildren, DSM5, Prevalence.

1. INTRODUCTION

Attention Deficit Disorder with or without Hyperactivity (ADHD) is one of the most common mental health problems affecting school-aged children. Between 3 to 9% of young people in North America are affected; this problem affects three times as many boys as girls [1]. This subtype of the disorder is currently recognized: inattention, hyperactivity/impulsivity and mixed [7]. Numerous cognitive of cognitive-behavioral problems arise, including poor including poor academic performance, learning disabilities learning disabilities, cognitive deficits, conduct disorders are just a few examples [2, 3]. These symptoms of ADHD are a handicap for the child and therefore a source of suffering, whether in his school learning and/or social relations [2, 4].

This mental disorder, common in children [5], is therefore part of the public health priorities. According to the American Psychiatric Association's [APA] Diagnostic and Statistical Manual of Mental Disorders, determining the prevalence of ADHD remains a challenging task [6]. that this disorder affects about 3% to 7% of school-aged children [7, 8]. Similar prevalence is also identified in New Zealand, Germany and Brazil [2] In North America, its prevalence varied by authors from 2% to 26%. The order of magnitude most often used by North American authors is 7% to 9% [1], for Canada, 1 to 3 children per class [1], and in the United States, it would affect 1 in 20 children [5].

Indeed, ADHD has garnered significant attention in the United States (US) and Europe, with extensive research conducted on the subject. However, there remains a relative lack of knowledge regarding ADHD in other regions of the world. Specifically, in the Arab world, there is a scarcity of studies focusing on children's behavioral issues, including ADHD. Existing studies on ADHD prevalence in Arab cases indicate a wide-ranging variance, spanning from 0.5% to 14.9%. It is important to note that these prevalence estimates are derived from a limited number of studies carried out in Arab countries, each employing distinct methodological approaches [9, 10].

Due to the lack of in-depth research in Morocco, there is no official statistical data available regarding the prevalence of the specific disorder. The behavior and school performance of children or adolescents with ADHD are often misunderstood by their family, school, and society. The negative impact of this disorder on the patient and those around them, along with its significant frequency, justifies its inclusion in public health priorities [3,11]. Limited research has been conducted on this subject in our country. Therefore, we have proposed to explore the frequency of ADHD with Hyperactivity and/or impulsivity type (ADHD h/i) among a specific population of adolescents (students) and to examine the extent to which this ADHD is associated with learning challenges.

2. METHODS

2.1. Study Design

The diagnosis of ADHD is currently based on empirical criteria defined in internationally recognized classifications (DSM5; ICD 10): the disorders cannot be explained solely by the child's developmental age; they must have begun before the age of 7, have lasted for more than 6 months, and be observed in at least two different situations (e.g., school and home) with significant impairment in the child's social, academic and leisure behavior [12]. Similarly, questionnaires and evaluation scales (such as the famous "Conners scales") filled out by the patient (adolescent or adult), his or her parents or teachers distinguish very well between groups (people with ADHD versus people without ADHD), but for a given patient their reliability is insufficient.

In fact, the most widely used medical system for diagnosing ADHD is the Diagnostic and Statistical Manual of Mental Disorders (DSM) [1]. In Canada, the United States and many other countries, it is by comparing the child's behavior to the DSM criteria that it is determined whether or not the child has ADHD [2, 6].

2.2. Setting

Our research work deals with the problem of ADHD h/i and its impact on the learning of school children in Morocco. In these country, the repercussions of this disorder on the patient and his or her entourage, the negative impact on the child's future and its significant frequency (around 10% of the general population), justify its inclusion in the framework of public health priorities, and require treatment, when the symptoms that characterize it constitute a handicap for the child and therefore a source of suffering, whether in his or her schooling and/or social relations with the long-term risk of deleterious repercussions on the whole of life (professional failure, social disintegration, additive behaviors).

2.3. Type of Study and Participants

Our study, which was a horizontal, randomized prospective study, involved 119 students (63 boys and 54 girls) who had not received any drug treatment, who had no somatic pathology, and follow their studies at the Ibn Yassine; and Jaber Ibn Hayane College in the city of Sidi Yahia Gharb in Morocco. Age ranges from 12 to 16 years (control and control groups).

2.4. Data Sources/Measurement

We asked a central question: what is the impact of ADHD on the neurocognitive behavior of these children, and to what extent ADHD is associated with a learning challenge in a target population of adolescents (students of college in the west region (Morocco)).

This question represents the backbone of our research and several guidelines emerge from it, namely:

- To explore the prevalence of ADHD in a specific population of secondary school pupils in the west region, (province of Sidi Slimane, Morocco).
- Examines the correlation between ADHD h/i and socio-economic and cultural factors in children aged 12-16 years.

