The relation between Attention deficit hyperactivity disorder and substance use disorder

Essay

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By

Mohammed Ahmed Mohammed Abd- Allah

MB,b.Ch.

Under Supervision of

Prof . Dr. Amany Haroun El Rasheed

Professor of psychiatry

Faculty of medicine

Ain Shams University

Dr.Nivert Zaki Mahmoud

Assistant Professor of psychiatry

Faculty of medicine

Ain Shams University

Dr..Hisham Ahmed Hatata

Assistant Professor of Psychiatry

Faculty of medicine

Ain Shams university

Faculty of Medicine

Ain Shams University

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تحت إشراف

أ.د أمانى هارون الرشيد
أستاذ الطب النفسى
كلية الطب
جامعة عين شمس

د نيفرت زكى محمود
أستاذ مساعد الطب النفسى
كلية الطب
جامعة عين شمس

د هشام أحمد حتاته
أستاذ مساعد الطب النفسى
كلية الطب
جامعة عين شمس

كلية الطب
جامعة عين شمس
٢٠١١

Summary

Attention-deficit/hyperactivity disorder (ADHD) is recognized as a common childhood psychiatric disorder . ADHD is characterized by the early onset of age-inappropriate hyperactivity, impulsivity and inattentiveness, and a world-wide pooled population-prevalence of 5.3%. One of the current psychiatric disease classification system, DSM-IV-TR, distinguishes three subtypes: a mainly inattentive, a mainly hyperactive–impulsive and a combined subtype . It is estimated that up to 60% of childhood cases of ADHD will continue to have clinically significant symptoms of ADHD as adults .

Substance use disorders can be subdivided according to the abuse/dependence state and the type of substance abused. According to the DSM-IV substance abuse is a maladaptive, non-medical use of psychoactive drugs that leads to functional impairments or distress, whereas substance dependence involves tolerance to the effects of the drug and the presence of withdrawal symptoms when the use of the drug is reduced or stopped.

Substance use disorders (SUD) (i.e., abuse and dependence) also constitute a substantial clinical, public health, and economic concern in the United States and globally . In 2000,

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List of abbreviations

ADHD: Attention-deficit/hyperactivity disorder.

AMP: Amphetamine.

ASB: Antisocial behavior.

ATX: Atomoxetine.

BART Balloon analogue risk task.

BAS: Behavioral Approach System.

CAADID: Conners Adult ADHD Diagnostic Interview for DSM-IV.

cAMP cyclic Adenosine Mono Phosphate.

2-CARS: 2-Component Approach to Reinforcing Substances.

CD: Conduct disorder.

CI : Confidence interval.

COMT: Catechol-O-methyltransferase.

CPT Continuous performance task

DA: Dopamine.

DAT: Dopamine transporter.

DBH : Dopamine beta hydroxylase.

DOPA: Dihydroxyphenylalanine.

DRD1: Dopamine D1 receptor gene .

DRD2: Dopamine D2 receptor gene .

DRD3: Dopamine D3 receptor gene.

DRD4: Dopamine D4 receptor gene.

DRD5: Dopamine D5 receptor gene.

DSM-IV-TR: Diagnostic and Statistical Manual of Mental Disorders.

DTAP: Disordered "thought and action" pathway.

EFs: Executive functions.

fMRI: Functional magnetic resonance imaging.

GABA: Gamma aminobutyric acid.

GWAS: Genome-wide association studies.

5-HTT : Serotonin transporter.

IGT: Iowa Gambling Test.

ITI: Inter-trial interval.

MAO: Monoamine oxidase (A and B isoforms).

MC4R: Melanocortin-4-receptor.

MFFT : Matching Familiar Figures Test

MPH:	Methylphenidate.
MRI :	Magnetic resonance imaging.
mRT:	mean go Reaction Time.
MSP:	Motivational style" pathway.
MTF:	Monitoring the Future.
NAc:	Nucleus accumbens.
NCS-R:	National Comorbidity Survey Replication.
NE:	Norepinephrine.
NET (SLC6A2):	Norepinephrine transporter.
OR :	Odds ratio.
PET:	Positron emission tomography.
PFC:	Prefrontal cortex.
RDS:	Reward Deficiency Syndrome.
SCID:	Structured Clinical Interview for DSM-IV.
SNP:	Single nucleotide polymorphism.
SSRT:	Stop-signal reaction time.
SUD :	Substance use disorders.

TH: Tyrosine hydroxylase.

UPPS: Urgency, lack of premeditation, lack of perseverance, and sensation-seeking

UTR : Untranslated region.

VNTR: Variable number of tandem repeats.

VS: Ventral striatum.

VTA: Ventral tegmental area.

