The Effects of Prenatal Substance Misuse on Children from Conception through Adulthood

Presented by: Kathryn Shea, LCSW
Learning Objectives

1. Describe the effects of substance use on fetal development and the post-natal period.

2. Understand how substance misuse impacts attachment relationships and parenting, and identify effective family interventions.

3. Recognize possible short and long term developmental problems associated with prenatal substance exposure.
OBJECTIVE 1

• We DO know that all drugs cross the placenta and can affect fetal brain development resulting in lifelong effects in learning, social relationships, employment, and behavior.
• We do NOT know how developmental timing, dosages, and genetics affect these processes.
OBJECTIVE 1 Cont’d.

- We DO know that “of all the substances of abuse (including cocaine, heroin, and marijuana), alcohol produces by far the most serious neurobehavioral effects in the fetus.” (Institute of Medicine, 1996)

- We do NOT know specifically how each drug affects specific parts of the brain, although the areas of the brain that appear to be the most impacted by ALL drugs, including alcohol, are those responsible for Executive Functioning.
Developmental Consequences of Fetal Exposure to Drugs

What we know:

• In a 2020 Morbidity and Mortality Weekly Report article, CDC scientists found that about 10% of pregnant women reported current alcohol use. The use of other substances was common among pregnant women who reported alcohol use—about 40% reported current use of one or more other substances (CDC 2020)

• Drugs can alter fetal development through a wide variety of mechanisms.

• Drugs can also act directly on the uterus and/or placenta, heart, lungs, and brain of the mother.
What is a Teratogen?

**Teratogen:** An agent that causes physical or developmental defects in an unborn child

Most common teratogens:

- Alcohol
- Mercury
- Isotretinoin (brand name Accutane, a treatment for severe acne)
- Nicotine
- Phenytoin (Dilantin, a treatment for epilepsy)
Combining Substances

• The greater the amount of the drug/s, the longer/frequency used during pregnancy, the greater the risk to the unborn child.

• The risks are significantly higher when mothers have used a combination of drugs during pregnancy.

• A combination of smoking and drinking alcohol during pregnancy add additional high risks.
Who is Most at Risk?

- Research indicates that “the age groups (18-34) with the highest birth rates are also the age groups most likely to use legal and illegal drugs. Obstet Gynecol Clin North Am. 2014 Jun; 41(2): 177–189. 10.1016/j.ogc.2014.02.001

- Binge drinking can be very dangerous for the developing brain. Highest risk group for binge drinking is women in their 30’s with a college degree earning more than $50,000 a year. https://www.acog.org/clinical/clinical-guidance/committee-opinion/articles/2011/08/at-risk-drinking-and-alcohol-dependence-obstetric-and-gynecologic-implications.

- There is no safe amount of alcohol/drugs and no safe time during the period of fetal development. https://www.cdc.gov/ncbddd/fasd/alcohol-use.html#:~:text=There%20is%20no%20safe%20time,to%20have%20abnormal%20facial%20features.
Risk Factors

- Dose of alcohol/drugs
- Timing of moderate/high usage during pregnancy
- Pattern of exposure - binge vs chronic
- Developmental timing of exposure
- Genetic variation
- Maternal characteristics
- Synergistic reactions with other drugs
- Interaction with nutritional variables
How Do Drugs/Alcohol?

- The pregnant woman, fetus, and newborn infant are at risk, as many of these drugs can cross the placenta and into breast milk. A drug, it readily moves across the placenta into the fetus’s bloodstream through the umbilical cord. The alcohol level of the mother is equal to the alcohol in the fetus.
Use of Drugs/Alcohol Increases Risk for Mother and Fetus

A pregnant woman’s use of drugs/alcohol can increase the risk of the following:

- Prenatal death
- Premature birth
- Miscarriage
- Birth defects
- Low birth weight
- Small size for gestational age
- Neurobehavioral symptoms
- Smaller head circumference
- Faster than normal heart rate
The Effect of Alcohol on Brain Development

- As a fetus develops, cells that will become the brain and nervous system attach to each other.
- Alcohol interferes with this process of brain development.
- The baby’s brain may be smaller, structurally or functionally damaged, with right/left hemisphere abnormalities.

