

# **Neurodevelopmental Disorders Associated with Prenatal Exposure to Alcohol (ND-PAE)**

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# Meharry Medical College

- Meharry Medical College - 1969, Dr. E. Perry Crump was the Chairman - Dept Pediatrics.
- Dr. Crump taught me that the low-income children of North Nashville had a high prevalence of “mild mental retardation.”
- Dr. Crump and Julius Richmond, M.D. (President’s Johnson’s and Carter’s Surgeon General) went on to form Head Start to address this national problem).

# The Critical Role of Self-Regulation

- Neuroscience and behavioral research are converging on the importance of self-regulation for successful development
- Children who do not develop the capacity to inhibit impulsive behavior, to plan, and to regulate their emotion are at high risk for behavioral and emotional difficulties

Bell CC & McBride DF. Affect Regulation and the Prevention of Risky Behaviors. Journal of the American Medical Association, Vol. 304, No. 5: 565 –566, August 4, 2010

# The Critical Role of Self-Regulation

- 1979 – 88.5% (246) of the 274 children in Pupil Service Center on Chicago's Southside had Childhood Neurodevelopmental Disorders (CND)
- 1985 – 20% of inmates in Texas Department of Corrections were “mentally retarded.”
- 2011 - chart audit on 162 children in several nurse-based school clinics estimates 39% (63) of those children met the DSM-5 Condition for (ND-PAE).
- 2012 prior to the closure of the Community Mental Health Council, Inc. - chart audit of 330 randomly selected patients revealed that 12% (39 of 330 patients) met criteria for CND.

# Social Determinants of Health

- Think about all the liquor stores in the African-American (ghettos) and Native American (reservations) communities all over the country.
- The plethora of liquor stores have a determination on the indigenous populations' health.

# Neurodevelopmental Disorders

- Autism and Autism Spectrum Disorders
- ADHD
- Intellectual Disability
- Specific Learning Disorders
- Communication Disorders
- Motor Disorders
- Newly defined DSM-5 ND - PAE

## DSM – 5: ND - PAE

- A. More than minimal exposure to alcohol during gestation, including prior to pregnancy recognition
  - Confirmation of gestational exposure to alcohol from
    - Maternal self-report of alcohol use in pregnancy
    - Medical or other records
    - Clinical observation (Ask for baby photos)
      - Patients report the following:
        - “I was taken from my mom when I was a baby”
        - “My mom was doing drugs”
        - “My grandmother told me my mom was drinking”
        - “I saw my mom drink when she was carrying my sister”

# DSM – 5: ND - PAE

- B. Impaired neurocognitive functioning as manifested by one or more of the following:
  1. Impairment in global intellectual performance
    - i.e. IQ of 70 or below
  2. Impairment in executive functioning
    - e.g. poor planning and organization, inflexibility, difficulty with behavioral inhibition
  3. Impairment in learning
    - e.g. lower academic achievement than expected for intellectual level; specific learning disability

# DSM – 5: ND - PAE

➤ B - Impaired neurocognitive functioning as manifested by one or more of the following:

4. Memory impairment

-e.g. problems remembering information learned recently; repeatedly making the same mistakes; difficulty remembering lengthy verbal instructions

5. Impairment in visual-spatial reasoning

-e.g. disorganized or poorly planned drawings or constructions; problems differentiating left from right

## DSM – 5: ND - PAE

- C. Impaired self-regulation manifested by one or more of the following:
  1. Impairment in mood or behavioral regulation  
-e.g. mood liability, negative affect or irritability, frequent behavioral outbursts
  2. Attention deficit  
-e.g. difficulty shifting attention; difficulty sustaining mental effort
  3. Impairment in impulse control  
-e.g. difficulty waiting turn; difficulty complying with the rules

## DSM – 5: ND - PAE

➤ D. Impairment in adaptive functioning as manifested by two or more of the following, one of which must be (1) or (2):

1. Communication deficit  
-e.g. delayed acquisition of or difficulty understanding spoken language
2. Impairment in social communication and interaction  
-e.g., overly friendly with strangers, difficulty reading social cues; difficulty understanding social consequences
3. Impairment in daily living skills  
-e.g. delayed toileting, feeding, or bathing; difficulty managing daily schedule
4. Impairment in motor skills  
-e.g., fine motor development; delayed attainment of gross motor milestones or ongoing deficits in gross motor function; deficits in coordination and balance.

