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Gender and alcohol moderate caregiver reported child behavior after prenatal cocaine☆

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Abstract

Objective: The concurrence of prenatal alcohol exposure with other drug exposure, low socioeconomic status and environmental risk factors may obscure associations, if any, between prenatal cocaine exposure and child outcomes. This study evaluates the effects of prenatal cocaine exposure on child behavior in analyses stratified by gender and prenatal alcohol exposure status.
Methods: Maternal alcohol, cigarette, and illicit drug use were prospectively assessed by interview during pregnancy and postnatally. Maternal and neonatal urine were tested for drug exposure as clinically indicated. Caregiver report of child behavior was assessed with the Achenbach Child Behavior Checklist (CBCL). Dichotomous cocaine exposure was characterized as no (negative history and biologic markers), and any (positive history and/or biologic markers during pregnancy and/or positive urine screen at delivery from either mother or infant).
Results: Prenatal cocaine exposure was associated with adverse effects on offspring behavior that were moderated by the gender of the offspring as well as prenatal alcohol exposure. For girls without prenatal alcohol exposure, 6.5% of the unique variance in behavior was related to prenatal cocaine exposure. For these girls, the odds of scoring in the abnormal range for Aggression was 17 times control levels (95% confidence limits 1.4 to 203). These findings, though significant, have wide confidence intervals and need to be replicated in larger cohorts and on longitudinal follow-up.

Keywords: Child Behavior Checklist (CBCL); Child behavior; Cocaine; Prenatal exposure delayed effects

1. Introduction

Abuse of cocaine by pregnant women is a major medical and social problem [60]. In the United States, recent reports of cocaine use during pregnancy vary between 2% and 18%. In the mid- to late 1980s at the height of the "cocaine epidemic", as many as 31% of the maternity clients at our center [17,45] had evidence of cocaine use during pregnancy. Because it is lipophilic, cocaine readily crosses the placental barrier by simple diffusion [42,60]. Furthermore, the low levels of metabolic enzymes, cholinesterases, in the fetus, and during

Abbreviations: CBCL, Child Behavior Checklist; HOME, Home Observation for Measurement of the Environment; SCL-90, Symptom Checklist-90; OR, Odds ratio; SES, Socioeconomic status; SCL-GSI, Symptom Checklist—Global Severity Index.

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pregnancy, potentially expose the fetus to relatively higher drug concentrations. Impairment of the reuptake of monoaminergic neurotransmitters by presynaptic nerve endings, a primary mechanism of action of cocaine, leads to accumulation of the neurotransmitters at synapses, activation of the adrenergic system and ultimately depletion of neurotransmitters from nerve endings [26,29,32]. These neurotransmitters have regulatory roles in the development of neuronal circuitry. These disturbances in the monoaminergic systems could adversely affect the developmental outcome of children exposed to cocaine in utero. However, studies on the behavioral teratogenicity of cocaine in animals and humans have produced conflicting results [59]. The ambiguous nature of outcomes may be due to methodological problems typically associated with behavioral toxicology research [4]. These include the potential confounding effects of other substances of abuse and poor maternal health and nutrition, as well as difficulties in obtaining sensitive and valid measurements of prenatal exposure, and of child outcomes. Finally, postnatal factors associated with drug use, including the child-rearing environment and postnatal drug exposure, may alter long-term outcome.

Our research group has previously reported the association of prenatal cocaine exposure and adverse effects on childhood growth, behavior and language development [15,18–20]. We have demonstrated gender moderation of the behavioral effects of prenatal cocaine exposure [21]. In additional analyses, we noted a significant interaction of prenatal cocaine by prenatal alcohol exposure and gender. The aim of the current study was to further examine the nature of this interaction and child behavior. Distinguishing features of this study include statistical analyses stratified by both gender and prenatal alcohol exposure to control for moderators and address collinearity; and sensitive and valid measurement of the level of prenatal cocaine exposure in a large cohort of urban African American women and children followed prospectively from the first prenatal visit.

2. Methods

The design of this study was historical prospective. Beginning in 1986, women attending the urban university-based maternity clinic were routinely screened at their first prenatal visit for alcohol and drug use by trained research assistants.

2.1. Sample

All mothers in this study received prenatal care in the antenatal clinics at Wayne State University and participated in a prospective pregnancy study approved by the IRB. Women were interviewed at their first prenatal visit to initially ascertain a dichotomous self-report of cocaine use and maternal urine was tested as clinically indicated. A trained research assistant administered a standardized, structured research interview to elicit estimates of amounts of cocaine and other illicit drug use (i.e., times/day, days/month and cost/month). At each subsequent prenatal visit, alcohol and illicit drug (henceforth referred to only as drug) exposure data were obtained by research interview [56]. Tobacco exposure was estimated from maternal report of the number of cigarettes smoked in the peri-conceptional period, as well as across pregnancy. At delivery, hospital policy at the time dictated screening of urine samples from mothers and infants for drug exposure when evidence (history or biologic measures) of past or current drug or alcohol use existed. Over 90% of the known cocaine-exposed pregnancies in this study underwent urine screening at delivery.

Children in this study were the singleton infants delivered between September 1, 1989 and August 31, 1991 to women extensively screened for in-pregnancy drug and alcohol use as described above. Block sampling, which over sampled alcohol- and cocaine-exposed pregnancies, was employed to reduce collinearity between drug and alcohol use, because an unselected sample would likely inadequately identify women using drugs, but not alcohol. Over 2400 pregnancies were screened yearly for this sample selection. Because more than 90% of antenatal patients were African American, the study was limited to this racial group. Additional exclusion criteria were very limited and included multiple gestation, children with major congenital malformations, and known positive maternal HIV status. Mothers with no prenatal care could not be evaluated prospectively in the clinic and were also excluded. The need for this exclusion was unfortunate because drug and alcohol abusing mothers are more likely to avoid prenatal care. However, this design decision was made to reduce the risks of misclassification of cocaine exposure status and inadequate assessment of other prenatal exposures (alcohol, tobacco and other drugs) that would be inherent among women who delivered with no prenatal care.

At follow-up 6–7 years later, families were intensively sought by telephone, mail or by home visit to the last known address. Client files of all Detroit-based University-affiliated hospitals and the pediatric and internal medicine ambulatory services were searched for updated contact information. Telephone numbers were also searched. Additionally, children were sought through the private and public school system. Families who could be contacted represented the potential study sample.

2.2. Instruments and procedure

At age 6–7 years, following informed consent, the child and caregiver (usually the biological mother when available, or, if not available, the primary caregiver) were tested