CURRENT PRACTICES IN THE MANAGEMENT OF ATTENTION DEFICIT HYPERACTIVITY DISORDER

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ABSTRACT

Attention deficit hyperactivity disorder (ADHD) is a disorder that was thought to affect only children but had been discovered to persist into adulthood. Advancements in technology and methodology have contributed to the increased research work on ADHD. The Diagnostic and Statistical Manual of Mental Disorders, 5th edition, has relatively added some changes to the diagnostic criteria of ADHD, to further accommodate diagnosis in adults. Several medications have also been studied to know how efficacious they are in treating ADHD. Recently, the FDA approved a non-invasive device for the treatment of ADHD. This review is aimed at highlighting the changes in diagnostic criteria with emphasis on the aetiology, treatment and recommended guideline for use by primary care physicians in the diagnosis and treatment of ADHD.

INTRODUCTION

The concept of attention deficit hyperactivity disorder (ADHD) as defined in the Diagnostic and Statistical Manual of Mental Disorders, 5th edition, is relatively new.[1] The essential criteria of attention-deficit and /or hyperactivity-impulsivity that interfere with functioning or development have been reduced from six (6) to five (5) with the age of onset increased from "prior to seven (7)" to "prior to twelve (12)".[2] These changes were made to accommodate diagnosis in adult, which has been a source of concern to the primary care physician.[2] Over the past two decades, there has been an increase in the study of ADHD and this has led to discovery of ADHD persisting into adulthood.[3,4] The increased interest stems from an increase in awareness of the disorder, development in the area of research methodology and technology, increased interest by pharmaceutical industry due to an increase in purchase of the drug in the market although there is a worldwide variability.[2,5,6]

Several names had been used to describe this condition before it was named ADHD. Such names included: post-encephalic behavior disorder, brain damage, brain dysfunction, hyperkinetic disease of infancy, hyperkinetic reaction of childhood, hyperkinetic impulse disorder, ADHD with or without hyperactivity, ADHD with three (3) subtypes.[4] The aim of this study is to identify the aetiology of the disorder and discover effective treatment for it. There have been some studies on the effectiveness of drug used in past decade, associated factors and so on.[2,7,8]

HISTORY

ADHD is an age long disorder. It is particularly seen in children noticed first by a British Paediatrician, **Sir, George Still**.[4,7] He noticed that some children could not control their behaviour, which a typical child should be able to, but their intelligence was not affected. He therefore described the behavior as "an abnormal defect of moral control in children".[4] Fig. I. highlights the trend diagnosis of ADHD alongside the changes in drugs overtime from onset of discovery

EPIDEMIOLOGY

ADHD is prevalent in most part of the world, although its prevalence varies from place to place. A retrospective study done by Cortese &Coghill found out the prevalence of ADHD to be 7.2% worldwide.[2] According to a Center for Disease Control and Prevention study in 2019, it was found that, as of 2016, 6.1 million children aged 2-17 years living in the U.S. had been diagnosed with attention-deficit/hyperactivity disorder (ADHD), which was similar to prior estimates".[9]

A study done in Brazil also found that 6.7% of children are likely to have the disorder.[10] A similar study done

