[Archived] FAS/FAE and Its Impact on Psychosocial Child Development

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February 2003

Introduction

Fetal alcohol syndrome (FAS) was first described in 1973, when Jones and Smith[1] identified a distinctive set of dysmorphic facial features (short palpebral fissures, flat midface, thin upper lip, and a flat or smooth philtrum) in children whose mothers drank very heavily during pregnancy. These children also exhibited growth retardation, as well as significant cognitive and/or behavioural dysfunction. The term *fetal alcohol effects* (FAE) was later applied to children who exhibited some, but not all, of the alcohol-related dysmorphic features and whose mothers were known to have drunk heavily during pregnancy.[2,3] Although many FAS patients were mentally retarded (IQ < 70), a substantial proportion performed within the low-average to average range.[2,4] The IQ scores of FAE patients were also depressed but tended to be somewhat higher than those found in FAS patients. Children with little or no facial dysmorphology whose mothers drank heavily during pregnancy also exhibited cognitive and behavioural deficits, similar to those found in FAS patients.[5] In contrast with Down's syndrome, where virtually all aspects of intellectual functions are impaired, FAS patients often exhibited considerable verbal facility (eg, reference 7). The most

consistent deficits were in arithmetic[2,6] and attentional function.[7,8]

Subject

This research examines the intellectual and behavioural sequelae of prenatal alcohol exposure and how these sequelae differ from the deficits that characterize certain other mental disorders.

Problems

Over the past decade, much of the research in this field has focused on the degree to which prenatal alcohol exposure has been associated with a distinctive pattern of intellectual and behavioural deficits.

Research Context

Two research designs have been utilized:

1. Case/control studies, in which individuals meeting standard criteria for FAS diagnosis and/or children born to mothers known to have drunk heavily during pregnancy were compared with individuals believed not to have been exposed to heavy alcohol drinking during gestation. Controls were usually matched by age and gender and, occasionally, by IQ.
2. Prospective cohort studies, in which mothers were interviewed about their drinking during pregnancy in order to recruit a sample, and in which those who engaged in heavy drinking during pregnancy, were over-represented. The children in these studies were followed longitudinally and assessed at various points during their development. Potential confounding variables were measured and controlled for statistically.

Research Questions

Two of the important questions in this research are as follows:

1. To what degree does fetal alcohol exposure affect specific aspects of attentional and cognitive processing?
2. To what degree might exposed children’s socio-emotional functioning also be affected?

Recent research results

a) Hyperactivity and attention

Hyperactivity has been reported in several studies of FAS/FAE clinic patients.[8,9] However, Coles et al.[3] found little evidence of hyperactivity or impulsivity in their sample of FAS/FAE children, recruited prospectively during the antenatal period. These authors suggest that because patients who were identified through referral to medical and psychiatric settings are more likely to be living in unstable family situations, the hyperactivity reported in studies of clinic-referred patients may have been attributable to social and environmental factors, such as attachment disorders, anxiety, and post-traumatic stress disorder. There also may have been a selection bias in clinic-referred samples; FAS children who are also hyperactive are more likely to be referred for treatment since their behaviour is disruptive in family and school settings.

FAS/FAE children generally do not show deficits in *sustained attention*, defined as the ability to remain alert over time.[3,10] At least three studies of FAS/FAE patients have reported deficits in *focused attention*, defined as the ability to maintain attention in the presence of distraction.[3,11,12] However, Coles et al.[3] noted that although focused attention was significantly poorer among their FAS/FAE children than among their controls, FAS/FAE children actually performed somewhat better than children with attention deficit hyperactivity disorder (ADHD), suggesting that the focused attention deficit associated with prenatal alcohol exposure is less severe than it is in ADHD.

Executive function involves the ability to coordinate, plan, and execute appropriate responses and to modify behaviour flexibly in response to feedback. FAS has been linked to below-average cognitive flexibility on tests of verbal fluency in which a child was asked to list as many words as possible from a given category.[7,13,14] These tests assessed the ability to monitor information retrieved from long-term memory for conformity with a prescribed rule. Limited cognitive flexibility was also found on a design fluency test,[14] and on the Wisconsin Card Sorting Test,[3,7] which was used to assess children’s ability to utilize feedback to alter their responses when the criterion for the correct

response changed and the ability to inhibit a previously learned but henceforth inappropriate response (*response inhibition*). Coles et al.[3] found that, in contrast with focused attention, executive function deficits were more severe in FAS/FAE children than in children with ADHD.

