

# Attention deficit disorder with and without hyperactivity (ADHD) and violence: Literature review

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Update by topics

## SUMMARY

Attention Deficit Disorder (ADD) and Attention Deficit Hyperactivity Disorder (ADHD) are subjects that are being written about daily around the world from different perspectives. The obvious reason is due to the overall involvement of the individual and the persistence of the disorder throughout his or her life. Here I seek to detect its relationship with violence. Google Scholar was used as a search engine on the topic and an extensive literature review was performed on journals over the last four years, national and international theses and books focusing on the issue of violence. Genetics, social and emotional repercussions, and prevalence of the disorder was established in those suffering from ADD and ADHD. The disorder affects them generally and throughout their life, and there is growing evidence of the close relationship between ADHD and violence/aggression. It is a disorder prevalent worldwide; a public health problem that involves all levels of society, the judicial system, educational institutions and health organizations. Because of its prevalence, it is a costly disorder, but the care of this segment of the population must be multidisciplinary.

**Key words:** Attention deficit, hyperactivity, impulsiveness, aggression, violence.

## RESUMEN

Se escribe cotidianamente a nivel internacional acerca del trastorno por déficit de atención con y sin hiperactividad (TDA/H), desde diferentes perspectivas, y la razón es obvia dada su prevalencia, afectación global del individuo y la persistencia a lo largo de toda su vida. Aquí se busca detectar su interrelación con la violencia. Se usa Google Scholar como fuente inicial de búsqueda de artículos sobre el tema y se revisan publicaciones especializadas de los últimos cuatro años, tesis, nacionales e internacionales, libros, todo enfocado en el tema de la violencia. Se logra establecer aspectos como prevalencia, genética, repercusiones sociales y emocionales en los que padecen el TDA/H, trastorno que los afecta globalmente y a lo largo de la vida, así como la creciente evidencia de la relación estrecha entre TDA/H y agresión-violencia. Es un trastorno prevalente a nivel internacional, un problema de salud pública que involucra a todos los estratos sociales, a las instituciones de orden judicial, a las instituciones de la sociedad tanto a nivel educativo como de salud, por lo que las implicaciones para la atención de este segmento de la población han de ser multidisciplinarias.

**Palabras clave:** Déficit de atención, hiperactividad, impulsividad, agresión, violencia.

## INTRODUCTION

At the present time, there is new writing daily around Attention Deficit Disorder, with and without Hyperactivity (ADHD) in dozens of publications, some of them specializing in the subject, from perspectives associated with the disorder such as weight, sleep, and renal and oral function.<sup>1-8</sup>

There is data that, as Hippocrates wrote about people in 493 a.C.: "...show quickened responses to sensory experience, but also less tenaciousness because the soul moves on quickly to the next impression."<sup>9</sup> The 1863 verse about "Fidgeting Phil"<sup>9</sup> is attributed to Heinrich Hoffman, which reads:

*"Let me see if Philip can  
Be a little gentleman;  
Let me see if he is able  
To sit still for once at table:"  
Thus Papa bade Phil behave;  
And Mamma looked very grave.  
But fidgety Phil,  
He won't sit still;  
He wriggles,  
And giggles,  
And then, I declare,  
Swings backwards and forwards,  
And tilts up his chair,  
Just like any rocking-horse-  
"Philip! I am getting cross".<sup>10</sup>*

<sup>1</sup> El Colegio de Chihuahua.

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The first reference to hyperactivity disorder is attributed to George Still in 1902, who considered that the disorder was due to children having a deficit in inhibiting their behavior and not adhering to the rules that govern social norms and etiquette, as well as the moral principles of the time, which he considered a defect in this vein and called it a defect of moral control.<sup>11</sup> It was given other names over time. This study aims to detect the prevalence of Attention Deficit Hyperactivity Disorder, its symptomatology, and behavior associated with the same, and in particular, to ascertain whether violence correlates with this disorder.

