The Impact of Maternal Substance Abuse on Child Development: What Do We Know?

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Center for Maternal Substance Abuse and Child Development

http://msacd.emory.edu

Developmental Research/Brain Imaging









Prevention

Maternal Substance Abuse and Child Development



Ask The Experts



Treatment Research







CO FAR

Since 1980 the focus of the Center for MSACD, under the direction of Claire D. Coles, PhD, has been on the effects of prenatal exposure to alcohol and drugs (both legal and prescription) as well as associated factors in understanding child, adolescent and adult development. Our Mission includes Developmental and Intervention Research and Prevention Services as well as Diagnosis and Treatment



A Pregnancy is...

Incentive to quit

Added stress

 A short time to change behavior, social life and relationships

Why the Concern for Prenatal Exposure?

- Inconsistent or inaccurate media coverage of prenatal exposure issues
- Confusion over total abstinence vs. low/light/moderate consumption
- 60 80% of DFCS referrals in GA involve substance abuse; 78% nationwide
 - Latest DFCS stats: 7,600 in 2013 15,000 in 2018
- FAS: 1 3 per 1000 but 10-15 per 1000 in higher risk groups such as foster care
 - Estimates range from 0.6 to 32% prenatally exposed

Diagnostic Challenges with Prenatally Exposed Children

- Health Care professionals frequently do not identify children or do not want to ask mothers about their use. <u>Stigma</u>?
- Not all children are tested for prenatal exposures
- Multiple other problems in the lives of mothers and families
- Many of the effects do not manifest in infancy (e.g., specific academic problems; behavioral disorders) so that children have to be <u>followed over time</u>.
- Wide variety of physical and behavioral outcomes due to both the drugs and to <u>complicating medical and social factors</u>
 - It is <u>time consuming</u> to collect information necessary to evaluate children correctly.

Diagnostic Challenges with Prenatally Exposed Children

- The issue of "background risk"
 - With each pregnancy, all women have a 3% to 5% chance of having a baby with a birth defect. This is regardless of whether they abuse drugs or not.
 - Both genetic and environmental factors cause birth defects.
 - The causes of about 60-70 percent of birth defects are currently unknown.

• It is almost never one drug

ENEC Case Study 1:

Referral Question? Referred by Pediatrician and Babies Can't Wait. The main concerns are "possibly short and long term effects from drug exposure".

ENEC Case Study 2:

Referral Question? Caregiver is concerned about prenatal exposure and developmental delays.

So...Let's Talk Teratology!!

Opioids
Alcohol
Tobacco
Marijuana

OPIOIDS



From: Prevention of Prescription Opioid Misuse and Projected Overdose Deaths in the United States JAMA Network Open. 2019;2(2):e187621. doi:10.1001/jamanetworkopen.2018.7621



Overdose Deaths From Prescription and Illicit Opioids From 2002 to 2025 Under the Base-Case Projection Scenario. The model closely replicated the overdose deaths reported by the Centers for Disease Control and Prevention (CDC) from 2002 to 2015 and projected that the number of overdose deaths will increase substantially from 2016 onward. The lines are the average outcomes across 1000 calibrated parameter sets. Shaded regions represent the bootstrapped 95% uncertainty intervals of the model outcomes. OPvM indicates opioid policy model.

Opiates: Use During Pregnancy

 Very problematic issue of polysubstance abuse, as often includes exposure to alcohol, tobacco, other drugs of abuse such as marijuana, heroin, methadone or both

 Prevalence rates during pregnancy range from <1-2% to as high as 21% but...

Let's look at West Virginia

Pregnant Women: Prescription and/or Illegal Drugs

- West Virginia: 1st prenatal visit
 - 706 tested, 227 (32%) positive for one or more illegal and/or prescription drugs
 - 74% marijuana
 - 23% opiates/6% methadone
 - 12% benzodiazepines and hypnotics (Xanax, Lunesta, Ambien)
 - 4% cocaine
 - Alcohol? Nicotine?

Effects of Opiates on the Fetus and Newborn



- Opiates cross the placental barrier just as they cross the blood/brain barrier.
- Growth reduction is common. (IUGR, SGA)
- Neonatal withdrawal syndrome (abstinence syndrome) may occur as a result of exposure to any of the narcotics (and other depressive drugs).
- May be affected by intermittent opiate use (repeated episodes of intoxication and withdrawal).
- Stillbirth, fetal wastage, prematurity
- Methadone maintenance also results in development of tolerance/dependence in infant.

What is Neonatal Abstinence Syndrome (NAS)?

- Withdrawal symptoms that a newborn can experience when the mother used or abused drugs during pregnancy
- Occurs in 55% 94% of exposed infants
- Symptoms affect multiple body systems
 - CNS irritability
 - GI disturbances
 - Autonomic instability

Rate of NAS Cases per 1,000 Live Hospital Births by Year, Georgia, 2007–2017



*By October 1, 2015, all hospitals in the US were required to switch from ICD-9-CM to ICD-10-CM codes.

