



Is adult-onset attention deficit/hyperactivity disorder frequent in clinical practice?



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ABSTRACT

Recent population-based longitudinal studies concluded that most adults with attention deficit/hyperactivity disorder (ADHD) symptoms would not have a childhood history of ADHD, leading to the concept of adult-onset ADHD. In a large, well-characterized clinical population of 446 adults with a primary complaint of ADHD, we reported a low frequency of adult-onset ADHD (6.9%), being a primary isolated condition in 2.8%. They had less severe symptoms and tendencies for higher hypersomnolence disorder comorbidity than patients with typical childhood-onset ADHD. Our findings reinforce the requirement to exclude other disorders that might overlap with ADHD or mimic ADHD symptoms in adulthood onset patients.

1. Introduction

The neurodevelopmental hypothesis of attention deficit/hyperactivity disorder (ADHD) has been recently challenged by the striking results from three population-based longitudinal studies: 67.5–90% of adults presenting with ADHD symptoms did not have ADHD in childhood, leading to the concept of adult-onset ADHD (Moffitt et al., 2015; Caye et al., 2016; Agnew-Blais et al., 2016). If these results argue for the existence of adult-onset ADHD as a clinically relevant entity, it seems premature to define it as a distinct disorder. First, some authors proposed that adult-onset ADHD subjects would have subthreshold symptoms in childhood, (Faraone and Biederman, 2016; Kennedy et al., 2016; Lecendreux et al., 2015a, 2015b) later decompensated into a full ADHD syndrome when prior social and educational supports are removed. A second hypothesis would be that adult-onset ADHD could be a misdiagnosis of another neurological or psychiatric disorder emerging in adulthood that mimics ADHD. More specifically, sleep disorders can induce ADHD-like symptoms as consequences of hypersomnolence in children and adults (Bioulac et al., 2015).

We reported here the frequency of adult-onset ADHD in a large clinical population of adults with a primary complaint of ADHD

symptoms. We also compared the clinical characteristics, the rate and age at onset of both psychiatric comorbidities and hypersomnolence between patients with adult and childhood-onset ADHD.

2. Methods

Between January 2012 and June 2016, 446 adult patients were referred for a primary complaint of ADHD symptoms to a specialized adult ADHD outpatient clinic (Montpellier, France). All patients underwent a structured interview on ADHD (*Diagnostic Interview for ADHD in adults - DIVA-2*, available on <http://www.divacenter.eu/DIVA.aspx>), by the same clinician (RL), to assess the presence of 18 symptoms and the related impairment in childhood (primary school, age 6–12, mostly based on informant and school reports) and currently (Kooij, Francken, 2010). The DIVA-2 is a reliable tool for assessing and diagnosing ADHD with an excellent concurrent validity (Ramos-Quiroga et al., 2016). For this study, the DIVA-2 was slightly modified to fulfill the recent DSM-5 criteria for adult ADHD (American Psychiatric Association, 2013).

Fifty patients with subthreshold actual ADHD symptoms (< 5 inattention and < 5 hyperactivity/impulsivity symptoms) and eight patients with comorbid psychotic symptoms were not included. Patients

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Table 1

Comparisons of demographic and clinical characteristics in patients with adult-onset and childhood-onset ADHD.

	Adult-onset ADHD n = 27			Childhood-onset ADHD n = 108			Statistics ^b		P value
Variable	n		%	n		%			
	med	[min-max]	IQR	med	[min-max]	IQR			
Demographic characteristics									
Sex (male)	12		44.4	48		44.4	0.000		> 0.99
Age, in years ^a	36.0	[20.0–56.0]	[27.0–43.5]	36.0	[19.0–57.0]	[27.0–44.0]	1440.0	–0.099	0.921
BMI, in kg/m ^{2a}	21.5	[18.1–29.7]	[20.5–23.9]	23.3	[16.4–35.8]	[21.1–26.2]	1122.0	–1.848	0.065
BMI > 25 kg/m ²	3		11.1	34		31.5	4.505		0.03
Educational level > 12 years	18		66.7	47		43.5	4.636		0.03
ADHD characteristics									
Inattentive presentation	18		66.7	45		41.7	5.424		0.02
Combined presentation	6		22.2	60		55.6	9.605		0.002
Hyperactive/impulsive presentation	3		11.1	3		2.8	3.532		0.06
CAARS Inattention ^a	73	[41–86]	[63–79]	73	[51–90]	[65–80]	1360.0	–0.540	0.59
CAARS Hyperactivity ^a	58	[32–78]	[41–67]	65	[36–83]	[59–72]	981.0	–2.627	0.009
CAARS ADHD index ^a	66	[44–81]	[60–72]	75	[49–90]	[68–81]	691.5	–4.220	< 0.001
WURS-25 ^a	23	[6–35]	[15–27]	57	[12–89]	[46–67]	68.5	–7.645	< 0.001
Personal history of psychiatric comorbid disorders									
Major depressive disorder	15		55.6	64		59.3	0.122		0.72
Bipolar disorder	3		11.1	9		8.3	0.206		0.65
SUD Alcohol	4		14.8	21		19.4	0.307		0.58
SUD Cannabis	7		25.9	32		29.6	0.144		0.70
SUD Stimulants	3		11.1	18		16.7	0.508		0.48
SUD Opioids	0		0.0	6		5.6	1.570		0.21
Familial history of psychiatric comorbid disorders (1 st and 2 nd degrees)									
ADHD (diagnosis)	6		22.2	36		34.0	1.373		0.24
Major depressive disorder	15		55.6	56		52.8	0.640		0.80
Bipolar disorder	3		11.1	16		15.1	0.279		0.59
SUD (any substance)	7		25.9	44		41.5	2.210		0.14
Hypersomnolence									
ESS score ^a	13	[0–22]	[8–15]	10	[0–21]	[7–14]	1124.5	–1.177	0.24
ESS score > 10/24	16		59.3	46		42.6	2.416		0.12
Age at onset of sleepiness	22.5	[15.0–45.0]	[18.7–28.0]	12.5	[5.0–42.0]	[10.0–23.0]	157.5	–3.111	0.002
Hypersomnolence disorder	9		33.3	19		17.6	3.256		0.07