## PREVALENCE

The global prevalence of the disorder is 5.29%.<sup>12</sup> In the US, one in 11 children between five and 17 years of age has ADHD. In primary school children, its presence is between 5% and 10%,<sup>13-20</sup> and is more frequent among boys, there being three to six affected boys for every affected girl in standard conditions,<sup>21-25</sup> although the number of affected girls is tending to increase.<sup>26</sup> The disorder persists in adolescence in 80% of cases,<sup>27-29</sup> and even in adulthood, where it persists in 33% to 66% of cases.<sup>9,12,30-34</sup> This has become a national health problem in the US and Mexico.<sup>26,27,35</sup> A North American article on development disorders including ADHD reports an increase of 2.82%, going from 12.84% to 15.66% in the last decade.<sup>36</sup>

## BIOLOGICAL ASPECTS

*Genetic:* Heredity in ADHD is high if one parent has the disorder, the likelihood of their child having it is several times higher,<sup>32,37-39</sup> and in univiteline twins the probability that the other will have it is between 50% and 80%.<sup>9,21</sup> Various studies have found chromosomal alterations in alleles, with a mutation of receptors such as in the  $\beta$  receptor of chromosome 3, mutation in the dopamine transporter (DAT1) in chromosome 5, mutation of the dopamine receptor gene (DR4) in chromosome 11, and polymorphism in exon 3 with the 7r variation of the DR4 gene associated with ADHD and also drug addiction, obsessive compulsive disorder, and tics.<sup>11,40,41</sup> Impulsive behavior, of exploring or the feeling of seeking and novelty is associated with alleles 6r and 7r in attention disorders.<sup>33,39,42</sup> As such, we find that genes such as SLC6a3, DAD4, DRD5, SNAP25, and HTR1B are detected, which have specific functions related to neurotransmitters in receptors, transport proteins that have allelic mutations such as allele R7 which is associated with a reduced orbitofrontal cortical, prefrontal inferior, and parietal posterior thickness on the right side, with lower activation of the caudate nucleus and greater of the cerebellar vermis, lower cerebellar thickness, and impulsive responses in neuropsychological tests.

Insofar as dysfunctionality in the go/no go tests are related to the R9 allele and the DRD4 gene is associated with cortical width, which is less in ADHD,<sup>39,43</sup> and with magnetic resonance in children, adolescents, and adults, the cortical thickness is diminished which is less in ADHD with variation in terms of age and gender but only on the right side. These works confirm the diminished cortical thickness but do not associate it with specific genes and behaviors.<sup>44</sup> One investigation proposes the interaction between the genes and their function with aggressive behavior.<sup>45</sup> There is still a long way to go with this research.

## CEREBRAL STRUCTURE AND FUNCTION

In the study of children with ADHD, both cerebral functions and structures have been investigated, and as such it has been found that the frontal lobe is responsible for executive functions, working memory, cognition, and impulse control.<sup>46,47</sup> Research work using EEG<sup>25,48</sup> has found that electroencephalography is not conclusive, even though the potentials evoked show alteration in the P300 wave,<sup>49,106</sup> and an anomalous pattern of theta frontal, beta posterior,<sup>50</sup> or asymmetrical waves<sup>51</sup> is presented.

Computerized axial tomography (CAT scans), positron emission tomography (PET),<sup>19</sup> unique proton emission tomography (UPET), and more recently, simple magnetic resonance imaging (MRI) and functional magnetic resonance imaging (fMRI)<sup>52,53</sup> use radioactive markers to capture the neurons of people with ADHD who have been given *ex profeso* tasks designed to measure cerebral function. It has been discovered how specific areas of the brain work, showing that the flow of blood and glucose is diminished at a prefrontal level.<sup>31</sup> The reduction in volume and activity has also been measured in: the frontal lobe (executive functions),<sup>44,54,55</sup> parietal lobe, thalamus, anterior cingulate, splenium collosum, vermis,<sup>56</sup> cerebellar hemispheres, and right caudate nucleus, and it has been detected that these neurofunctional alterations persist through to adulthood,<sup>31,57,58</sup> albeit with the behavioral correlate modified.<sup>28</sup>

There have been many psychological and neuropsychological tests designed to assess development, cerebral maturity level, and measure reaction times, impulse control, working memory, attention, planning, and general executive functions. Although in some cases there seemed to be some controversy, the conclusion has been that there is as much organic alteration as dysfunctionality, especially in what is referred to as impulse control.<sup>47,54,59-61</sup> This explains the prevalence, given that in clinical or forensic spheres, the prevalence increases and the proportion of girls and boys that is habitually six to one in the general population, raises to nine to one.<sup>21,62-64</sup> Among the psychological tests, the Bender Visual Motor Gestalt *Test* demonstrates cerebral dysfunction or injury, normally reported as "organicity".

