The Relationship Between ADHD and Environmental Stress

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ADHD: A Biochemical Look

What ADHD Looks Like in the Body

Precise neural mechanisms involved in Attention-Deficit/Hyperactivity Disorder (ADHD) are not known, but researchers have found some clues about how ADHD alters brain structures and biochemistry of the body.

In one study of ADHD animal models, reduced dopamine transmission was found in the:
•prefrontal cortex
•nucleus accumbens
•striatum[1]

Another study found that:
•Delayed prefrontal and temporal cortical development occur in children with ADHD. Both of these regions are involved in brain control.
•ADHD patients showed earlier development of the motor cortex.
Conclusion: The authors of the study hypothesized that early maturation of the primary motor cortex with late maturation of higher-order motor control regions may reflect or even drive the excessive and poorly controlled motor activity cardinal to the syndrome [9].

Effects of Smoking on Fetal Development

"Lack of blood to the brain of the developing fetus may thus provide a mechanism by which smoking during pregnancy may impact upon the psychological development of children" [2].

The quoted paper above discusses a study that found, for fetuses whose mothers smoked more than 10 cigarettes a day compared to fetuses whose mothers didn't smoke at all, suffered from reduced blood flow to the brain due to increased resistance in:
•uterine arteries
•umbilical arteries
•fetal middle cerebral arteries[2]

One study found that nicotine is shown to cause changes in the fetal brain, some of which are:
•shrinking of hippocampal neurons
•reduced blood flow to the brain
•reduced serotonin/dopamine turnover [7]

An increasing amount of literature has found that maternal smoking can lead to the reduced amount of dopamine produced in Attention Deficit Hyperactivity Disorder (ADHD) [8].

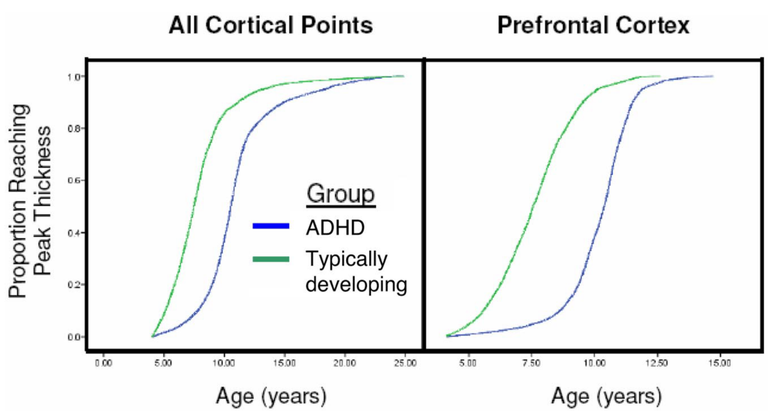

Figure 1 [9] : Cortices of ADHD patients develop later than the cortices of non-ADHD patients. This data is based on MRI scans.

Diagnosing ADHD: Societal Implications

What are the symptoms* of ADHD?

- inattention (where children are easily distracted and unable to keep their minds on a single task for extended periods of time)
- hyperactivity (often indicated by a child's constant restlessness)
- impulsivity (indicated by a lack of control or restraint) [3]

How is ADHD Diagnosed?

The following guidelines, from the American Academy of Pediatrics (AAP), are used to assist clinicians in diagnosing children aged 6 to 12:
1. Symptoms meet the DSM IV criteria for ADHD.
2. Parents or caregivers have documented the symptoms.
3. Teachers or another source have documented the symptoms.
4. An assessment has been done on potential coexisting conditions (mood disorders, learning disorders, etc.) [4]

What are the problems with diagnosing ADHD?

The Problem in Noticing ADHD

It isn't usually until adolescence, when the child starts attending school, that there is a great demand for organizational skills, time management, and the mastering of large amounts of material. Some adolescents may not be diagnosed until middle school or high school [4].

DSM IV Criteria Doesn't Account for How ADHD Interacts with Other Conditions**

"Studies show that as many as 67% of children who have ADHD may have a coexisting condition such as a psychiatric problem, learning disorder, or social immaturity" [4].

The AAP guidelines above rely on DSM IV criteria. This means that when a child's behaviors do not conform to DSM IV criteria because of the existence of other conditions, the diagnosis of ADHD may be missed [4].

It is important to consider the following when diagnosing a child with ADHD:

- family stressors (including domestic violence)
- lack of sleep (either from disorders or poor sleep hygiene)
- inappropriate school placement
- unrealistic expectations (e.g., expecting a child to juggle many activities)
- psychiatric disorders such as autism, anxiety problems, mood disorders, or specific learning disabilities [4]

The above factors can be sole causes of symptoms or can coincide with ADHD. It important to diagnose a child correctly so that they can be treated correctly.

Treatment of ADHD

The AAP recommends that clinicians treat ADHD as a chronic condition. Treatment goals are generated for an individual child in collaboration with family and school [4]. ADHD medication can, but is not necessarily, managed by behavioral therapy [4].

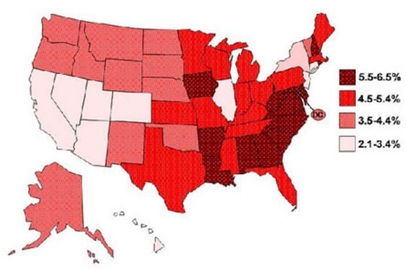

Figure 2 [3]: This map shows the percent of youth (ages 4-17), who have ever been diagnosed with ADHD, are taking medication.

Environmental Stressors Interacting with ADHD

Smoking

There is no consensus on how large of an effect smoking has on ADHD. According to various studies, children of smokers are 2-4 times more likely to have clinical diagnoses of ADHD than the children of non-smokers [2].
Mothers who smoke during pregnancy are also more likely to continue smoking after their pregnancy. It is likely that postnatal smoking exerts a greater influence than prenatal smoking on various aspects of child behavior. A study found that children of mothers who quit smoking after giving birth did not have a much higher risk of antisocial behavior than children whose mothers did not smoke during pregnancy. [2]

Socioeconomic Factors

Swedish researchers performed an in-depth study on potential factors that could cause ADHD by testing ADHD-medicated patients. Low maternal education alone predicted 33% of cases with medicated ADHD, single parenthood 14% and social welfare 10%, while psychiatric or addictive disorder in the parents predicted less than 4%. [5]

A Closer Look: Autism's Relationship to ADHD

In a study done by Kroger, et al., 205 children with ADHD were assessed for a wide range of variables. It was found that hyperactive symptoms are predictors of autistic symptoms in children with ADHD. The study pointed to both genetic and environmental risk factors to possibly explain this relationship. It is possible that ADHD is exacerbated by environment to cause autistic symptoms [6].

Conclusions

Findings in the poster indicate that it is important to catch ADHD symptoms early because ADHD can be exacerbated by environmental factors. Furthermore, ADHD can be masked by other conditions. Of course, the findings presented in this poster have only been suggestive, not definite. It might concerning to look for symptoms of ADHD early in development because it may lead to misdiagnosis or overdiagnosis. The findings presented in this poster, however, indicate that parents and doctors should be more wary of ADHD if there are certain risk factors present for a child. While we think it is important to recognize and treat ADHD early, we are not suggesting that medication is the best way to treat early diagnoses of ADHD.

References and Notes

*Separate handout with exact Diagnostic Criteria from Diagnostic and Statistical Manual of Mental Disorders, 4th Ed (DSM IV)
**Separate handout with a list of common co-existing disorders with ADHD.

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