With regard to planning, FAS children did not perform as well as other children on the Stepping Stone Maze (which assesses a child's ability to utilize feedback to find an invisible path through a maze[11]) and two variants of the Tower of Hanoi (which assesses complex planning, including the ability to analyze a problem, devise a strategy, monitor one’s performance, and modify one's

strategy as performance proceeds[7,15]). Poorer inferential reasoning and concept formation have also been reported in FAS children.[15-17]

b) Learning and Memory

Recent studies of FAS/FAE patients found that certain aspects of learning and memory function were more impaired than others. Kerns et al.[12] reported that although non-retarded adults with FAS found it difficult to memorize word lists on the California Verbal Learning Test (CVLT) they had little apparent difficulty in retaining what they learned. Similarly, Mattson et al.[16,18] found that FAS/FAE children tested on the CVLT had more difficulty in encoding than in retaining and retrieving previously learned information. In a study comparing FAS/FAE children with a sample of Down's syndrome children, Mattson and Riley[19] found that the learning and memory impairment associated with prenatal alcohol exposure was more circumscribed than in Down's syndrome. Retention and recognition memory were relatively intact, as was the capacity to benefit from prompting or priming.

c) Socioemotional Function

Two studies have found that children with prenatal exposure to alcohol were rated by their teachers as less socially competent and more aggressive in the classroom than their classmates.[13,20] Because these effects remained significant after controlling for current maternal drinking and measures of the quality of parenting, these studies suggest that prenatal alcohol exposure may have effects on socioemotional development that are independent of the social environment in which a child is raised.

Carmichael Olson et al.[11] used the Vineland Adaptive Behavior Scale to rate the parents of a sample of FAS/FAE adolescents. The most substantial deficits were seen in the area of socialization, for which interpersonal skill and the ability to conform to social conventions were assessed. The most salient problems were failure to consider the consequences of one's actions, lack of responsiveness to social cues, and poor interpersonal relationships.[2] Thomas et al.[22] found that the Vineland scores of FAS/FAE children were significantly lower than those of IQ-matched controls, especially in the area of interpersonal skills. These findings indicate that the social judgment and relationship problems exhibited by FAS/FAE children were not simply consequences of their intellectual limitations. Thomas et al. also found that the discrepancy between an FAS/FAE child's chronological age and his or her age-equivalent Vineland score increased as he/she grew

older. This finding may help explain why Coles et al.[23] found no adverse effects on Vineland scores at 6 years, an age when FAS children are frequently characterized as talkative, affectionate, and outgoing, and why Steinhausen et al.[24] found that the behaviour problems that become evident during childhood do not improve as FAS patients reach adulthood.

On the Personality Inventory for Children (PIC), the two domains identified by parents of FAS/FAE children as being the most problematic were cognitive function and delinquency, domains not salient in most forms of mental retardation.[25] These children were more likely to exhibit antisocial behaviours, lack consideration for the rights and feelings of others, and to resist limits and requests made by authority figures. This finding is consistent with Streissguth et al.'s[26] report that adults with FAS are more likely to get into trouble with the law and to exhibit sexually inappropriate behaviour.

Conclusions

Studies conducted during the past decade show that prenatal alcohol exposure is associated with a distinctive pattern of intellectual deficits, particularly in arithmetic and certain aspects of attention, including planning, cognitive flexibility, and the utilization of feedback to modify a previously learned response. With respect to learning, the acquisition of new information is more likely to be impaired than retention and retrieval of previously learned information. As alcohol-exposed children grow older, deficits in socioemotional function become increasingly salient, particularly with regard to social judgment, interpersonal skills, and antisocial behaviour.

Implications in Policy and Provision of Services

While FAS/FAE entailed relatively severe cognitive and emotional impairment in a limited number of offspring, similar problems were found in the much larger number of children whose mothers drink recreationally during pregnancy but were not necessarily alcohol dependent or alcohol abusers. Although reduced IQ scores were not usually found among children in this category[3,13,27] (but see reference 28), they did exhibit developmental deficits in the domains that are typically most severely affected by FAS, particularly arithmetic,[27,29] executive function,[13,30] and socioemotional function.[10,13] This specificity suggests that it may be important to develop educational programs to deal with the specific patterns of weaknesses and relative strengths associated with prenatal alcohol exposure. Indeed, the prevalence of fetal alcohol exposure in our society is, in itself, an indication that we must design preventative interventions during pregnancy

for both alcohol abusers and recreational drinkers. The evidence that aggression and delinquency increase during adolescence regardless of an FAS/FAE child's intellectual limitations suggests that we must develop innovative interventions for dealing with fetal alcohol-related adolescent and adult behavioural problems, which appear to be particularly resistant to standard treatments.

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