Abbreviations: ADHD, attention-deficit / hyperactivity disorder; BMI, body mass index; CAARS, Conners' adult ADHD rating scale; WURS, Wender Utah rating scale; SUD, substance use disorder; ESS, Epworth Sleepiness Scale.

^a Continuous variables are expressed as medians, minimum value-maximum value and interquartile range.

^b Chi-square test value, nonparametric Mann-Whitney test U and Z values (for continuous variables).

were classified as persistent ADHD with childhood-onset if they had $\geq$ five symptoms of inattention or hyperactivity-impulsivity in adulthood and $\geq$ six before the age of 12, with significant impairment in at least two areas of daily life during the last six months prior to the interview and in childhood. Patients with significant ADHD symptoms ($\geq$ five symptoms of inattention or hyperactivity-impulsivity) occurring after the age of 18 were classified as having adult-onset ADHD.

Demographic characteristics including body mass index (BMI) and educational level were reported. Lifetime major depressive disorder, bipolar disorder, substance use disorder were assessed according to DSM-5 criteria (American Psychiatric Association, 2013). Age at onset of ADHD symptoms and of psychiatric comorbidities was carefully assessed and confirmed by informant/school reports. A familial history of ADHD (diagnosis), depression, bipolar disorder and substance use disorder was reported. All patients also completed the *Conners' Adult ADHD Rating Scale* (CAARS-S:S), the *Wender Utah Rating Scale* (WURS-25) (Conners et al., 1999; Stein et al., 1995; Caci et al., 2010).

We also assessed excessive daytime sleepiness in all patients using the *Epworth Sleepiness Scale* (ESS), a self-report questionnaire with a score above 10/24 indicating clinical significant sleepiness (Johns, 1991). Patients with an ESS score > 10 underwent a structured clinical interview to determine the age of onset of sleepiness, and the presence of a hypersomnolence disorder, according to the DSM-5 criteria (Ohayon et al., 2012; American Psychiatric Association, 2013). The diagnosis of hypersomnolence disorder required: (a) self-reported EDS for at least three months and at least three times per week, despite a main sleep period of at least seven hours; and (b) at least one of the

following symptoms: (1) periods of irresistible need to sleep or recurrent naps within the same day; (2) a non-restorative prolonged main sleep episode of more than nine hours per day; and (3) sleep inertia (i.e., need of multiple alarm clocks to wake up, or need to be pulled out of bed by others, or remaining drowsy for at least one hour, this symptom occurring almost every day).

Each patient with adult-onset ADHD was matched for sex and age ($\pm$ one year) to four patients with childhood-onset ADHD. Demographic and clinical characteristics were compared between the two groups. The samples are described using percentages for categorical variables and medians and ranges for continuous variables. Chi-square tests and Mann-Whitney tests were used for categorical and continuous variables, respectively. Significance level was set at $P < 0.05$. Analyses were performed using SPSS (version 18.0.3). Patients were invited to participate in the study during their routine clinical evaluation. The protocol was approved by the research scientific committee of the University Hospital, Montpellier, France. This study was conducted in accordance with the Declaration of Helsinki and French good clinical practices.

3. Results

The final sample consisted in 388 patients (53.3% males, median age 33 range [18–76]), including nine patients over 60 y.o. Twenty-seven (6.9%) were classified as adult-onset ADHD (44.4% males, median age 36 [20–56]), including nine patients with subthreshold ADHD symptoms (four to five symptoms of inattention or

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