Source: Dr. Edward Riley, Ph.D., San Diego State Univ.
Continuum of Brain Dysfunction from Prenatal Alcohol Exposure

Prenatal Ethanol Exposure → Decreased Neuron Production → Migration Abnormalities
Small Brain → Structural Brain Abnormalities

Neurotransmission
Abnormal Neurotransmitter → Pathway Activity -> Electrical Dysfunction

Modularity
Cognitive-Behavioral Dysfunction

Abnormal Apoptosis (Pruning) → CNS Dysfunction
Loss of IQ

Developmental Delays → Learning Disabilities → Mental Retardation

Impairments in:
- Memory
- Attention
- Adaptive Behavior
- Use of Social Rules
- Sleep
- Behavior Regulation

Learning Impairments
Brain Abnormalities (structural) Related to Prenatal Alcohol Exposure

Online Source: courtesy of Clarren, S,K.

fetal-brain.jpg (253×199) (weebly.com)
## Brain Structures Most Sensitive to Prenatal Alcohol Exposure

<table>
<thead>
<tr>
<th>Brain Structure</th>
<th>Function</th>
<th>Prenatal alcohol exposure may result in problems with:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corpus Callosum</td>
<td>Communicates motor, sensory and cognitive information between the two hemispheres of the brain</td>
<td>Storing and retrieving information, problem solving, attention and verbal memory</td>
</tr>
<tr>
<td>Cerebellum</td>
<td>Processes input from other areas of the brain to coordinate motor and cognitive skills</td>
<td>Controlling movements, maintaining balance and fine motor skills</td>
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</tbody>
</table>

National Organization on Fetal Alcohol Syndrome (NOFAS)
1.800.66NOFAS or visit www.nofas.org
Impact of Prenatal Fetal Exposure to Drugs/Alcohol

• It appears that all, or nearly all, drugs impact the developing brain causing neurobehavioral effects in the fetus that can be life-long.

• The effects can be physical, emotional, cognitive, social, and behavioral and usually are a combination of all of the above.

• Opioids and Poly-Substance Exposure-Research is showing behavior and attention problems and lower cognitive functioning in eight-year-old children. (Nygarrd, Slinning, Moe, & Walhovd, 2016)
Polling Question #1

Which of the following substances is most likely to cause fetal harm?

- Heroin
- Methamphetamine
- Alcohol
- Tobacco
Withdrawal Symptoms in Newborns

Withdrawal from substance exposed newborns can be physical distressing. A newborn exposed to alcohol/drugs before birth can demonstrate several typical signs of withdrawal:

- Tremors
- Sleeplessness
- High pitched crying and agitation
- Muscle Spasms
- Seizures
- Feeding difficulties
Benefits of Breastfeeding While Taking Methadone

Benefits:

- Baby receives all the benefits of breast milk
- Enhances maternal/infant bonding
- It is safe to breast/chestfeed while taking medications for opioid use disorder such as methadone and buprenorphine, regardless of the dose of medication that you take.
- Consult the LactMed database to learn more about the evidence on use of the medications while lactating:
  - methadone
  - buprenorphine
  - naloxone
Benefits of Breastfeeding While Taking Methadone Cont’d.

Breast/chestfeeding can make the baby’s withdrawal symptoms less severe. Studies suggest this is because skin-to-skin contact, and attachment formation help the baby feel better while breast/chestfeeding. When other opioids like methadone were studied, it was found that only about 2% of the total dose made it into human milk. For buprenorphine, there are negligible amounts of buprenorphine/norbuprenorphine in human milk and infants absorb even less of this because of the way buprenorphine is broken down and metabolized (not absorbed well in the stomach).
Cautions of Breastfeeding While Taking Methadone

Cautions:

• With heroin and other unregulated opioids, it is best not to breast/chestfeed, since you can’t know the exact dose and it may be cut with other unknown substances and contaminants that aren’t safe for the baby.

• Most drugs a mother takes are present in her breast milk in a small amount

• Safety risks for infant when mother is falling asleep/not fully functional while nursing
Neonatal Abstinence Syndrome (NAS)

This can occur within 24 hours to five days after birth and is related to physiological withdrawal from any opioid (heroin, fentanyl or treatments like buprenorphine and methadone). It is treatable with skin-to-skin contact, keeping the parent in the same hospital room as the infant, breast/chestfeeding, or also with medications such as methadone, morphine, buprenorphine or other agents as needed.
OBJECTIVE 2

• Addiction is associated to a dysregulation of the balance between reward and stress neurobiological systems, which both undergo significant changes during the transition to parenthood.

