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Objectives

- recognize the wide range of physical and behavioral effects of alcohol exposure
- understand why the effects of alcohol exposure can vary widely
- be an effective advocate for services for affected children and adults
  - at school
  - in the community
Introduction

• alcohol-related developmental problems can occur with or without visible signs
• these cognitive and behavioral problems overlap with other diagnoses:
  • ADHD
  • mood disorders
  • conduct disorder
  • learning disorders, intellectual disability
Terminology

- there is a shortage of ICD-10 and DSM-5 codes to cover the observed problems related to alcohol exposure
- ICD-10 code for FAS: Q86.0
- proposed DSM diagnosis: Neurobehavioral Disorder associated with Prenatal Alcohol Exposure (ND-PAE)
- currently DSM 315.8, Other Specified Neurodevelopmental Disorder
Fetal Alcohol Spectrum Disorders (FASD) include:

• Fetal Alcohol Syndrome (FAS)
  • facial abnormalities, small size, and brain abnormalities

• Partial Fetal Alcohol Syndrome (PFAS)
  • facial abnormalities and small size OR brain abnormalities
FASD’s: a family of diagnoses

• Alcohol-Related (“Other Specified”) Neuro-developmental Disorder (ARND)
  • learning, behavior, coordination problems

• Alcohol-Related Birth Defects (ARBD)
  • organs other than the brain affected
Prevalence: how many affected?

• CDC data: FAS in 0.3 out of 1,000 (national)
• in several US communities it is as high as 6 to nine out of 1,000
• the average rate of ALL FASD’s may be as high as 2 to 5 per 100 in this and other Western countries
  • much higher in some communities

https://www.cdc.gov/ncbddd/fasd/data.html#ref
FASD prevalence in AI/AN children

• due to differences in study design (how cases are identified), it is not possible to compare many studies directly

• 47-56% of pregnant patients in a Northern Plains community admitted to using EtOH during pregnancy*

• FAS diagnosed in 3.9 to 9.0 per 1000 live births in the Northern Plains

Prevalence and risk factors for FAS: Midwestern 6-7 year olds

• FAS: 6 to 9 per 1000 (0.6 to 0.9%)
• all FASD’s: 24-48 per 1000 (2.4 to 4.8%)
• risk factors
  • late recognition of pregnancy
  • amount of drinking in the 3 months before pregnancy
    • nutrition, epigenetics?
  • quantity of drinking reported for child’s father

Alcohol intake in the 3 months before pregnancy

• if drinking in the 3 months before pregnancy is strongly associated with having an affected child,

• it is not enough for a woman to stop drinking when she finds out she is pregnant

• for women of childbearing years, if they are sexually active and not on reliable birth control they should not drink
women of childbearing years who are sexually active SHOULD NOT DRINK unless they are on reliable birth control
Most alcohol exposure problems are **INVISIBLE**

- prospective study of 101 heavily alcohol-exposed children in Chile
- not one child met full criteria for FAS
- **44% had some sort of impaired brain function:** ADHD, language delay, others

How is alcohol harmful?

- direct toxic effects
- indirect toxicity
  - poor diet
  - dehydration
  - stress associated with EtOH abuse
  - inattention to physical signs and symptoms
  - increased risk of injury....
What determines the effect of alcohol exposure?

• timing (can be critical)
• quantity (dose)
• frequency
• and many other factors...
Direct toxic effects of alcohol
14 days: cells start differentiating

5 weeks: organs visible, heart is beating

6 weeks: eyes, ears, facial features

8 weeks: face, organs, fingers/toes
Normal embryo stage: 2 to 8 weeks

- at about 2 weeks, stem cells start to differentiate into one of 3 ‘germ layers’
  - ectoderm: brain, spinal cord, eyes, hair, nails, tooth enamel
  - mesoderm: muscle (heart), circulatory system, bone, genitourinary system
  - endoderm: stomach, bowel, liver, lungs
Alcohol in weeks 2 to 8 of pregnancy

- alcohol derails the differentiation process
  - the development of organs involves cell division and gene expression at precise times
  - folic acid is critical for normal cell division
  - *alcohol blocks folic acid absorption*
- alcohol interferes with migration of specialized cells to the proper location
# Embryonic Development Timeline

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University of New South Wales Embryology, *Foundations* course
Normal facial development

if embryo cells don’t **migrate** and **differentiate** normally,

midline facial features (eye spacing, philtrum, palate) will be affected

A. 5 weeks
B. 6 weeks
C. 7 weeks
D. 9 weeks
Facial signs of FAS

- Short palpebral fissures
- Flat midface
- Indistinct philtrum
- Short nose
- Thin upper lip
Other factors associated with higher FAS risk

• **BINGE DRINKING**
  • high BAL, nutritional mini-crisis
  • being smaller, having low BMI

• genetics
  • alcohol metabolism gene polymorphisms
Mothers of children with FAS

- study of 80 mothers of children with FAS
  - 96% had at least one psychiatric diagnosis
  - 86.4% had a mental health problem which started before age 18
  - 73% reported *sexual abuse* in lifetime
  - 95% reported *physical or sexual abuse* during their lifetime

New study of mothers of children with FAS

- 12 times as likely to have substance use disorders
- 13 times as likely to have personality disorder
  - associated with complex trauma
- High rate of mood, anxiety disorders