## DSM – 5: ND - PAE

- E. Onset of disorder occurs in childhood.
- F. The disturbance causes clinically significant distress or impairment in social, academic, occupational or other important areas of functioning.
- G. The disorder is not better explained by the direct physiological effects associated with postnatal use of a substance (e.g. medication, alcohol or other drugs); medical condition (traumatic brain injury, delirium, dementia);

# The Fetal Alcohol Exposure Picture

- Mild mental retardation
- Specific learning disorders
- Speech and language deficits
- ADHD
- Special education classes
- Seizure Disorders
- Explosive emotionality - Low frustration tolerance / explosive temper; Short-lived affective outbursts wrongfully referred to as moods the reality is their emotional stability is labile

# The Fetal Alcohol Exposure Picture

- Often childlike and naïve, they really want people to like them
- They have been ostracized most of their lives because they are "slow"
- Poor judgment, planning ability, capacity to foretell consequences of their behavior
- Difficulty doing simple math
  - e.g. Serial 7's:  $100-7= \dots$   $93-7= \dots$   $86-7= \dots$

# The Fetal Alcohol Exposure Picture

- Prior diagnoses: Bipolar, schizophrenia, ADHD, major depression
- Patients report being on a wide variety of medications that they do not find helpful.
- Patients may or may not continue to have the characteristic facial characteristics of FAE
  - widely set eyes, epicanthal folds in their eye lids, flat mid-face, short palpebral fissures, indistinct philtrum, small chin, irregularly shaped ears, small head - of course these features go away as the child ages

Discriminating  
Features

- short palpebral fissures
- flat midface
- short nose
- indistinct philtrum
- thin upper lip

Associated  
Features

- epicanthal folds
- low nasal bridge
- minor ear anomalies
- micrognathia

In the Young Child

# Prevalence of Drinking while Pregnant in the US

- 13% knowingly drink
- 1% drink heavily
- 3-4% binge drink (SAMHSA)
- 12% of pregnant women consume 5 or more drinks per month
- 50% of pregnancies are unplanned

# FETAL ALCOHOL SPECTRUM DISORDER TERMINOLOGY

- Different organizations, different terms
  - SAMHSA, ICD-10, APA, IOM, etc.
- **FASD:** “an umbrella term describing the range of effects that can occur in an individual whose mother drank during pregnancy.”
- Growth retardation – facial dysmorphology – CNS abnormalities (OFC); pFAS: partial FAS; NL growth vv ht/wt; ARND: alcohol-related neurodevelopmental dx (NL growth); ARBDs: alcohol-related birth defects (Major structural abnormalities)

# Three most common research methodologies to discover prevalence of FASD

- Clinic-based studies
- Positive surveillance of existing records often limited to a geographical area
- Active Case Ascertainment

# Prevalence of Fetal Alcohol Spectrum Disorders – U.S.

- Fetal Alcohol Syndrome (FAS) occurs far more frequently than generally believed
  - 1 per 1000 live births
- Although estimates vary widely, when combined with the milder afflictions of Fetal Alcohol Spectrum Disorders (FASD), the Centers for Disease Control puts the frequency of FAS/FASD as high as 1 in 100.

# Prevalence of Fetal Alcohol Spectrum Disorders – U.S.

- May et al. Prevalence & Characteristics of Fetal Alcohol Spectrum Disorders. *Pediatrics*, 2014, 134: 855-866.
- Study in a 160,000 Midwestern community (Median income \$51,800, with 11% below poverty) surveyed 70% of 2,033 1<sup>st</sup> graders.
- They found between **2.4 to 4.8% had FASD.**

**Patients seen at Jackson Park Hospital's  
Family Medicine Clinic serving 143,000  
Median income \$33,809 & 95% Public  
Assistance for Medical Care**

<b>Total patients with Neurodevelopmental Disorders</b>	<b>297 (49%) 39% had FASD</b>
<b>Total Patients without Neurodevelopmental Disorders</b>	<b>314 (51%)</b>
<b>Total</b>	<b>611 (100%)</b>

**This is a rate of 338/1,000!!!!**

# Prevalence of Fetal Alcohol Spectrum Disorders – U.S.

- Susan Astley, Ph.D., & colleagues
  - rates of FASD in Washington state's foster care population were **10-15/1,000**
- Dr. Pat Rojmahamongkol, et al
  - 17% of physicians correctly identified FAS
  - 74% were able to correctly identify Williams Syndrome
- Williams Syndrome occurs in only 1/7,500.