On the other hand, it is also possible to find the measure of the level of visual perception and motor coordination in children between five and ten years of age.<sup>59,65,66</sup>

## PSYCHIATRIC COMORBIDITY

So-called comorbidities are present in up to 70% of those affected with ADHD, among which depression of variable intensity is common, and can include risk of suicide. Anxiety and bipolar disorders<sup>67,68</sup> are also found; as well as alcohol abuse; drugs; tics;<sup>11,69</sup> ludopathy; autism, sometimes indistinguishable from ADHD;<sup>70</sup> enuresis;<sup>71</sup> and emotional problems, which take many forms and are present throughout one's lifetime.<sup>72,73</sup>

## SUBTYPES OF ADHD

There are three subtypes of ADHD:

1. the predominantly "pure" type of ADD,
2. predominant hyperactivity/impulsivity, and
3. a mixture, which is the most frequent type.<sup>9,49,74-77</sup>

ADD (1) should be considered its own entity, given that the principal here is inattention that brings with it problems concentrating –sustained attention– distractibility, social torpor, general deficiency in solving academic problems, and in particular, inability to inhibit impulses.<sup>9,76</sup> ADD involves a clinical framework where the child habitually has very brief periods of attention,<sup>78</sup> is generally distracted, stares into space, daydreams, and is not aware of the environment around them. If they are given instructions looking forward and directly into the eyes, they forget what was said, explained, shown, instructed, or requested. At a school level, they have very low achievement, and on occasion they have even been categorized as mentally retarded. In 1997, Barkley<sup>79</sup> described this clinical framework as "Cognitive lethargy" with the following characteristics: "conspicuous inability to inhibit impulses and thoughts that interfere with executive functions".<sup>80</sup> These people tended towards disorder of their things and themselves, conspicuous difficulty in organizing their time and activities, loss of possessions, difficulty carrying out tasks requiring sustained concentration, low tolerance of frustration, and stubbornness.<sup>19,74,76</sup> On the other hand, a child with ADD is not prone to either aggression or violence; however, they can come to present aggression in reactive or sudden attacks, out of proportion to the simulant.<sup>28,69,81,82</sup> ADD has an average prevalence level of 18.52%.<sup>25,33,83,84</sup> Inattention secondary to executive function persists into adolescence and even adulthood in 94% of cases.<sup>85</sup>

In terms of ADHD, there are two varieties: the predominantly hyperactive and impulsive subtype (2), which is less

frequent with an average of 17.10%, and the combined subtype (3), which is more frequent on average (58.72%).<sup>25,33,83,84</sup> This presents a clinical framework in which the child is always moving, verbose –talks non-stop– wriggles in their chair, touches everything around them, does not pay attention due to being distracted by any stimulus, tends towards mythomania and pyromania, is a nuisance to those around them, is impulsive, does not judge danger well which makes them reckless and accident-prone,<sup>79</sup> they are aggressive, destructive, and abusive towards animals.<sup>79,86</sup> They have mild neurological dysfunction and fluctuating moods,<sup>69,87</sup> all of which predisposes them to being associated with other childhood behavioral disorders.<sup>74,76,79,88,89</sup> Half of children with ADHD develop behavioral disorders.<sup>48,69</sup>

## AGGRESSION, VIOLENCE, AND DESTRUCTIVENESS

If we are to use the terms aggression, violence, and destructiveness, it is important to properly define them. "Aggression", according to the Royal Spanish Academy, is "the act of attacking something in order to kill, injure, or damage it, especially without justification". "Aggression" is the "propensity to attack, assault, charge at, or abuse". "Violence" is the "trait of violence, the act and effect of violating or violation", and "violent" is one "who is outside of their natural state, situation, or form, and works under momentum and strength". "Destructiveness" is "the trait of being destructive". In 1973, Bandura said: "Aggression is a behavior directed to causing personal damage or destruction of property"; in 2003, Swann defined aggression as "all behavior intended to destroy oneself, others, or objects", and in 2002, Volavka proposed the term "destructive behavior" as that which would include "any behavior which results in total or partial injury to the physical or psychological integrity of a person or object."<sup>90</sup>

