Assessment of Maternal Drinking Patterns from Self-Report Screening and Two Direct Alcohol Biomarkers in Newborns

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Significance

- Despite initiatives to increase awareness, alcohol consumption during pregnancy continues to be a serious public health concern in many countries.
- Latin America has a high prevalence of alcohol consumption, with alcohol traditionally being consumed in moderation with meals.
- Cultural patterns of drinking alcohol in Uruguay have changed in the last 30 years, from moderate consumption with meals to more risky, dangerous patterns of heavy alcohol consumption.
- Data from a surveillance study conducted in Uruguay in 2007 found that 65.6% of women surveyed reported alcohol use during pregnancy (1).
- The incidence of prenatal alcohol exposure in Montevido, Uruguay, as determined by fatty acid ethyl esters (FAEE) detection in meconium, was found to be 44% (2).
- Self-report screening questionnaires of maternal drinking during pregnancy is currently the standard test for monitoring maternal alcohol consumption and identifying alcohol-exposed newborns.
- Alcohol biomarkers can be used as objective measurements for monitoring maternal alcohol consumption and screening for prenatal alcohol exposure.

Research Aims

- Assess the presence of FAEEs in meconium and PEth in dried blood spot (DBS) cards of neonates from a high risk population of mothers.
- Evaluate and compare the sensitivity of identifying prenatal alcohol exposure using maternal self-report or through the detection of the direct alcohol biomarkers FAEE and PEth in newborns.

Experimental Design

- Pregnant women who delivered at the Neonatologist University School at the National Social Security Perinatology Unit in Montevideo, Uruguay, were enrolled in the study by Dr. Raquel Magri, Assessor in Alcohol and Drugs for this hospital.
- Of the 232 mothers enrolled, 135 subjects had:
  - Complete maternal self-report data
  - Complete newborn birth characteristics data
  - Sufficient meconium for FAEE analysis
  - DBS cards for PEth analysis.
- Evaluate the number of infants positive for FAEE in meconium and/or positive for PEth in DBS.
- Identify mothers that self-report drinking during pregnancy and compare the positive rates for FAEE in meconium and PEth in DBS in this population of infants with self-reported prenatal alcohol exposure.

Results

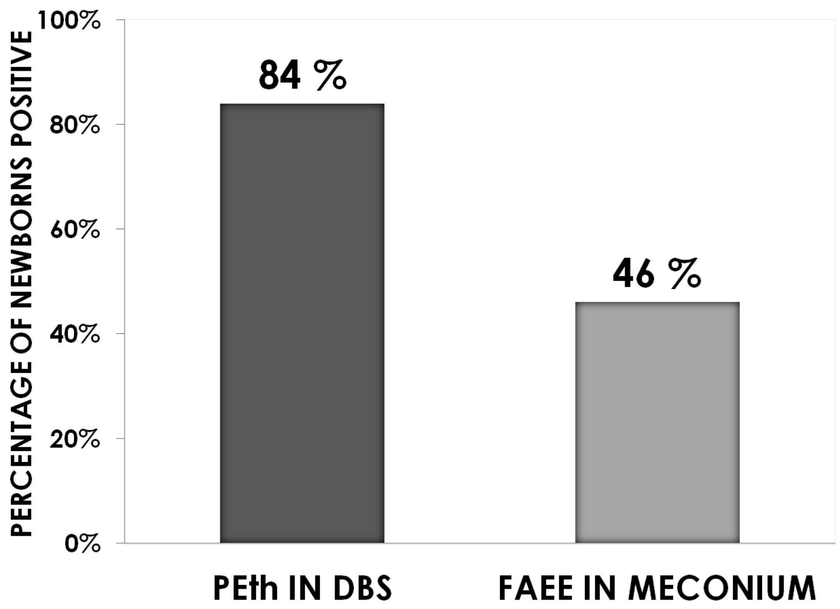
Table I. Maternal Characteristics (135 subjects)