2.5. Sampling Tool

The diagnostic manual utilized for this purpose is the DSM-V, published by the American Psychiatric Association (APA) in 2013. The DSM-V offers a comprehensive clinical description of various disorders.

- To establish this study, we distributed two questionnaires to the teachers working with these students, asking them to read it carefully and fill in the appropriate boxes for each question.

- He hardly pays attention to details; he makes mistakes of inattention.

- He's having trouble getting his attention.

- He doesn't seem to listen when we talk to him directly.

- They do not follow instructions and do not perform tasks (without being in opposition). They have difficulty planning and organizing their work or activities.

- Avoids or reluctantly performs certain tasks, especially if they require sustained mental effort.

- He loses the objects necessary for his work or activities.

It is easily distracted by external stimuli.

- Often forgets in everyday life

The affected individual must have at least six symptoms of inattention repeatedly and to an unsuitable level, and incomparable with the normal level of development for age.

2.6. Statistical Tools and Variable

The data collected were entered on an Excel support, after filtration we transposed this matrix on an SPSS (Statistical Package for the Social Sciences) support for a later analysis. The quantitative variables in mean \pm standard deviation and qualitative variables were expressed in frequency. The tests applied for the decision are: khi-two test, Pearson correlation and logistic regression, at an error of 5%.

3. RESULTS

3.1. Descriptive Data

The distribution of our sample shows that the average age of pupils is 14.27 ± 0.11 years, (min=11 years and a max=17 years). This distribution meets the requirements of Gaussian applications (asymmetry coefficient = -0.138 ± 0.222). 36.1%($n=43$) are in the first year of college, 35.3%($n=42$) in the second year and 29%($n=34$) in the third year of college. The distribution of pupils according to their weight is shown in Figure 1. 44.5% ($n=53$) of these pupils have a weight between 40 and 50 Kg, 25.2%($n=30$) have a weight between 50 and 60 Kg and 30% ($n=36$) have a weight less than 40 Kg. The Pearson correlation (0.421; $p < 0.000$) revealed a strong link between age and weight. However, 98.3%($n=117$) of these children are born without any complications by lower and 1.7% ($n=2$) of caesarean section. In addition, 83% ($n=99$) come from urban areas and 17% ($n=20$) only from rural areas.

Nevertheless, 63% ($n=74$) of these pupils come from households with a low socio-economic level, 35%($n=41$) with an average socio-economic level and only 6% ($n=4$) from wealthy families. 7.6% ($n=6$) of the students surveyed had divorced parents and 95.8% ($n=113$) were

women in households. According to the number of years repeated, the distribution of secondary students indicates that 26.9% (n=32) fail (one year repeated) and 4.2% (n=5) lose two years. Nevertheless, the distribution of the averages acquired in the first semester shows that 60% (n=71) of these pupils had averaged between 10 and 15 of

which 36.97% (n=44) are male and 22.69% (n=27) are female, 29% (n=35) with averages between 5 and 10 compared to 9% (n=11) where the average displayed is less than 5/20 and only 2% (n=2) of supposedly excellent pupils (score>15).

Table 1. Study of the link between socioeconomic and cultural factors and ADHD with Hyperactivity and /or impulsivity type (ADHD type h/i)

Variable	Modality	ADHD h/i (Yes)	ADHD h/i (No)	Khi-Deux	p-value	%ADHD h/i	Odds ratio
Sex	Boys	6	66	1.06	0.041	8.33%	2.32
	Girls	2	51			3.77%	
School level	1st year	3	40	0.055	0.973	6.98%	
	2nd year	3	39			7.14%	
	3rd year	2	32			5.88%	
School failure	No	7	75	1.38	0.24	8.54%	0.3
	Yes	1	36			2.70%	
Antecedent ADHD	No	5	69	0.000	0.985	6.76%	
	Yes	3	42			6.67%	
Writing/reading difficulties	No	0	16	1.33	0.25	0%	
	Yes	8	95			7.77%	
Fear and phobia	Yes	4	46	0.22	0.64	12%	
	No	4	65			7.25%	
Taking medication	Yes	0	3	0.31	0.58	0%	
	No	8	105			7.08%	
Chronic disease	Yes	3	30	0.41	0.52	9%	
	No	5	81			9.30%	
Number of hours of sleep	5.0	0	2	4.46	0.48	0%	
	6.0	0	14			0%	
	7.0	4	31			11.43%	
	8.0	3	26			10.34%	
	9.0	0	19			0%	
	10.0	1	19			5%	
Sleeping difficulties	Yes	3	23	1.23	0.050	12%	
	No	5	88			5.38%	
1st Semester Validation	<5	0	11	2.52	0.47	0%	
	5< score <10	4	30			11.76%	
	10< score <15	4	67			5.63%	
	>15	0	3			0%	
Confectionery consumption	Yes	8	98	1.05	0.31	7.55%	
	No	0	13			0%	
Taking breakfast	Yes	4	59	0.03	0.86	6.35%	
	No	4	52			7.14%	
Source of pollution	Near	8	91	1.73	0.19	8.08%	
	Far	0	20			0%	
Weight	30-40	4	21	4.84	0.30	16%	
	40-50	2	51			3.77%	
	50-60	4	26			13.33%	
	60-70	2	8			20%	
	70-80	0	1			0%	
Prevalence		6.72%					