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Introduction

Chapter(I)

Epidemiology of ADHD&SUD

I-Epidemiology of Attention Deficit Hyperactivity Disorder

Attention-deficit/hyperactivity disorder (ADHD) is recognized as a common childhood psychiatric disorder **(National Institute for Health and Clinical Excellence.,2011).** According to the American Psychiatric Association (APA), ADHD afflicts 3% to 5% of school-age children (APA, 2001). Although ADHD is now looked upon as a potentially chronic disorder, the APA does not distinguish child and adult presentations of the disorder. As mentioned, it is estimated that 30% to 70% of childhood ADHD cases extend into adulthood **(Kaplan & Stevens, 2002).** As one expert in the field expressed it: "if a conservative estimate of the prevalence of ADHD among children is 4% and there is a 50% remission rate from childhood to adulthood, the prevalence among adults should be about 2% **(Weiss & Murray, 2003).** However, recent reports indicate that the prevalence figures for children may be as high as 10%, which is significantly higher than previously estimated **(Rowland et al.,2002).** Carrying a 10% childhood rate into the adult population would result in something closer to a 5% occurrence in adults. The National Co-morbidity Study is currently evaluating the prevalence of ADHD in adults using the Adult Self Report Rating Scale **(Adler et al.,2003)** and estimates suggest a prevalence of 4.7% in adults . In short, this is not an uncommon disorder.

In childhood, ADHD is believed to affect males at a higher rate than females, currently estimated at a 3:1 ratio. However, the

literature is replete with statements questioning childhood referral bias of males, typically attributed to boys being more disruptive to others and therefore being more likely to be referred to the clinic for assessment. However, by college age the prevalence of the disorder in men and women is about equal **(Heiligenstein, et al.,1998).**

Prevalence figures may vary depending upon whether the data is based on self-report or on parental reports. Using a group of hyperactive (n=147) and community-control (n=71) children, **Barkley, and colleagues (2002),** evaluated the subjects in their young adult years (ages 19-25). According to self-reports, ADHD occurred in only 5% of the hyperactive group and in none of the control group. However, parental reports indicated much higher numbers of children who had coped with ADHD as a child; ADHD occurred in 46% of hyperactive group and in 1.4% of the control group.

Prevalence data also differ depending on whether the investigator is evaluating groups of ADHD-diagnosed children and following them to adulthood or analyzing a randomly selected, community-based population. Research on follow-up of children with ADHD into adulthood shows a persistence of disorder of anywhere between 4% and 80% **(Faraone et al.,2000).** While in a community-based study of adults applying for a driver's license, 4.7% of those evaluated met the DSM-IV criteria **(Murphy & Barkley, 1996).**

Another source of controversy involving ADHD is the gender differences seen between childhood and adult populations. Whereas pediatric ADHD is a male-dominated disorder (4:1-9:1 male: female), adult ADHD has a balanced gender distribution. Some postulate that this gender difference represents inconsistency between the childhood and adult ADHD diagnoses. It is possible that the differences seen in childhood ADHD do not represent an actual syndromatic difference between boys and girls, but rather a referral bias. **(Biederman, et al., 1994).**

While clinic studies continue to report 60 to 90 percent of ADHD children are male, population studies report ratios between 2:1 and 3:1 ratio of male to female **(Gaub and Carlson, 1997).**Recognition of adult ADHD has led to important changes relevant to the recognition of women with ADHD, allowing them the opportunity to recognize the ADHD patterns in themselves in adulthood and to refer themselves for diagnosis and treatment. Some clinicians in private practice report a close to 1:1 ratio of women to men in treatment for ADHD.

ADHD symptoms result in a large individual and public burden; it is estimated that consequences of ADHD result in the loss of 120 million days of annual lost work in the U.S. labor force, which is equivalent to $19.5 billion lost human capital **(Kessler et al .,2005).** ADHD is associated with comorbid mood (e.g., depression, anxiety) and disruptive behavior disorders oppositional

defiant disorder [ODD] and conduct disorder [CD] , neuropsychological deficits (e.g., verbal working memory), family problems (e.g., negative parent–child interactions), poor academic achievement, and social dysfunction (e.g., peer rejection). These associations have been reported in boys and girls, including as young as preschool who have been followed prospectively into adolescence and young adulthood **(Biederman et al., 2010).** Thus, ADHD predicts a highly dispersed pattern of impairment across behavioral, academic, social, affective, and family domains **(Lee et al ., 2011).**

II- Epidemiological studies of Substance Use Disorders

Tobacco/cigarette daily use and dependence

Tobacco and other drug use prevalence have been examined extensively among youth and adults; for example, by the Monitoring the Future (MTF) research group in the United States **(Johnston et al ., 2009a, 2009b).**

Daily (20 or more days in last 30 days) cigarette smoking varied from 11.4% among 18-year-olds to 17% among 50-year-olds **(Johnston et al., 2009a, 2009b).** One may infer that daily cigarette smoking is addictive use, though several studies measure tobacco (nicotine) addiction specifically. Tobacco addiction (dependence) among older teenagers has been found to vary between 6% and 8% **(Chen et al ., 2004).**