



Cause of attention deficit hyper activity disorder

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ABSTRACT

Attention Deficit Hyperactivity Disorder (ADHD) is a behavioral and developmental disorder. ADHD is one of the most common childhood neurological disorders and can continue through adolescence and adulthood. Symptoms include difficulty staying focused and paying attention, difficulty controlling behavior, and hyperactivity. It is a chronic condition that affects millions of children and often persists into adulthood. Children with ADHD also may struggle with low self-esteem, troubled relationships and poor performance in school. ADHD can cause significant emotional, social and educational problems. However, when ADHD causes are known early and properly, the condition can be managed effectively, so children can grow up to have productive, successful and fulfilling lives. This review paper summarizes the different causes of this common neurological disorder. © 2013 Trade Science Inc. - INDIA

KEYWORDS

ADHD;
Causes;
Childhood neurological
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Minimal brain damage.

INTRODUCTION

ADHD always begins in childhood. For some people, though, ADHD is not diagnosed until adulthood. That means adults who are newly diagnosed have actually had ADHD for years, and have had to endure symptoms as they've matured. Long-term studies have shown that 40% to 60% of children who have ADHD still have symptoms into adulthood^[3]. Untreated adults have an increased incidence of aggressive behavior, anti-social personality disorder, conduct disorder, depression, divorce, school drop-out and alcohol and drug abuse.

CAUSES OF ADHD

The exact causes of ADHD are not known with certainty. There are, however, a number of factors that

may contribute to, or exacerbate ADHD. They include genetics, diet and the social and physical environments. Scientists are not sure what causes ADHD, although many studies suggest that genes play a large role. In addition to genetics, researchers are looking at possible environmental factors, and are studying how brain injuries, nutrition, and the social environment might contribute to ADHD.

Like many other illnesses, ADHD probably results from a combination of factors. The main purpose of this review paper is to provide an integrated source of information that reflects the most current knowledge about ADHD from neurological, hereditary, environmental factors in educational, social, technical and psychological perspectives. It is hoped that this information will be useful to children with ADHD, educators, parents and other involved individuals as they seek to help children with ADHD.

Review

Neurological

One early theory was that attention disorders were caused by minor head injuries or damage to the brain, thus for many years ADHD was called “minimal brain damage” or “minimal brain dysfunction”. The vast majority of people with ADHD have no history of head injury or evidence of brain damage. Scientific studies have shown that people with ADHD can have abnormalities in some parts of the brain, including the prefrontal cortex^[6]. The prefrontal cortex is the area of the brain that’s believed to control ‘executive functions’.

Some research involving brain scans shows that children with ADHD had smaller frontal and temporal lobes. The frontal lobe controls, among other things, planning and attention, both of which are negatively affected by ADHD. In one study, two other areas of the brain, the temporal and inferior parietal cortices, showed increased gray matter up to 24 percent more^[13]. The more gray matter appeared to contribute to inattention, and the bigger frontal lobe seemed to boost hyperactivity. Although the children studied were or had been on stimulant medications, as commonly prescribed, researchers didn’t believe that the changes in brain size were caused by the use of medication^[7]. Many researchers directly points to a dopamine production defect in adults with ADHD. The brain chemical findings could lead to more effective treatments for these patients who are inattentive, impulsive, and hyperactive. A new study suggests a delay in brain development, rather than a total alteration in normal development, is the instigating factor for ADHD^[13]. In the current investigation, researchers expanded an earlier study that found thickening of the brain’s cerebral cortex is delayed in children diagnosed with ADHD^[7].

Few early researchers believed that hyperactivity and disruptive behavior in children could be caused by a biological defect, which was either inherited or resulted from some pre or post natal injury^[8]. Several authors during early days felt that the behavioral problems were due to brain damage without physical evidence. Even the recent studies show that unfavorable factors in pregnancy and delivery could cause damage to the brain of different severity ranging from small injuries leading to mild behavioral problems like ADHD more severe injuries leading to the problems like cerebral palsy.

According to the^[11] children who have suffered certain types of brain trauma may show symptoms

similar to ADHD. But because only a small portion of children with ADHD have suffered a traumatic brain injury, it’s not considered a major risk factor. Another study found overall brain shrinkage of 3 to 4 percent among children with ADHD^[13]. Injury to the brain can be the result of trauma, brain tumor, stroke or disease. These factors can cause problems with inattention and poor regulation of motor activity and impulses. While such circumstances can result in a diagnosis of ADHD, the occurrence of such is atypical. While the exact cause of ADHD remains a mystery, brain scans have revealed important differences in the structure and brain activity of people with ADHD.

Heredity

Heredity is the most common cause of ADHD. In this topic, the hereditary cause of ADHD has discussed by focusing on genetics and twin studies.