• Drug use can affect these neuro-circuits, and “high jack” the same reward processing systems in the brain, making mothers less responsive to more “natural” reward cues, such as their infant’s behaviors and facial expressions.

• If mother did not have a secure attachment with a primary caregiver as a child, she may not have the “internal working model” to create that for her baby. And thus, the cycle repeats itself.
Pre-natal Exposure to Opioids, Alcohol & Other Drugs-The Baby Part

• Nearly all drugs affect the neurobehavioral systems of the baby’s brain, sometimes for a lifetime.

• Many of these infants exhibit symptoms of a regulatory disorder, which include dysfunction in autonomic regulation, sleep/wake control, motor, attentional/interaction, and self-regulatory systems.

• Dysregulation in any one or more of these domains may interfere with basic neonatal functions such as feeding, sleeping, growth, emotional regulation, attachment, or social interaction.
The Impact of Pre-natal Exposure to Drugs/Alcohol-The Dyad Part

- Separation of infant from mother during withdrawal period impacts attachment and bonding.

- Guilt, substance use/abuse, mental health issues (including trauma) impact attachment and bonding.

- Infant issues (poor sleep patterns, difficulty feeding, fussy/irritable temperament, prolonged crying, poor eye contact, difficult to soothe/comfort, over/under reactive to stimuli) impact attachment and bonding.
Attachment is a Two-Way Street

• Each individual must be able to read the other’s cues and each individual must be able to respond appropriately to the other’s cues.

• When an infant’s neurobehavioral functioning is disrupted by the effects of prenatal drug and alcohol exposure, that infant may not be able to participate in the give and take dynamic required for attachment to occur.

• When the caregiver does not receive positive feedback and reinforcement from the infant, she may back off; and the dance of attunement is disrupted and stress for both mother and infant increases.
Impact on Infant/Parent Relationship

Moms with behavioral health needs  +  Babies in withdrawal with compromised brains
Impact On Infant/Parent Relationship = Very High Risk for Abuse, Neglect, and Future Problems
The Vicious Cycle

Both mother and infant disengage, secure attachment at risk.

Dysregulated Infant

Mother’s negative response increases infant stress.

Mother feels rejected and inadequate (increasing risk for relapse and abuse).
Many factors impact fetal development when mothers have OUD (Social Determinants of Health). 

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6108075/
Factors that may exert programming effects on the developing fetus exposed to opioids in utero. Adapted from Conradt et al. (2018).
Effective Attachment-Based Parenting Training Programs for Opiate Dependent Parents

Circle of Security (COS-P) Goals:

- Increase security of attachment of the child to the parent
- Increase parent’s ability to read child’s cues
- Increase empathy in the parent for the child
- Decrease negative attributions of the parent regarding the child’s motivations
CIRCLE OF SECURITY®

PARENT ATTENDING TO THE CHILD'S NEEDS

- Watch over me
- Delight in me
- Help me
- Enjoy with me

Support My Exploration

I need you to...

Secure Base

- Protect me
- Comfort me
- Delight in me
- Organize my feelings

Welcome My Coming To You

I need you to...

Safe Haven

Always be BIGGER, STRONGER, WISER, and KIND. Whenever possible, follow my child’s need. Whenever necessary, take charge.
Activity #2
Small Group Discussion on Parent Child Attachment

Please select a spokesperson to report your groups thoughts on:

• What 3 possible strategies could support parent/child attachment?
• From a systems perspective, what are the main barriers in supporting parent/child attachment?
OBJECTIVE 3
Areas of the brain most impacted by alcohol and drugs negatively affect the development of Executive Functioning.

Executive Functions involve:
• focus- concentrating on a task;
• cognitive flexibility - thinking outside of the box or adjusting to changing priorities;
• working memory - holding information in your mind and working with it — for example, doing mental arithmetic or understanding a story; and
• inhibitory control - the ability to go off “auto-pilot” and do what is appropriate, even though you want to do something else.
Executive Functioning

Frontal lobe is responsible for much of the executive functioning of the brain.

