



Prenatal alcohol exposure as a risk factor for dysfunctional behaviors: the role of the pediatrician

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Abstract

Objective: Although the classic features of fetal alcohol syndrome have been recognized since 1968, research on alcohol teratogenesis has only recently demonstrated that the brain is the organ in the body most vulnerable to the effects of prenatal alcohol exposure. In this present article, we reviewed the literature focusing mainly on behavioral disturbances related to prenatal ethanol exposure.

Sources: We performed a PubMed search on the literature published between 1968 and 2006 using the terms ethanol, pregnancy and behavior. We limited our search to studies on humans.

Summary of the findings: The data presented in this review suggested that youths with fetal alcohol spectrum disorder are at risk of disruptive social behavior, among other neurobehavioral abnormalities.

Conclusions: Although it is still impossible to completely separate brain teratogenesis secondary to alcohol exposure from environmental postnatal influences as the definite cause for these outcomes, the pediatrician should be encouraged to early diagnose children affected by fetal alcohol syndrome and fetal alcohol spectrum disorder. This provides proper management and care and avoids long-term consequences on their behavior, besides ensuring better and productive school and social adaptation.

J Pediatr (Rio J). 2008;84(4 Suppl):S76-79: Fetal alcohol syndrome, ethanol, alcohol, behavior, pregnancy, teratogenesis.

Introduction

The classic features of the fetal alcohol syndrome (FAS) have been recognized since 1968. Research on alcohol teratogenesis has demonstrated that the brain is the most vulnerable organ to the effects of prenatal alcohol exposure. Central nervous system damage from prenatal alcohol exposure results in permanent impairments, including neurological abnormalities, behavioral dysfunctions, developmental delays, and intellectual impairment. More recently, several studies have suggested that children with FAS also have behavioral and emotional difficulties that can lead to a variety of serious secondary cognitive, emotional, behavioral and developmental problems. Among those secondary disabilities are disrupted school experiences, trouble with the law, confinement, inappropriate sexual behavior, and alcohol/

drug problems. In the present article, we reviewed the literature mainly focusing on behavioral disturbances related to prenatal ethanol exposure.

Review of the literature

The effects of prenatal alcohol exposure were first reported in France in 1968, by Lemoine et al.¹ and named in 1973 by Jones & Smith.² The term FAS refers to a cluster of features and developmental delay among children born to mothers who consumed alcohol during pregnancy. This characteristic pattern of anomalies includes pre- or postnatal growth deficiency, facial features such as short palpebral fissures, smooth philtrum and a thin upper lip, and some central nervous system abnormalities.³

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Research on alcohol teratogenesis has demonstrated that the brain is the most vulnerable organ to the effects of prenatal alcohol exposure.⁴ This teratogen acts in different ways, depending on the type of brain cells and the developmental stage of the embryo or fetus: it can lead to cell death, interfere with cellular functions, hinder the generation of new cells, cause abnormal cell migration and disorganized cell tissue structure, interfere with neurotransmitter production, and cause abnormal formation of neural synapses.⁵ Thus, there is no greatest period of vulnerability and it seems that all trimesters during pregnancy are critical for brain development.⁶

Central nervous system damage from prenatal alcohol exposure results in permanent impairments, including neurological abnormalities, behavioral dysfunctions, developmental delays and intellectual impairment.⁶ Children with FAS or some features of the syndrome but who do not meet the criteria for the full blown diagnosis are now encompassed under the term fetal alcohol spectrum disorder (FASD). Individuals with FASD have shown intellectual deficits with the average intelligence quotient (IQ) in the borderline range (70-79),⁷ lower scores on tests of arithmetic than on other tests,⁸ deficiency in different components of attention and executive functioning,^{9,10} impairments in information processing,¹¹ number processing,¹² visual spatial reasoning,¹³ visual memory,¹⁴ language¹⁵ and motor functions.¹⁶

Studies have suggested that these children also have behavioral and emotional difficulties that can interfere with their participation in home, school and social environments. For example, they have less adaptive ability and skills necessary to perform age-appropriate daily activities. Adolescents and adults often exhibit poor socialization and communication skills. Most of them display significant maladaptive behaviors, such as impulsivity and inappropriate sexual behavior, and they are less likely to be living independently.¹⁷⁻¹⁹ Those problem behaviors occur in individuals prenatally exposed to alcohol, whether or not they meet the criteria for FAS and these abnormalities can lead to a variety of serious secondary cognitive, emotional, behavioral and developmental problems. Secondary disabilities are those that arise as a result of the interaction between the individual's impairments and deficits (primary disabilities) and life experience. It is assumed that secondary disabilities can be prevented, reduced or eliminated with proper intervention.²⁰

One of the first studies to indicate concern regarding secondary disabilities was published in 1996 and it examined risk and protective factors for mental health problems (MHP), disrupted school experience (DSE), trouble with the law (TWL), confinement (CNF), inappropriate sexual behavior (ISB) and alcohol/drug problems (ADP).²¹ Among the 415 clients investigated with FAS or FASD, more than 90% had experienced MHP, 60% had experienced DSE, 60% had experienced TWL, 50% had experienced CNF, 50% had experienced ISB and 30% had experienced ADP. The protective factors for these

secondary disabilities included: 1) longer period of living in a stable and nurturant home; 2) being diagnosed with FAS or FASD before the age of 6 years; 3) never having experienced violence against oneself; 4) longer duration of residence in each living situation; 5) experiencing a good quality home between the ages of 8 and 12; 6) having applied for and been found eligible for Division of Developmental Disabilities services; 7) having a diagnosis of FAS; and 8) having basic needs met for at least some part of life.