Among children with ADHD there is a subgroup that presents aggression; in this subgroup there is a higher level of physical aggression, the propensity to lie, steal, and a higher grade of social adversity than those who only have ADHD.<sup>35,82,86</sup> One characteristic of aggression/violence in these children with ADHD is that it has a reactive type nature, unlike in Oppositional Defiant Disorder (TND or ODD) and Conduct Disorder (TD or CD), in which the expression of aggression/violence is more proactive.<sup>82</sup>

ODD appears during primary education from six to 13 years of age, and presents in children who at an early age are terse, obstinate, disobedient, do not follow adult instructions, and who do not complete schoolwork or domestic tasks –passively– as a form of pressurizing or provoking authority figures, whether parents, teachers, tutors, religious leaders, etc. Upon starting secondary school or a little beforehand, they display defiance –actively– against

authority: such as a raised voice, answering back, shouting, provoking, lacking respect in many forms, insulting, verbally threatening, attacking (physically or with weapons), and even reaching the level of homicide.<sup>82,91-94</sup>

CD is characterized by multiform antisocial behaviors in which all rules, regulations, laws, or norms for living in society are broken. As such, these young people at the end of their elementary and secondary schools smoke, drink, take drugs, commit robbery, steal cars, and even reach the level of using weapons in their crimes. Arguments, fights and physical aggression, including murder, are common.<sup>95,96</sup>

The so-called emotional factor has been detected in those children who grow up with the condition, and upon arriving at adolescence, they demonstrate a typical pattern of "callos-unemotional" behavior, which translates insensitivity and lack of emotion into characteristics of lack of guilt, absence of empathy and insensitivity to others, which ultimately results in antisocial, sociopathic, or psychopathic behaviour.<sup>86,97-99</sup> It should also be noted that the use/abuse of drugs, and especially tobacco,<sup>100</sup> is a type of comorbidity in children with ADHD, and in the absence of CD, the risk is moderate.

It seems there are specific symptoms of ADHD that are related with the use of certain drugs, and this echoes back to the proposal of whether the use of stimulants in treatment favors this behavior of use/abuse of drugs and establishes that on the contrary, the majority of these investigations advise that this type of treatment with stimulants in childhood seems to act as a protecting factor against the use/abuse of psychotropic drugs in adolescents and adults with ADHD.<sup>95</sup>

In a four year follow-up study on adolescents with ADHD with healthy control subjects, the two groups had the same 15% risk of using/abusing drugs, but the risk was greater if CD or bipolar affective disorders were associated. In both cases of ODD and CD, after the age of ten, the children started aggressive behavior towards others, known as "bullying", harassment, or victimization.<sup>101-103</sup> One characteristic that accompanies these frameworks is the growing tendency to not feel remorse or guilt and not learning from the experience, meaning that problems with the law are common and frequent.<sup>28,74,86,104,105</sup>

In the case of females, aggression is less open; they are passive, ignore instructions, are evasive, talk about others, although physical, open, and even armed violence are not excluded. It has been difficult to define antisocial behavior in girls. In one study of young girls from five to eight years of age, there was no difference found in terms of age, and parents said that a smaller number were more disruptive and aggressive, whereas teachers identified a higher number. In older girls, there was ODD and aggression in interpersonal relationships, predominantly among girls from poorer neighborhoods.<sup>94</sup> In the case of children with ADHD, the symptomatology is more intense and persistent over time.<sup>28,106</sup> Although ADHD coexists with ODD and CD,