These functions include:
- Attention
- Working memory
- Planning, organizing
- Forethought
- Impulse control
Developmental Consequences of Fetal Exposure to Drugs/Alcohol

Areas of the Brain involved in Executive Functions include:

- Prefrontal cortex works in concert with other parts of the brain, including the anterior cingulate and parietal cortex and the hippocampus.
- The executive functions are a set of processes that have to do with managing oneself and one’s resources in order to achieve a goal. It is an umbrella term for the neurologically-based skills involving mental control and self-regulation.
Developmental Consequences of Fetal Exposure to Drugs/Alcohol

Areas of the Brain that can be impacted:

The Insula Cortex which is involved in perception, processing and emotion is also influenced. The Insula Cortex plays a role in personality disorders with skewed perceptions, including Borderline Personality Disorder which is common in adults with behavioral health and nurture and attachment challenges, as well as some of the NAS developing children.

The Insula Cortex can be influenced prenatally during gestational age 13 to 28 weeks.

https://www.jneurosci.org/content/35/14/5860
<table>
<thead>
<tr>
<th>Layers/Levels of Self-Regulation</th>
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<tbody>
<tr>
<td>“Executive Control”</td>
</tr>
<tr>
<td>Behavior Regulation</td>
</tr>
<tr>
<td>Emotion Regulation</td>
</tr>
<tr>
<td>Attention Regulation</td>
</tr>
<tr>
<td>Basic Physiological Regulation</td>
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</table>
What Impacts a Baby’s Ability to Self Regulate?
Almost All Individuals Prenatally Exposed to Substances Experience Sensory Processing Issues

- Sensory Overload (shutdown or disorganized behavior)
- Emotional Lability/
  Irritability/Instability
- Difficulty in Inter-Personal Relationships
- Learning Problems
- Behavior Problems
- Poor Self-Esteem
- Perceptual Problems
Effects of poor sensory modulation on learning and behaviour

Under-Reactivity
- Under-Arousal
  - i.e. misses non-verbal cues, slow affective responses
  - Needs large amount of stimulation for arousal
  - “Spacey” & “Slow”

Normal Sensory Modulation
- Impaired Social Behaviour
  - Defective Attending Behaviour
    - i.e. fails to look, listen, process, and remember
    - Learning is impaired

Over-Reactivity
- Over-Arousal
  - i.e. over-reacts to non-verbal cues, anxious, too alert
  - Must attend to all stimuli as much as possible
  - Distractible & Fragmented

Roley, Mailloux et al. (2007)
Behaviors Associated With Sensory Processing Issues

- **Infancy** - poor sleep patterns, difficulty feeding, fussy/irritable temperament, prolonged crying, difficult to soothe/comfort, over/under reactive to stimuli or sensations, difficulty forming attachment

- **Toddler/Early Childhood** – aggressive, highly active and impulsive, poor attention span, disorganized, no sense of danger, poor sleep patterns, pica, self-injurious, fight/flight behaviors
What Contributes To These Behaviors?

- Behaviors associated with prenatal exposure are caused by CNS (brain) impairments.
- Environmental factors can compound the problem (domestic violence, neglect/abuse, poverty, teen or single parent, parental substance abuse).
- Multiple disruptions from relative or foster care placements due to behavior disrupts attachment which is critical to sound social/emotional development.
Possible Behaviors Associated With Sensory Problems

**Latency age** – poor cause/effect relationships, does not understand rules or consequences, difficulty at home and school, anxious, fearful, takes things that don’t belong to them, tells stories or fabricates when not sure how to answer, poor abstract thinking, poor social skills, poor sensory processing

**Adolescence/Adulthood** - Cannot manage daily living skills without adult supervision, overly friendly with poor physical/verbal boundaries, poor judgment, easily influenced by peers, might be able to state the rule but cannot follow it, can have high verbal skills but poor thinking skills, impulsive, poor sensory processing
Disordered Sensory Integration

source: Dorothy Schwab
Critical to Screen for FASD in Treatment Programs

Teens and adults with FASD are at a much higher risk for issues in substance use and mental health treatment programs due to sensory processing challenges:

• Poor cause-effect relationship

• Concrete thinkers. Do not do well with level/point systems.

• They need a person to serve as their “external brain” to navigate them through the process.

• They require a great deal of acknowledgement/reinforcement with every success, even minor ones.
Activity #3 What Will You Do Differently?