DATA SOURCE: Georgia Hospital Discharge Data (2007–2017). Georgia Department of Public Health, Office of Health Indicators for Planning. Data pulled October 25, 2018.

NAS Rates by Maternal County of Residence (2017)

The rates of NAS by county ranged from 0 to 73.5 cases per 1,000 live births. In 20 counties there were no identified cases of NAS and each county had fewer than 250 live births in 2017. Thirteen counties had rates of 40 or more cases per 1,000 live births. Haralson County had the highest rate of NAS (73.5 cases per 1,000 live births).





*Results are not displayed for any substance with <25 positive test results. Results are not mutually exclusive, as an infant could test positive for more than one substance/class. Among confirmed NAS cases, 585 infants tested positive for at least one substance.

Opioids Identified by Type, Georgia, 2016



Source: Neonatal Abstinence Syndrome, Annual Surveillance Report 2016, From Grace Kang 2018

ENEC Case Study 3:

Referred for evaluation of developmental delays and to rule out effects of prenatal exposures.

ALCOHOL

Wide Range of Effects of Prenatal Alcohol

- Fetal Alcohol Spectrum Disorders (IOM, CDC)
 - Fetal Alcohol Syndrome (FAS)
 - Partial FAS
 - Alcohol Related
 Neurodevelopmental
 Disorder (ARND)
 - Neurodevelopmental Disorder-Prenatal Alcohol Exposure (ND-PAE)

TYPE OF DRUG EXPOSURE: Critical Periods of Development



Major morphological abnormalities Physiological defects and minor morphological abnormalities

"Misdiagnosis and Missed Diagnosis in FASD" <u>Pediatrics</u>, January 2015

- 156 children and adolescents who met criteria for a diagnosis within the fetal alcohol spectrum:
 - 125 had never been diagnosed as affected by prenatal alcohol exposure, a missed diagnosis rate of 80.1%
 - 31 who had been recognized before referral as affected by prenatal alcohol exposure, 10 children's FASD diagnoses were changed within the spectrum, representing a misdiagnosis rate of 6.4%
 - 21 (13.5%) children's diagnoses stayed the same
- Within this clinical sample, 86.5% of youth with FASD had never been previously diagnosed or had been misdiagnosed.

"More Kids Harmed in Pregnancy Than Expected, Study Reports"

November, 2014: <u>Pediatrics</u>

- 32 schools, 2,000 first graders
- 2.4 4.8% on spectrum
 - <u>6-9 per 1,000 had FAS</u>
 - <u>11-17 per 1,000 had pFAS</u>
- Predictors: longer it took mother to learn she was pregnant, how frequently she drank three months
 before pregnancy, and the more alcohol the father drank

FASD Results From CNS Damage

- Reduction in overall brain volume
- Malformations and reduction of volume of grey and white matter
- Thin or missing corpus callosum
- Reduction in volume of cerebellum
- •Reductions in size of basal ganglia
- Alteration in brain activation



•Alterations in functional connectivity









NICOTINE

Growth Effects: Tobacco

- Tobacco exposure effects fetal growth even after controlling for pertinent demographic and confounding variables
- Risk of LBW or SGA infant is two to four times higher for smokers
- Smokers' neonates weigh an average of 200 to 300 grams (7-10 ounces) less than nonsmokers
- Effect not found if quit before week 30

Physiological Effects: Tobacco

- Decreased gestational length
- Increased risk for spontaneous abortion
- Sudden Unexplained Infant Death (SUID)
- Congenital heart disease, cleft lip and palate
- Increased rates of bronchitis and pneumonia
- Increased rates of asthma
 - Increased severity of asthmatic symptoms

MARIJUANA

MARIJUANA: Epidemiology

- Marijuana is the most commonly used illicit drug and, after alcohol and tobacco, the most commonly used drug during pregnancy
- 4.9% of pregnant women worldwide report some use of marijuana during pregnancy
- 8.5% of pregnant women aged 18-25
- 48 60% <u>continue use throughout</u> pregnancy

Pregnant Women: Prescription and/or Illegal Drugs

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Marijuana: Epidemiology... "Tip of the Iceberg"

- Marijuana use in pregnancy is frequently accompanied by other forms of drug use:
 - 12% concurrently identified as using opioids
 - 10% as using stimulants
 - 4% have alcohol related dx during pregnancy
 - 50% smoke >10 cigarettes per day
 - So, need prompt investigation into exposure to other substances

Marijuana: Prenatal Exposure

- Great concern, because of cannabis' lipophilic nature
- Readily crosses many types of cell barriers, including blood/brain and transplacental membranes
- Cannabis metabolites easily detectable in placenta, amniotic fluid and the fetus

Marijuana: Prenatal Exposure

- No firm link between gestational cannabis use and congenital malformations but...
- Few studies have found link with anencephaly/1st month neural tube closure (but less likely to take folic acid)
- 2x risk of stillbirth
- Found to increase the risk of neonatal intensive care unit admissions, predominantly for prematurity