the number of children with CD or ODD that are associated with ADHD is much greater. As ADHD has varied symptomatology, it can be categorized as mild, moderate, or severe, according to its intensity.<sup>107</sup> When ADHD is associated with ODD, the ADHD symptoms worsen, there is a higher level of physical aggression, and lying and robbery are frequent. ADHD and CD both have problems with learning, scarce social skills, and very low self-control. The pairing of ADHD and CD constitutes between 30% and 50% of children referred for treatment from various social institutions (schools, police, social workers).<sup>23</sup> Over time, the situation worsens; problems with parents, teachers, and school adaptation increase, and there is open antisocial behavior and delinquency. It is on this basis that Lynam described "fledgling psychopaths" in 1996 and 1997, where behaviors of robbery, fighting, arguments, idleness, not meeting obligations, aggression, agitation, and a belief that violence against parents, peers, and parents is legitimate, leads to what adults will call Antisocial Personality Disorder.<sup>81,82,86,104,107-110</sup>

Frequently, these children -like any with a disability- are the object of child abuse in all its forms. A study in Cuba on a half-boarding school detected that in a sample of 50 mistreated children vs. 100 non-mistreated controls, 66% had ADHD vs. 24% of the controls; low academic performance was found in 45% vs. 14% of controls, and a low socioeconomic level was found in 45% vs. 26% of the controls. An average of 46% of the parents were divorced, and the primary aggressor was the mother, with 86% physical abuse, and 72% emotional abuse. However, it is worth noting that the father was the aggressor in 38% and tutors in 34% of the mistreated children, which confirms the assertion that children with ADHD are prone to child abuse.<sup>111,112</sup>

## OTHER FACTORS

In ADHD, there are factors related with birth, such as neonatal hypoxia;<sup>54,62</sup> the risk is multiplied by 3.2 if there is a low birth weight, and by 2.2 if the mother was a smoker<sup>113</sup> or an alcoholic during pregnancy.<sup>21</sup> Encephalitis is a cause of hyperactivity;<sup>20</sup> the addition of food colorants and additives and exposure to heavy metals such as lead and mercury<sup>13,114-116</sup> and manganese can also cause predisposition to the condition.<sup>117</sup>

It is proposed that ADHD favors the modern diet, deficient in eicosapentaenoic (EPA) and docosahexaenoic fatty acids which form part of the cerebral structure where one in every three fatty acids are of this type, or even promote the neurotransmission function where 45% are long chain fatty acids.<sup>27,116,118</sup> The social environment participates in the symptomatology of ADHD,<sup>119,120</sup> being high inheritance, but in less than one; this suggests that there are environmental factors involved, and as such the surroundings are necessary for genetic expression.<sup>21</sup>

## TREATMENTS

The treatment of ADHD should be multidisciplinary<sup>27,65,121-123</sup> including medically-prescribed methylphenidate-type stimulants, effective in 70% of cases, and which seems to protect against future addiction, or even atomoxetine.<sup>7,124-128</sup> A psychologist should participate in behavioral management, as well as academic deficiencies, emotional problems, and above all, cognitive behavioral therapy, including psycho-education for the patient and their family,<sup>11,129-132</sup> as well as with games, diets, exercise, alternative medicine, and others.<sup>27,65,133-136</sup>

## CONCLUSION

ADHD is a complex neurobiological disorder, with an important genetic framework and environmental modulation in behavioral expression, which, given its prevalence, is a global health problem, appearing in infancy but persisting throughout the lifetime of a high percentage of people. It is associated with multiple psychiatric comorbidity, and it is importantly expressed through aggression, destructiveness, and violence. If it is associated with Oppositional Defiant Disorder or Conduct Disorder, this inevitably leads to serious behavioral disorders, delinquency, and criminality, with a configuration of antisocial personality or sociopathy and the risk to society that that implies. It affects the sufferer in all aspects of their life: physically, with dysfunction; educationally, with low academic achievement and specific disorders; in working life, with poor performance and frequent changes in employment; and emotionally, with feelings of low value, low self-esteem, rage, anger, and problems in interpersonal relationships in their whole environment; the greatest problem being that this will last throughout their life. Treatment should be multidisciplinary and early on in an individual's life. It requires a sociological and psychological focus for treatment, given that if it is only medicated, the change will be deficient and short-lived. Sessions of psycho-education for the patient and those around them, along with rational emotional therapy is emphasized in order to offer the best results.

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