Please select a spokesperson to report your groups thoughts on:

• What will you do differently in your practice with the knowledge gained from today’s presentation?
Supportive Plans of Care Needed

Plan of Care for Baby  Plan of Care for Mom  Plan of Care for Dyad
With the Right Interventions and Coordination of Services & Supports, We Can Change the Families Trajectory and Stop the Cycle
When to Seek Help

• If your infant/child is demonstrating behaviors that are atypical for stage of development
• If you are worried about behaviors your infant/child is demonstrating
• When you just need reassurance that your infant/child is meeting developmental milestones
• Your child’s pediatrician is your first “go to”. They will have your prenatal, birth, and neonatal history and refer you to your Early Intervention Services program (Early Steps).
• Early identification and intervention can significantly improve long-term outcomes for these children.
VIDEO-Involving Mothers in the Care of Their Substance Use Dependent Babies

* [https://www.youtube.com/watch?v=-8Qby7XDkNo](https://www.youtube.com/watch?v=-8Qby7XDkNo)
Workshop Summary

• There is no safe time or safe number of drugs/substances that can be used during pregnancy.

• All women and fetuses metabolize drugs/alcohol differently, so predicting short- or long-term outcomes of pre-natal substance use is not possible.

• The risk can be high for both short- and long-term developmental problems for the exposed fetus and can be life-long.

• Supportive interventions are necessary for parent and child to negate adverse effects and promote optimal outcomes for mom, dad, child, and relationships.
Resources


- Center for Disease Control (CDC) [https://www.cdc.gov/ncbddd/fasd/data](https://www.cdc.gov/ncbddd/fasd/data)

- Center for Disease Control (CDC) [https://www.cdc.gov/mmwr/volumes/69/wr/mm6931a1.htm?s_cid=mm6931a1_w](https://www.cdc.gov/mmwr/volumes/69/wr/mm6931a1.htm?s_cid=mm6931a1_w)

- Centers for Disease Control (CDC) [https://www.cdc.gov/ncbddd/fasd/alcohol-use.html#:~:text=There%20is%20no%20safe%20time,to%20have%20abnormal%20facial%20features](https://www.cdc.gov/ncbddd/fasd/alcohol-use.html#:~:text=There%20is%20no%20safe%20time,to%20have%20abnormal%20facial%20features).

- Drugs and Lactation Database (LactMed) from the National Library of Medicine

- Early Childhood Technical Assistance Center. [https://ectacenter.org/](https://ectacenter.org/)

- Engagement in Early Intervention Services Among Mothers in Recovery From Opioid Use Disorders | American Academy of Pediatrics (aappublications.org) [http://fasdunited.org/](http://fasdunited.org/)


- National Center on Substance Abuse and Child Welfare. [https://ncsacw.samhsa.gov/#:~:text=NCSACW%20is%20a%20national%20resource,for%20children%20and%20families](https://ncsacw.samhsa.gov/#:~:text=NCSACW%20is%20a%20national%20resource,for%20children%20and%20families)
Resources Cont’d.

- Neonatal Opioid Withdrawal Syndrome | American Academy of Pediatrics (aappublications.org)

Medications, Pregnancy and Lactation

If you are looking for reliable information on medications and evidence-based guidance for their use during pregnancy and lactation, we recommend these resources:
- MotherToBaby from the Organization of Teratology Information Specialists
- Drugs and Lactation Database (LactMed) from the National Library of Medicine

- Treating Babies Who Were Exposed to Opioids Before Birth (samhsa.gov)
Resources Cont’d.

Video’s

• Prenatal Opiate Exposure: Impact on Early Childhood Learning and Behavior
  https://youtu.be/gOdivN83kxw

• Pediatric Effects of Parental Substance Use
  https://youtu.be/8yz1-33T9nU

• IM 8 - Behavior - Prenatal Substance Exposure
  https://youtu.be/BYDIbmL-Z-E
Questions/Comments

Any Questions?
THANK YOU!
References

Learning Objective 1- (Slides 1-24)


3. Human Brain Abnormalities Associated With Prenatal Alcohol Exposure and Fetal Alcohol Spectrum Disorder; Jessica S. Jarmasz, BSc,∗ Duaa A. Basalah, MSc,∗ Albert E. Chudley, MD, FRCP,∗ and Marc R. Del Bigio, MD, PhD, FRCP∗; Neuropathol Exp Neurol. 2017 Sep; 76(9):813–833. Published online 2017 Aug 8. doi: 10.1093/jnen/nlx064


Learning Objective 2: (Slides 25-36)


Objective 3 – (Slides 37–56)


5. Sensory Processing Issues; FASD Network of Southern California. DOI: Sensory Processing - FASD Network of Southern California (fasdsocalnetwork.org)
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