Genetics

At one time, people thought there could be just one gene that makes someone develop ADHD. Now experts think the disorder is probably caused by several genes, each of which makes a small contribution^[2]. The genes that experts have identified as potentially contributing to the development of ADHD are genes that control certain types of neurotransmitter. The defects in one or more of these genes may contribute to a greater risk of developing ADHD symptoms, but they might not be severe enough to need treatment.

If one person in a family is diagnosed with ADHD there is a 25 to 35 percent probability that any other family member also has ADHD, compared to a 4 to 6 percent probability for someone in the general population. Several genes that may be associated with ADHD are currently being studied. Learning about specific genes could also lead to better treatments. Ongoing research is looking to pinpoint the genes responsible for ADHD. A new study by scientists at^[2] found that children with ADHD are more likely to have missing or duplicated segments of DNA. A large majority of ADHD cases may arise from a combination of various genes, many of which affect dopamine transporters.

Children with ADHD who carry a particular version of a certain gene have thinner brain tissue in the areas of the brain associated with attention. But^[11] research showed that the difference was not permanent, however, and as children with this gene grew up, the brain

developed to a normal level of thickness. Their ADHD symptoms also improved.

A new study shows that children who have been diagnosed with ADHD are more likely to start smoking early and to smoke twice as much as those without the condition. Researchers discovered a variation of a particular gene that links the behaviors typical of ADHD with those associated with smoking. Now this research has focused on specific genes that may be involved in the transmission of ADHD. Dopamine genes have been the starting point for investigation. Two dopamine genes, DAT1 and DRD4 have been reported to be associated with ADHD with a number of scientists^[5,16,17].

Twin studies

A large number of twin studies also suggest a genetic element to ADHD.

If ADHD is present in one twin, it is significantly more likely also to be present in an identical twin than in a fraternal twin, even when these twins have been raised separately. Twin studies indicate that the disorder is highly heritable and that genetics are a factor in about 75 percent of all cases. Hyperactivity also seems to be primarily a genetic condition; however, other causes have been identified^[14].

A genetic predisposition has been demonstrated in identical twin and sibling studies. If one identical twin is diagnosed with ADHD, there is a 92 percent probability of diagnosis with the twin sibling. When comparing non-identical twin sibling subjects, the probability falls to 33 percent.

Another way to determine if there is a genetic basis for a disorder is by studying large groups of identical and non-identical twins. Identical twins have the exact same genetic information while non-identical twins do not. Therefore, if a disorder is transmitted genetically, both identical twins should be affected in the same way and the concordance rate, the probability of them both being affected should be higher than that found in non-identical twins. There have been several major twin studies in the past few years that provide strong evidence that ADHD is highly heritable. They have had remarkably consistent results in spite of the fact that they were done by different researchers in different parts of the world. In one such study^[14] on 1,938 families with twins, siblings and found that ADHD has an exceptionally high heritability as compared to other

behavioral disorders. They reported an 82 percent concordance rate for ADHD in identical twins as compared to a 38 percent concordance rate for ADHD in non-identical twins. Twin studies support the hypothesis of the important contribution that genes play in causing ADHD, but these studies do not identify specific genes linked to the disorder.

Environmental factors

In fact, research suggests that ADHD is largely a genetic disorder. However, some environmental factors may play a role as well.

Exposure to toxic substances

ADHD isn't entirely caused by genetic factors.

Researchers have found an association between mothers who smoked tobacco products or used alcohol during their pregnancy and the development of behavior and learning problems in their children. Nicotine, alcohol, and lead can be toxic to developing brain tissue and may have sustained effects on the behavior of the children exposed to these substances at early ages. A similar association between lead exposure and hyperactivity has been found, especially when the lead exposure occurs in the first three years. However, it is unlikely that such exposure accounts for differences in brain development in the vast majority of children and adolescents with ADHD.

Young children exposed to certain heavy metals are at higher risk for problems with attention and behavior later in life, a new study shows. Exposure to lead, which is found mainly in paint and pipes in older buildings, has been linked to disruptive and even violent behavior and to a short attention span. Lead and mercury are potent toxins, and the developing brains of young children are vulnerable to their effects. Studies of kids with mercury poisoning show they have trouble with language skills, attention, and coordination, as well as other problems. Lead affects learning and memory. Lead, a neurotoxin, has been removed from most homes and schools, but traces of it are still everywhere. A recent study found that children with ADHD tend to have higher blood-lead levels than other kids^[4]. The theory that fluoride could cause ADHD arose from a study done in rats. Although rats exposed to fluoride during the study did develop ADHD symptoms, this may not necessarily translate into increased risk among humans.