Variable	
Age at birth (years)	**24.7 ± 5.5**
Education (years)	**8.8 ± 2.3**
Married	**31 (23.0%)**
Employed	**14 (10.4%)**
Low socioeconomic status	**118 (87.4%)**
Reported any alcohol use during pregnancy	**81 (60.0%)**
Reported smoking during pregnancy	**53 (39.3%)**
Reported marijuana use during pregnancy	**0 (0.0%)**
Reported cocaine use during pregnancy	**0 (0.0%)**

Table II. Newborn Characteristics

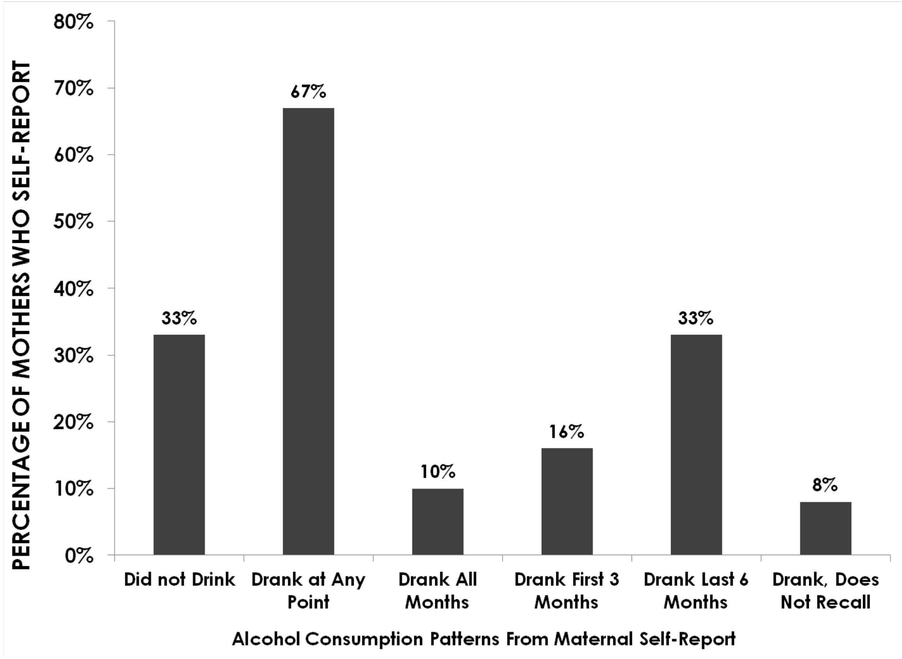
Variable	Mean ± SD
Gestational age (weeks)	**38.4 ± 1.5**
Birth weight (grams)	**3277 ± 481**
Birth length (cm)	**48.9 ± 2.1**
Birth head circumference (cm)	**34.4 ± 1.4**
Apgar score	**8.9 ± 0.7**
Females	**69 (51.1%)**
Premature (<37 weeks gestation)	**15 (11.1%)**

Figure 1. Sensitivity of Newborn Alcohol Biomarkers.
The presence of PEth in DBS and FAEE in meconium was analyzed among mothers who self-report alcohol use during pregnancy (n=81 mothers)



Results

Figure 2. Sensitivity of Maternal Self-Report.
The reported drinking patterns were analyzed among mothers with newborns that are positive for both PEth and FAEE (n=49 newborns and their respective mothers)



Conclusions

- Detection of PEth in DBS cards identifies newborns exposed to alcohol *in utero* at a higher rate (84%) than detection of FAEE in meconium (46%) and maternal self-report (67%).
- Detection of PEth in newborns of mothers who report drinking only during the first 3 months suggests that these mothers in fact drank throughout pregnancy and the combination of maternal self-report and biomarkers can assist in detecting these high risk mothers.
- The advantage of PEth analysis over current biomarkers is that:
  - Analysis of PEth in DBS is less expensive
  - DBS are a universally available sample
  - PEth is stable at RT for at least 6 months, indefinitely at -80°C
  - The DBS sample can be collected and analyzed sooner
  - Specimen integrity improved since DBS are a single collection

Acknowledgements

- This research was funded by NIAAA R43 grant AA017792-01

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