Marijuana: Growth Effects

- Use during pregnancy was found to be associated with growth restriction in midpregnancy and late pregnancy
- Effects on low birth weight most pronounced if use continued throughout pregnancy
- Growth effects remained significant even after adjustment for potential confounds such as smoking

Marijuana: Newborns

- Subtle neurobehavioral disturbances such as exaggerated and prolonged startle reflexes and increased hand-mouth behavior
- High-pitched cries
- Sleep cycle disturbances with EEG changes
- Suggests that prenatal cannabis affects newborn neurophysiological function

But...confounded by polysubstance abuse

Marijuana: Later Development

Children exposed to marijuana in utero:

- Lower scores on tests of visual problem solving
- Visual-motor coordination
- Visual analysis
- Decreased attention span
- Increased behavioral problems
- Predicted marijuana use by age 14 years

So...Enough Teratology!!

- What else is there to be concerned about?
- What can we do?
- What is available in our state?

Elephants in the Exam Room...

Inadequate Social Services

Familial Genetics

Mental Health



Polydrug Exposure

Educational Inequality

Poverty

Environment

Hep C (HCV) Transmission

Effective Interventions for prenatal exposure: Collaboration among community, home, and schools



State-level Resources



Department of Community Health Division of Public Health

E.g., "Babies Can't Wait"

MSACD Center's Resources

Emory Neurodevelopmental Exposure Clinic

ENEC is the only multidisciplinary pediatric center of its kind in the Southeast, treating children exposed to alcohol and other drugs. At this clinic, specialists in many different fields serve children from birth to 21 years of age.

THE TEAM

Team members collaborate on the comprehensive and coordinated treatment plan to meet children's needs.

The multidisciplinary team includes:

- Pediatric Genetics
- Psychology
- Special Education
- Clinic Coordinator
- Child Psychiatry

SERVICES

ENEC offers many diagnostic and support services for families seeking care for an affected child, including:

- Differential diagnosis
- Educational consultation and testing
- Math Interactive Learning Experience (MILE)program
- Medical and genetic evaluations
- Neurodevelopmental and psychological testing
- Parent coaching and behavior management
- Parent workshops and Web-based educational interventions
- Psychotherapy
- Medication Management Clinic





Common Misdiagnoses Associated with Prenatal Exposure

- Autism Spectrum Disorder most common "Rule Out" request in ENEC
- ADHD not necessarily part of the dx but can co-occur
- Oppositional Defiant early hx important, may be adaptive?

Conduct Disorder – behavioral dysregulation?

Most Common Recommendations Associated with Prenatal Exposure

- OT
- PT
- Speech
- Behavior Management
- Genetic Workup with Metabolic Profile
- Neurology
- MRI
- Special Needs Preschool/Special Education Placement



Our research comes from pregnant volunteers just like you. When you call us, we may ask you about volunteering for a study during your pregnancy.

Taking part in a study would NOT require you to change anything about including taking your prescribed medications. It will require phone intervi and after the birth of your child. Your participation can mean you're tak to gain better information about the health of your baby. At the same ti contributing important information about the effects of diseases and me on preanancy outcome

Volunteer today to help provide answers for tomorrow! MotherToBaby research projects are conducted by the Organization of Teratology Info Specialists (OTIS) and are coordinated at the University of California, San Diego, CA.



MotherToBab GEORGIA

Medications & More During Pregnancy & Breastfeeding Ask The Experts



Communicating Directly with Pregnant Women

Teratology Information Service provides answers to women who are at risk.

MotherToBaby Mission

MotherToBaby, a service of the non-profit Organization of Teratology Information Specialists (OTIS), is dedicated to providing evidence-based information to mothers, health care professionals, and the general public about medications and other exposure: during pregnancy and while breastfeeding. MotherToBaby affiliates support and contribute to worldwide initiatives for teratology education and research.





MotherToBaby

Call MotherToBaby GA Monday - Friday 9:00 am to 3:00 pm EST

mothertobaby@emory.edu

Georgia Department of Behavioral and supported by Emory University School of Medicine:





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WE have answers.

Call Toll-FREE (866) 626-6847 www.MotherToBaby.org

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MotherToBaby GA, is funded by Health and Developmental Disabilities

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Summary

- Maternal SUD is associated with polysubstance abuse, late and inadequate prenatal care, poverty, poor nutrition, domestic and stranger violence, maternal psychopathology and other severe threats to maternal and infant health
- Outcomes of prenatal exposure strongly related to parenting/environmental variables
- Be as concerned about "co-exposures" while we are currently so focused on opioids
- <u>Early Intervention</u> is key! Capture that window of neural plasticity
- Long term follow-up, well into school age
- Need prospective studies to further investigate role of the environment vs. drug exposure
 - Greater family outreach remember that dyad!





Center for Maternal Substance Abuse and Child Development

Department of Psychiatry and Behavioral Sciences



workshops, educational materials, trainings,

services, educational materials, and information

publications and current research activities taking May 20, 2014 FAS and Heart Defects

Fetal alcohol syndrome (FAS) I



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