# Prevalence of Fetal Alcohol Spectrum Disorders – U.S.

## ➤ Chasnoff, et al

- 547 youth referred for severe behavioral disorders
  - 50.6% African American
  - 1.3% Asian
  - 32.2% White
  - 0.7% Native American
  - 12.2% Biracial
  - 3% Other/unknown
- **28.5% of these youth had FASD** (86.5% had never been diagnosed or were misdiagnosed; 26.4% of these youth were misdiagnosed as having ADHD )

# Prevalence of Fetal Alcohol Spectrum Disorders – South Africa

- In a low SES, highly rural of South Africa in the Western Cape Province, FASD occurs in **182 – 259 per 1,000 children or 18-26 percent**
  - May, et al “The continuum of fetal alcohol spectrum disorders in four rural communities in South Africa: Prevalence and characteristics.” *Drug and Alcohol Dependence* 159: 207 – 218

# Prevalence of Fetal Alcohol Spectrum Disorders - Australia

- In a remote Aboriginal community of the Fitzroy Valley in Western Australia, FASD occurs in **120 per 1,000 children or 12 percent**
  - Fitzpatrick et al, (2015) Prevalence of fetal alcohol syndrome in a population based sample of children living in remote Australia: The Lililwan\* Project. Journal of Paediatrics and Child Health 51: 450-457.

# Prevalence of Fetal Alcohol Spectrum Disorders - Russia

- The prevalence of FAS among adopted children from Eastern Europe/Russia) living in US **15 to 70/ 1,000**
- Children Russian adoptees diagnosed **ARND = 34%**
- Records of alcohol-exposed pregnancy were significantly higher and constituted 19% to 41%
- Prospective adopting parents are concerned about the high risk of FASD among children adopted from Russia
  - Popova et al 2014.

# Public Mental Health

## ➤ Biotechnical Prevention

- There is a biotechnical prevention/ intervention for Fetal Alcohol Spectrum Disorder – Choline 500mg BID.

## ➤ Psychosocial Prevention

# CHOLINE

- Precursor to acetylcholine, phosphatidyl choline
- Contributes to the integrity of the cell membrane

# CHOLINE

- The current recommended choline intake for pregnant women is 450 mg/day
  - IOM Standing Committee on the Scientific Evaluation of Dietary Reference Intakes and its Panel on Folate, Other B Vitamins, and Choline. (1998). Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B<sub>6</sub>, Folate, Vitamin B<sub>12</sub>, Pantothenic Acid, Biotin, and Choline. Washington, DC: National Academies Press.
- 90% of pregnant women do not meet the choline intake requirements - Jensen, H. H., Batres-Marquez, S. P., Carriquiry, A., & Schalinske, K. L. (2007). Choline in the diets of the US population: NHANES, 2003–2004. *FASEB J*, 21, 1b219

## **PRENATAL VITAMIN**

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## **CHOLINE CONTENT**

1) Megafood Baby & Me Prenatal  
Multivitamin

- None

2) Garden of Life Vitamin Code Raw  
Prenatal Multivitamin

- None

3) Zahler Prenatal Vitamin and DHA

- None

- Marteklife's DHA 250 mg (Other  
ingredients = Sunflower Lecithin)

4) Thorne Research Basic Prenatal  
Multivitamin

- None

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## **CHOLINE CONTENT**

**5) New Chapter Perfect Prenatal**

- None

- Breast support blend (sprouted seeds)  
100mg = organic broccoli and cauliflower

**6) Rainbow Light Prenatal Petite Mini**

- **Choline (as bitartrate) 10mg**

**7) Deva Vegan Prenatal Vitamin**

- **Choline (bitartrate) 50mg**

**9) Rainbow Light Prenatal One**

- **Choline (as bitartrate) 10mg**

**10) Twinlab Prenatal Care**

- **Choline (as Choline Bitartrate) 10mg**

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## **CHOLINE CONTENT**

### **11) The Honest Company Prenatal Multivitamin**

**- Choline (as Bitartrate) 30 mg**

12) New Chapters Wholemega Prenatal

- None

13) Garden of Life Ocean's mom Prenatal  
DHA

- None

14) Naturemade Prenatal Multi + DHA

- None

15) Similac Prenatal Multivitamin

- None

16) Naturemade Prenatal Multivitamin

- None

17) Bellybar Chewable Prenatal Vitamin

- None

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## CHOLINE CONTENT

### 18) Nature's Way Completia Prenatal Multivitamin

- Choline (as choline bitartrate): serving = 2mg / day = 4mg

19) Spectrum Essentials Prenatal; DHA

- None (Other = Sunflower Lecithin)

20) One a Day Women's Prenatal Vitamin with DHA

- None

21) Enfamil Expecta Prenatal Multivitamin - Choline (as choline bitartrate) 55mg

22) Vitafusion Prenatal Gummy MV

- Choline (as choline chloride) 10mg

23) Centrum Specialist Prenatal Multivitamin - None

24) Spring Valley Prenatal Multivitamin

- None

25) Happy Health Smart Prenatal Multivitamin

- None