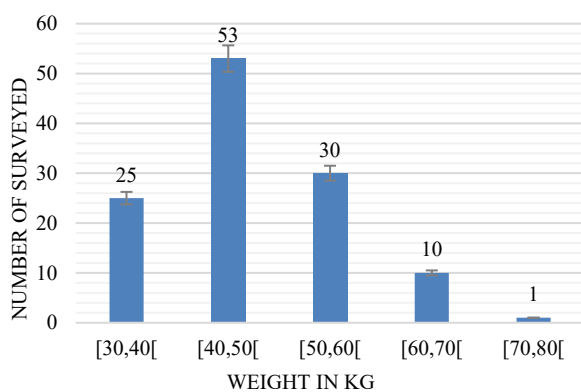


Figure 1. Distribution of surveyed by weight in kg (Ibn Yassine College in the city of Sidi Yahia Gharb in Morocco 2016)

3.2. Outcome Data

Hyperactivity is characterized by an excessive amount of physical activity. According to the APA (2004), motor hyperactivity is described by six behavioral characteristics. First, the student or adolescent frequently fidgets with hands and feet, or squirms in his or her seat.

They often stand up in class or in other situations where they must remain seated. He runs or climbs everywhere, in situations where this is inappropriate (in teenagers or adults, this symptom may be limited to a subjective feeling of motor impatience). He also has trouble keeping still in games or leisure activities, and often talks too much.

In other words, the child's motor activity is overflowing, inappropriate and disordered, and he or she can't "sit still", "moves all the time" and "makes incongruous noises" [13].

Impulsivity, which is part of hyperactivity, is defined as the student's inability to wait before making a behavioral (motor impulsivity) or verbal (cognitive motor impulsivity) response. According to the APA (2004), this impulsivity is described by three characteristics. The student frequently allows the answer to a question that has not yet been fully asked to pass.

Secondly, they find it difficult to wait their turn and often interrupt others or force their presence [13]. A total of 119 students from the same middle school from grades 1 to 3 were recruited for the study. The results concerning certain risk factors for hyperactivity and impulsivity are presented in table [1]. Our survey has revealed that the prevalence of children with hyperactivity/impulsivity type ADHD is 6.72%. According to the analysis, this pathology is much more frequent in boys (8.33%) than in girls (3.77%), with an odds ratio of (2.32), 5 boys for every two girls. However, the KHI-two test of independence showed no link between gender and the disease ($p < 0.25$). 7% of students suffering from this pathology confirmed that at least one member of their family is affected by hyperactivity/impulsivity.

This situation leads us to seriously believe that genetic factors are involved, although research has not been able to explain the direct impact of these factors. 17% of DTAH hyperactive/impulsive pupils had average marks in the first term, and 6% had difficulties in math's, but the test of independence confirmed that there was no link between school behavior and the disease. Added to this is the "fear" factor: 12% of students developing hyperactivity and/or impulsivity said they were afraid of the night, of exams, of teachers... 9% also suffer from chronic illnesses. In addition, 22% of these students stay in bed for 7 to 8 hours, and 12% have difficulty sleeping. 11.76% of hyperactive/impulsive ADHD students had marks of between 5 and 10 out of 20, in the first semester. 7% of these students do not eat breakfast regularly, and consume food products that are generally enriched with sugars and colorants, such as cookies and sweets.

3.3. Main Results

We used regression whose dependent variable is the ADHD and the independent explanatory variables are the socio-demographic. It is apparent from this analysis that the factors listed in the table below have been very associated with the occurrence of this inattentive behavior. In addition, these are children whose normal weight index is between 30 and 50 kg, and who are male. However, these pupils suffer from certain chronic and/or behavioral illnesses (anxiety). They also consume a lot of foods rich in sugar and food additives. They also make excessive use of the Internet and entertainment media, and come from large families with a history of the disease. These factors are therefore associated with this type of ADHD, with p -values of less than 5% Table 2.