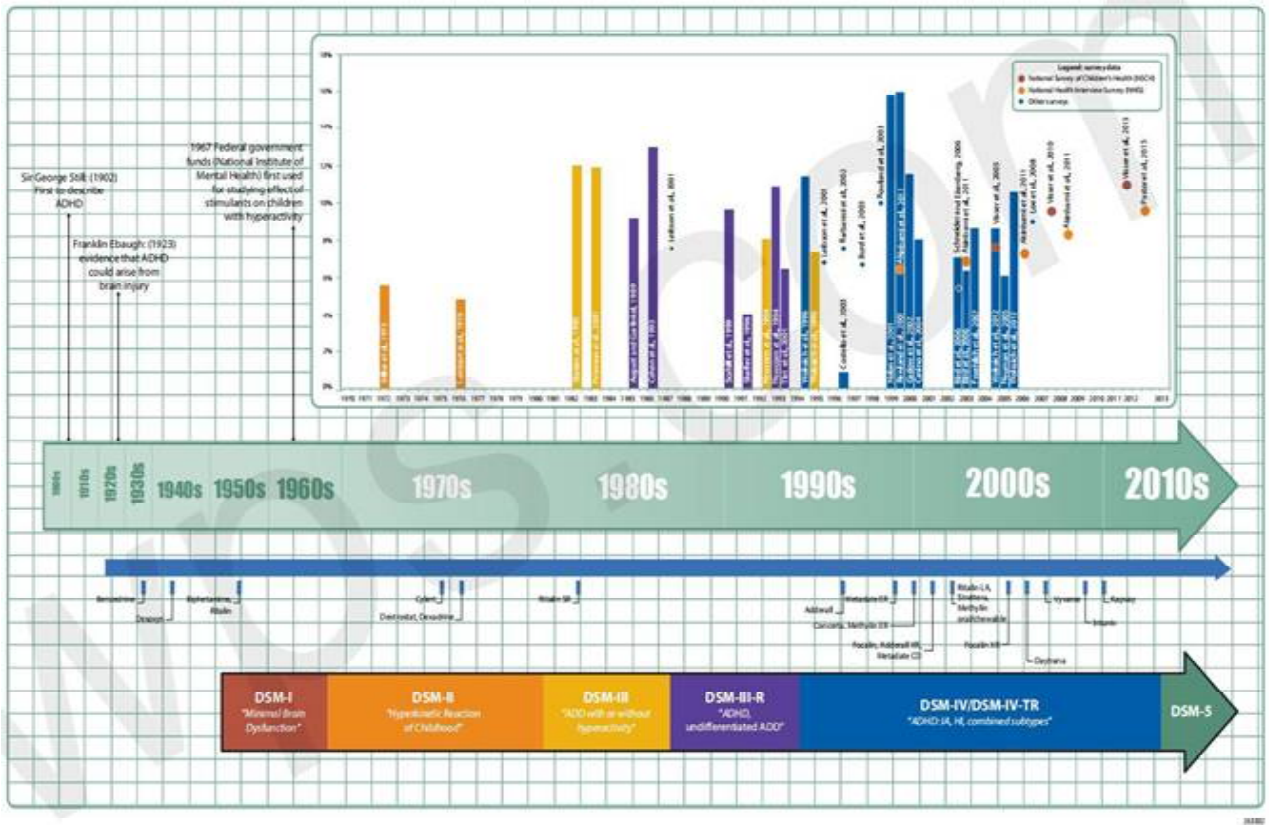


FIG I: The time trends in the diagnosis of Attention-Deficit/Hyperactivity Disorder.[9]

by Bakare et al., in 2012, found the prevalence of ADHD in Africa to range from 5.4% to 8.7% among school children and 1.5% in general population.[11]

A study among primary school pupils in Edo state, Nigeria found prevalence based on subtypes to be 11.8% for the hyperactivity subtype, 4.93% for inattention subtype and 7.14% for the combined type.[12] In comparison, a study in Saudi Arabia also based on DSM-IV Classification, found the prevalence of the combined subtype as 16.4%, 16.3% for the inattention sub-type and 12.4% for the hyperactivity/impulsivity subtype.[13] The variable rates may be due to methodology differences that exist between the studies. Several studies the the male sex is a risk factor for developing ADHD.[12,14] However it was found that the more severe cases of ADHD, the hyperactive-impulsive subtype occurred more in females while the inattentive subtype was more prevalent in males.[10,12,14]

ETIOLOGY

ADHD results from complex dealing between genetics, environment and developmental traits.[15]

DEVELOPMENTAL TRAITS

Alterations in the pre-frontal cortex and its connections to the striatum and cerebellum can lead to ADHD.[16] The basal ganglia and cerebellum are powerfully modulated by dopamine and norepinephrine which are neurotransmitters in the brain. So, the abnormalities of these neurotransmitters play a role in the pathology of ADHD as the alterations which affect their action may alter the basal ganglia and cerebellar functioning.[2,16]

The catecholamines also have profound effect on the functioning of the prefrontal cortex(PFC). Therefore, an alteration in these neurotransmitters in these region would cause an inhibition of the functions of the PFC of which attention, concentration is one.[8,16]

It has been found that the cerebellum of children with ADHD are smaller compared to their counterparts and the cerebellum may have a role in cognitive function.[16]

GENETICS

Genetics studies varied from the candidate gene approach to the genome wide absolution studies "(GWAS). These initially were not successful, but has resulted in the finding of the first 12 independent loci associated with ADHD. The most recent is the "copy number variants".[2,17]

ENVIRONMENTAL

Studies suggest that prenatal and postnatal factors such as maternal smoking and alcohol, LBW babies, premature birth and exposure to environmental toxins

such as organophospahte pesticides, polychlorinated biphenols and zinc are associated with increased risk of ADHD.[2] Living with a single parent, childbirth order, low socio-economic status are also identified risk factors.[2,15]

There are conditions identified as ADHD co-morbidities, which often have behavioural disorders that affect functioning apart from the disorder itself. These conditions include: psychosis; bipolar disorder; substance abuse; severe depression; severe anxiety; oppositional defiant disorder; conduct disorder; sensory integration disorder; learning disorder; early speech/communication problems amongst others.[8,17]

DIAGNOSTIC CRITERIA

Screening is essential to the diagnosis of ADHD. In general, since the hallmark of adult ADHD is a chronic trait-like condition that emerges out of childhood or early adolescence, anyone presenting with such a clinical picture should be screened, including those with chronic histories of inattentive, restless or impulsive behaviours, as well as those with emotional instability.[17]

Furthermore, some target population should be screened too and these include family members of individuals affected with the disorder; patients with history of behavioural problems, any chronic mental health disorder including anxiety, depression,

Fig II: Difference between DSM-V and ICD-10 in the diagnosis of Attention-Deficit/Hyperactivity Disorder