Long-term changes in gene expression

- in mice exposed to EtOH during pregnancy, long-term changes in gene expression were found
  - stress and inflammation
  - neurological disease
- we see more inflammatory/autoimmune problems in people with alcohol exposure

question

• when do women generally find out they are pregnant?
  • 2 weeks after conception
  • 5 to 6 weeks
  • 7 weeks to 2 months
  • more than 2 months

• women with substance abuse problems find out *later*
Effect of alcohol on the brain

- brain cells continue to migrate and differentiate throughout pregnancy
- alcohol interferes with this
- brain structures can be smaller, less “connected” to each other
Neurodevelopmental effects of alcohol

• poor orienting, ‘attention capture’
  • visual and auditory

• impaired language development
  • worst with 3rd trimester exposure
  • syntactic (related to rules of language)

• can be mitigated by good childhood environment

Neurodevelopmental effects of alcohol

• lower IQ
  • can be mitigated by good childhood environment

• memory problems
  • ‘source monitoring’ errors
  • impaired recall (recognition not so bad)

Neurodevelopmental effects of alcohol

- impaired executive functions
  - planning
  - flexibility (‘set shifting’)
  - affective (emotional) decision-making
  - response inhibition (impulse control)
Neurodevelopmental effects of alcohol

• social cognition problems
  • social/emotional processing deficits
  • poor prosody comprehension (tone of voice, emphasis)
  • poor social problem-solving
  • moral immaturity

• social problems may worsen with age

Neurodevelopmental effects of alcohol

- increased psychiatric problems
  - (inherited risk) x (environmental stress)
- increased arrests for impulsive sexual behavior
- deficient adaptive skills (independent living)
ARND and incarceration

- review of 54 studies on prevalence/incidence of FASD in correctional systems
- in Canada, children with FASD’s are 19 times as likely to be incarcerated

A good environment can reduce some alcohol exposure effects

- optimal early childhood environment
  - good nutrition
  - verbal stimulation
  - consistent care/nurturing
  - lack of trauma

- and post-natal disadvantages can make problems worse
question

• heavy alcohol exposure in the second half of pregnancy causes damage to which of these?

a. learning
b. emotional control
c. memory
d. judgment
ARND overlaps with

- ADHD
  - problems with attention, impulse control, planning, emotional decision-making
- Conduct Disorder
  - ‘lying’ may be driven by memory problems
  - behaviors are more impulsive than planned, and if planned, not planned well
- Oppositional Defiant Disorder, Disruptive Mood Dysregulation Disorder
ARND and peer relationships

- high risk of being rejected by peers, bullied, or used as “fall guy”
  - poor reading of social cues
  - language skills
  - tall tale-telling
- loneliness, depression, anxiety
ARND and peer relationships

- risky behaviors due to impulsivity, poor anticipation of consequences
  - substance use
  - unprotected sex
  - truancy, running away
  - fighting, assault
  - accidental injury
Assessment of children

• when taking a developmental history, ask guardian about mother’s drinking during pregnancy and in the months before pregnancy detected

• children: non-specific clues
  • out of home placement
  • small for age (note family size)
  • speech, hearing, vision problems
  • learning problems
Resources for children up to 36 months

• refer for vision, hearing tests
• if FAS suspected, refer to geneticist
• in Arizona, AZEIP (Arizona Early Intervention Program)
• in Utah, BWEIP (Baby Watch Early Intervention Program)
• in Nevada, NEIS (Nevada Early Intervention Services)
Resources for children over 36 months

• the **public school system** is responsible for providing therapies and (if appropriate) special educational services for children over 36 months in their home district

• charter schools usually do not offer the full range of services

• public schools are not required to provide services for out-of-district students
Know your IDEA

- **Individuals with Disabilities Education Act**
  - appropriate educational services are a child’s right under federal law
- school is responsible for evaluation
- **request school evaluations in writing**
- the school has 60 days from receiving a written request for evaluation to either
  - do the evaluation
  - respond in writing why they are not doing it
For children with IQ < 70

- state agencies provide services for those with Intellectual Disability (and Autism Spectrum Disorders) throughout the lifespan
  - therapies, respite care
  - assisted housing, vocational assistance
  - need to have developmental delay documented before age 18
  - In AZ, referral for eligibility determination takes 2 to 3 minutes, and can be done on-line by provider during a visit

https://ddd.azdes.gov/ddd/EligibilityReferral/frm_EligibilityRequirements.aspx
For Moms

• help women access substance abuse treatment, with realistic expectations
  • the probability of sudden, absolute abstinence is very low

• keep goal of abstinence, but include “harm reduction” strategy to build trust and encourage honesty
  • “if you do slip, don’t forget to eat”
  • “try to put on the brakes- it’s better to stop after a few drinks than to keep going all night”
Summary

- Alcohol exposure can be harmful at any stage of pregnancy
- Most children with FASD have no visible signs
- The cognitive/behavioral effects of alcohol exposure mimic or overlap other diagnoses
Summary

• the earliest interventions for children are the most helpful
  • stable, stimulating home environment, state early intervention programs, school system, DDD

• teachers, parents/guardians will need help and support to accept that some deficits are not likely to resolve
  • “is he going to grow out of this?”
Summary

• prevention efforts should reach women **BEFORE** they become pregnant

• we need to know more about the role of fathers’ drinking on FASD’s