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Family environment

There are certain aspects of the family environment that are found more often in children with ADHD. It isn't clear whether these factors can actually cause ADHD. It may be the family environment just increases the likelihood of ADHD developing in a child who is already more at risk because of other reasons. A child's home life can also affect the severity of symptoms, how long ADHD lasts and how it develops. It's possible that some of the factors linked to ADHD, such as family conflict and criminal behavior, could be the result of the same genes that cause ADHD, rather than independent causes of the disorder. Because ADHD symptoms, affect a child's ability to learn and get along with others, some people think an ADHD child's behavior is caused by a lack of discipline, a chaotic family life, or even too much TV.

Role of food

Environmental toxins, artificial flavors, dyes, preservatives and other food additives have been claimed by some to be the primary cause of ADHD. Some researchers have been advocates of sugar, food allergy and food additives causing ADHD. Anecdotal evidence and testimonials have been used by the above to back their claims, however double-blind controlled studies have shown this not to be important causes.

Recent research has shown, however, that in a select group of children, food allergies and sensitivities to food dyes may contribute to behavioral problems and physical symptoms, although no differences were noticed in psychological test scores. Some of these studies involved preschool children with ADHD and known allergies or sensitivities to certain foods^[10]. Avoidance of these resulted in behavioral improvement as well as improvement in headaches, runny nose, and sleep problems. In neither study were these children representative of ADHD children in general.

A new international study suggests a protein receptor found in the gastrointestinal track is also found in important areas of the brain. When the receptor was removed in mouse models, the mice became hyperactive and displayed problems with their ability to pay attention.

Many European countries have banned certain preservatives after research linked hyperactivity in young children to food with mixtures of some artificial food colors and the preservative, sodium benzoate. The idea that refined sugar causes ADHD or makes symptoms

worse is popular, but more research discounts this theory than supporting it. In one study, researchers gave children foods containing either sugar or a sugar substitute every other day. The children who received sugar showed no different behavior or learning capabilities than those who received the sugar substitute^[12]. Another study in which children were given higher than average amounts of sugar or sugar substitutes showed similar results. Still, certain dietary components may affect behavior, and a recent study suggested that adolescents with diets high in fat, refined sugar, and sodium were two times as likely to be diagnosed with ADHD as other kids^[11]. Additional studies have also linked diets deficient in omega-3 fatty acids, which are important for brain development and function, to ADHD symptoms. These fats are important for brain development and function, and there is plenty of evidence suggesting that a deficiency may contribute to developmental disorders including ADHD. The studies suggest a possible link, but can't prove that pesticides cause ADHD^[9].

Other causes

Other possible causes of ADHD include:

- Brain damage either in the womb or in the first few years of life.
- A Biochemical pathway long associated with diarrhea and intestinal function may provide a new therapeutic target for treating ADHD.
- Preterm and early birth (before week 37 of the pregnancy) having low birth weight are associated with a significant risk of developing ADHD by school age, according to a cohort study of more than one million children^[15].

WHAT DOES NOT CAUSE ADHD

In the 1970's it became popular to view ADHD as resulting from allergies or sensitivities to certain food substances. However, much of the research done over the past two decades was unable to support the claim that diet played a significant role in causing ADHD and no studies have found any significant connection between problems with hormone functioning and hyperactivity or ADHD. For a number of years some clinicians have proposed the theory that ADHD and some learning and emotional problems could be the

result of problems within the vestibular system of the brain which affects balance. They contend that treatment with anti-motion sickness medicine could correct these problems. This theory is unsupported by scientific research and is inconsistent with what is known about ADHD and the vestibular system.

No studies support the idea that ADHD is the result of poor parenting practices or other family environment variables. While parents of children with ADHD are likely to give more negative commands to their ADHD child and less positive attention, this may be due to the fact that ADHD children are often non-compliant and, therefore, parents are more likely to be more negative in their interaction with them. Furthermore, the interactions of parents of ADHD children whose behavior was not oppositional were no different than they were from non-ADHD children. It is important to note, however, that symptoms of ADHD and the degree, to which such symptoms can impact the child's functioning, can be reduced by parents who provide appropriate accommodations and interventions. On the other hand, a stressful home environment or parents who refuse to accept ADHD as a diagnosed condition can make the symptoms worse.

No studies have found any connection between television viewing and ADHD. Nor have any studies indicated that children with ADHD watch more television than do those without ADHD. There is not enough evidence to say television is definitely a cause of ADHD, but allowing children up to the age of three to watch several hours a day could contribute to attention problems and ADHD in later life.

SUMMARY

There is no single cause for ADHD. Scientists agree that ADHD is a medical disorder affecting the several areas of the brain with the frontal area likely having the greatest involvement. Heredity is the most common cause of ADHD and twin studies also given valuable results. Genetic research has focused on the specific genes or combination of genes may be responsible for characteristics of ADHD. Other risk factors for ADHD have to do with factors that can influence brain development and functioning such as exposure to toxic substances in the developing fetus and acquired brain injury due to trauma or disease. Factors such as diet,

vestibular dysfunction, television viewing and parenting have not been proven to be causes of ADHD.

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