	DSM-5	**ICD-10**
Name	**ADHD**	**Hyperkinetic disorder**
Symptom criteria for children	Some symptoms before age 12	Some symptoms before age 6
Symptom criteria for children	ADHD combined: 6 of 9 symptoms of innattention and 6 of 9 symptoms of hyperactivity/impulsivity: ADHD predominantly innattentive: 6 of 9 symptoms of inattention; ADHD predominantly hyperactive/impulsive: 6 of 9 symptoms of hyperactivity/impulsitivity	Must have a combination of impaired attention AND hyperactivity; the only subtype is hyperkinectic conduct disorder for those who meet criteria for both disorders
Symptom criteria for persons aged ≥17	ADHD combined: 5 of 9 symptoms of inattention and 5 of 9 symptoms of hyperactivity/impulsivity: ADHD predominantly inattentive: 5 of 9 symptoms of inattention; ADHD predominantly hyperactive/impulsive: 5 of 9 symptoms of hyperactivity/impulsitivity	Must have a combination of impaired attention and hyperactivity
Settings	Several symptoms present in ≥ 2 settings	Full syndrome in ≥2 settings and observed by clinician
Duration	≥6months	≥6months
Impairment	Interference with social, academic, or occupational functioning; includes severity specifiers; mild, moderate, severe	Clinically significant distress or impairment in social, academic, or occupational functioning

cyclothymia, personality disorder, bipolar disorder, substance use disorders, pateints with multiple physical diseases, and those within the criminal justice system.[8,17]

CURRENT TREATMENT

There has been a marked increase, over the past two decades, in the number of randomized controlled trials(RCTs) aimed at testing the tolerability and short term efficacy of pharmacological treatment for ADHD.[2] In parallel, due to concern around possible side effects of medications and lack of clarity around their long term effects, several lines of research on pharmacological interventions were developed. Methylphenidate was identified as an effective pharmacological treatment in children and adolescent, and amphetamines for adults.[2]

In general, a solid evidence has not been provided to relatively recommend non-pharmacological interventions as highly effective treatments for ADHD core symptoms, although some, for example, cognitive training, may be effective for associated impairment such as working memory deficit.

The American Academy of Pediatrics in 2019, released a guideline on treatment of ADHD for different age groups. Recommended as the first line treatment for children aged 4-6years includes "Parent training in behaviour management, Behavioural classrooms interventions (if available)". In cases where behavioural therapy provides non-significant improvement, then, Methylphenidate(pharmacological) be used. However, for children greater than 6, but less than 18, the recommended first line treatment is approved medications alongside the behavioural therapy. The school plays a role in the treatment of children with ADHD. Behavioural support by teachers as well as the school environment can help support patient treatment such as Individualized Education Program.[18] Furthermore, before treatment commences, comorbidities as stated earlier, must be established to determine the best order of treatment together with the patient. Disorders are treated in order of priority, as the most severe one is attended to first. For example, psychosis, bipolar disorder, substance abuse, severe depression and severe anxiety are usually treated first. Milder mood or anxiety disorders, and emotional instability, may respond to treatment of ADHD and can be treated at the same time as ADHD. Drug and alcohol abuse should be stabilized but can be treated at the same time as ADHD. [18]

A study suggested the role of fatty acid supplementation and artificial food colour exclusion as possible treatment strategies but these should be considered cautiously.[2]

A new device was approved by Food and Drug Administration (FDA) in 2019 for treatment of ADHD. The FDA-approved non-invasive trigeminal nerve stimulation system intended for patient 7-12years old delivers a low level electrical pulse into A patch that sticks to the patient's forehead, stimulating the branches of the trigeminal nerve, sending therapeutic signals to the parts of the brain thought to be involved in ADHD.[19] The exact mechanism of action is unknown yet but neuroimaging studies have shown that the device increases activity in the part regulating attention, emotion and behaviour. The relative limitation of this device is that it can take up to four(4) weeks to see results and only used during sleep.[19] It is new but offers a promising future for treatment of ADHD as it is non-pharmacological and non-invasive. The device is to be used under the supervision of a caregiver.[19]

The study of ADHD offers future avenues of research, some of which include: the use of induced pluripotent stem cell derived from peripheral tissue of patients with ADHD and used to generate brain cells with the aim to model brain circuits and responses to medications or other stressors; the use of zebrafish and fruit fly models to augment currently available animal models of ADHD.[2]

CONCLUSION

ADHD offers exciting areas of research both for diagnosis and treatment, however little is known about the the knowledge, perception and management practices in the developing world. To effectively recognize patients with this disorder, seminars would be avenues to share this knowledge with parents, teachers, and the public in general which may help and encourage the public identify and report these children to the health facility where appropriate intervention can be given. Although medications and behavioural interventions have been shown to be effective, they are however symptomatic treatment of the disorder, neither is curative and as such, more research on how to effectively treat this disorder should be explored. The AAP guideline should be followed by the primary care physicians with parental education on diagnosis and treatment for each child, this is to enhance compliance and regular attendance at the clinic the child attends.

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