In the following year, Streissguth et al.²² provided more empirical evidence suggesting that the populations of individuals with FAS or FASD are at higher risk for involvement with the criminal justice system. They collected information from 213 clients with evidence of the effects of prenatal alcohol exposure between the ages of 12 and 51 and demonstrated that 32% of the adolescents and 42% of the adults had been incarcerated for a crime. The extent of these problems appeared to be associated with the diagnosis of FAS or FASD and not to mental retardation in and of itself. It is important to note that their criminal activity seemed largely to be impulsive rather than premeditated, suggesting that their maladaptive behaviors and cognitive deficits led them into TWL. The most frequent crimes reported in this study were theft and shoplifting.

In an extensive review, Boland et al.²⁰ suggested that the link between FASD and delinquency may occur through a developmental pathway similar to that seen with attention deficit disorder (ADD) with or without hyperactivity. The predictors of conduct disorder or delinquent behavior in individuals with FASD or ADD in the absence of prenatal alcohol exposure are similar, and include impulsivity, low intelligence, poor school achievement, antisocial behavior and poor parental child-care, in addition to the risk factors listed above. Not all children will follow the developmental pathway that begins with FASD or ADD and ends in criminal conduct; much of the delinquency displayed among these people seems to be related to poorly suited patterns of behavior, difficulty sorting out cause and effect, and trouble understanding consequences.

In 1999 the first published study on the prevalence of FASD in youths in the criminal justice system was performed in Canada. Investigators evaluated 287 offenders who were sent for psychiatric/psychological assessment and found that 23.3% (67) of them had an alcohol-related diagnosis, three of which (1%) were FAS. The average IQ was within the normal range (87.26 ± 13.76) with scores from a low of 55 to a high of 129. Of the 67 individuals found to have an alcohol-related diagnosis, only three had been diagnosed with FASD prior to this evaluation. The authors concluded that a large number of youths with FASD come in conflict with the law. These data suggest that: 1) since not all youths in the criminal justice system receive such a careful evaluation with

respect to FASD, the percentage of youths with these disorders in the criminal justice system is likely to be underestimated; 2) individuals with FASD appear to be disproportionately represented in the criminal justice system compared to worldwide prevalence data; and 3) there is a need for extensive education to provide accurate diagnosis in this population.^{23,24}

Another study addressing these questions was performed in the Canadian corrections system and included incarcerated people from federal and provincial prisons. The investigators sent a questionnaire to each Director of Corrections about issues related to FAS, use of screening methods, availability of diagnostic resources, staff awareness and number of diagnosed cases. The total prison population in the surveyed sites included 148,797 individuals, 91.2% of whom were male and 8.8% of whom were female. Among them, 13 cases of FAS were identified. This represents a prevalence rate of 0.087/1,000 offenders. Using a conservative estimate of the true prevalence of FAS based on a U.S. rate of 0.33/1,000 in the general population, there could be a minimum of 36 undiagnosed cases of FAS in this sample. Using a high estimate of 9.1/1,000 for the true prevalence of FASD in the general population, there could be as many as 404 undiagnosed cases in this sample, revealing the magnitude of the task of identifying FASD in adolescents and adults in the prison population.²⁵

Burd et al.²⁶ later published a similar study conducted in the US prison system. The investigators used the same questionnaires developed for the Canadian study, and sent them to 54 entities nationwide. From the 42 entities that provided complete responses, a total of 3.08 million prisoners were involved, 89.7% of whom were male and 10.3% of whom were female. Only one individual was reported to have a diagnosis of FAS. Again using conservative to more liberal rates to estimate the true prevalence of FAS or FASD in this prison sample, the total number of affected individuals could range from a low of 1,540 to a high of 28,036 undiagnosed cases. Once more, these data demonstrate that adolescents and adults in prison systems due to inadequate availability of appropriate assessment capability may be critically underdiagnosed. This concern suggests that when carefully appraised, individuals with FASD are overrepresented among those who are incarcerated.

Conclusions

In conclusion, there is a growing body of evidence of the disruptive action of alcohol on brain development even in the absence of the full characteristics of the FAS. FAS and FASD represent nowadays the most common congenital cause for neurobehavioral alterations, including mental retardation.²⁷

It is still impossible to completely separate the effects of alcohol directly on the brain and those effects due to the disturbed environment where a drinking mother lives. The data

presented in this review suggest that youths with FASD are at risk of running into trouble with the law. However, to date, no study has compared the incidence of criminal behavior in youths both with and without FASD who have comparable characteristics and environmental risk factors to determine whether the disorder itself contributes to the excess risk. Similarly, the studies presented in this review suggest that a large number of youths who come in contact with the criminal justice system have FASD. However, these studies also lack control groups of non-incarcerated youths who have received an equivalent assessment for features of FASD, and are matched on age, race/ethnicity, sex, socioeconomic status, and environmental factors. Without this kind of comparison group, we cannot state that FASD is overrepresented in the incarcerated population.

For the pediatrician, it is important to early diagnose children affected by FAS or FASD, to initiate appropriate management and care and to avoid long-term consequences on their behavior and to ensure better and productive school and social adaptation.

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