Table 2. Logistic regression analysis (dependent variable; ADAD h/i)

Model	No- standardized coefficient		standardized coefficient	t	Sig.
	B	Standard error	Beta		
(Constant)	-0.233	0.324		-0.719	0.047
Sex	0.104	0.050	0.205	2.075	0.041
Number of siblings	-0.145	0.065	-0.221	-2.231	0.028
Apparent disorders	0.170	0.081	0.197	2.092	0.039
video set	0.123	0.069	0.180	1.786	0.050
Difficulted to sleep	0.099	0.058	0.163	1.701	0.050

Dependent variable: ADHD hyperactivity/impulsivity *: significant difference; sig: significant; t: test student

4. DISCUSSION

The objective of this study was to determine the prevalence of symptoms of ADHD h/i in Moroccan schoolchildren, as well as the risk factors likely associated. A cross-sectional descriptive study and simple random sampling were utilized to select 119 students, aged 6 to 12. The results showed that the prevalence rate, of the hyperactive/ impulsive subtype, was 6.72%, is, which is similar to the rates found in Europe [14, 15], America [16, 17], Asia [18], and Africa by Atwal et al. [19, 20] and in Arab country [21]. The results showed that the prevalence rate, of the hyperactive/impulsive subtype, was 6.72%, which is similar to the rates found in Europe [14, 15], America [16, 17], Asia [18] and Africa by Atwal, et al. [19, 20] and the Arab countries [21]. In our study, ADHD h/i is more prevalent in boys compared to girls. This finding is consistent with a study conducted in the USA by the American Psychiatry Association [9], in Africa [20], in Arab country [21], and in several European studies, such as Cortese, et al. (2013) [22]; and Rodriguez Quiroga, et al. (2017) [23].

Although ADHD h/i is present in both sexes. This could be explained by the fact that hereditary factors play a major role in the development of ADHD. Studies on identical twins have shown that when one twin has ADHD, there is an 80% chance that the other twin will also have ADHD [24, 25]. Furthermore, most ADHD cases have at least one family member who also suffers from the disorder. Several genes associated with ADHD have been identified, but genetic factors alone cannot fully explain the condition. In our study, we found that students with ADHD with hyperactivity and impulsivity traits are generally found in the first and second years of high school. These results are consistent with previous research published by Colomer, et al. [26], Semrud Cliekman [27].

Moreover, numerous scientific studies have shown a positive association between ADHD h/i and obesity. Individuals with this trouble seem to have an increased risk of developing overweight [28]. In our research, children with this ADHD type an average weight of 40 kg usually have 6-7 hours of sleep, indicating that these children often experience sleep disorders [29]. Furthermore, these sleep disorders in ADHD h/i children are closely linked to supposed high-risk factors such as fear in nighttime situations and excessive exposure to the internet and video games. This convergence opens up new possibilities for applications and consequences in the field of health [30].

Moreover, numerous scientific studies have shown a positive association between ADHD h/i and obesity. Individuals with ADHD seem to have an increased risk of developing overweight [28]. In our research, ADHD h/i children with an average weight of 40 kg usually have 6-7 hours of sleep, indicating that children with ADHD h/i often experience sleep disorders [29]. In addition, these sleep disorders in children with this ADHD are closely related to assumed high-risk factors such as fear and excessive exposure to the Internet and video games. This convergence opens up new possibilities of application and consequences in the field of health [31].

5. CONCLUSION

Our preliminary study on the hyperactivity and impulsive behavior of school children indicates that this type of ADHD could be a problem among these children in Morocco. Our findings could serve as a reference for further investigations into ADHD in Morocco, given the dearth of related research to date. Future studies should involve large randomized samples from all regions of the country to enable generalization of the results. Furthermore, these results should assist in developing health programmers to raise awareness among parents, teachers, policymakers, school nurses, and healthcare professionals about ADHD, particularly with respect to its signs, symptoms, causes and consequences; and essentially provide assistance to affected children and, if necessary, guide them towards appropriate interventions.

This research had several limitations, which means that the results need to be considered with caution. Firstly, the study sample was not representative of all Moroccan schoolchildren. Secondly, we used a screening tool, and no attempt was made to establish a clinical diagnosis among the study sample. Future studies should involve screening and diagnosis to identify ADHD symptoms among schoolchildren. Thirdly, the prevalence of ADHD was based on information obtained from two sources (teachers and schooled children). Future research should involve teachers, parents, and healthcare professionals to confirm the diagnosis of ADHD. Finally, this study is one of the first attempts to evaluate ADHD among schoolchildren in Morocco. The reported prevalence suggests that ADHD is more common in Moroccan school-age children than in other parts of the world. In addition, the present study showed that a variety of sociodemographic factors were significantly associated with the development of ADHD, including age and gender, child weight and genetics.

NOMENCLATURES

1. Acronyms

DSM5	Diagnostic and Statistical Manual of Mental Disorders American Psychiatric Association (APA), fifth Edition
APA	American Psychiatric Association)
ADHD	Attention Deficit Disorder with or without Hyperactivity
ADHD h/i	Attention Deficit Disorder with Hyperactivity
And/Or	Impulsivity Type

2. Symbols / Parameters

*: significant difference

sig: significant

t: test student

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