# Alcohol reduction in the first trimester is unrelated to smoking, patient or pregnancy characteristics☆

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A B S T R A C T

*Introduction:* Studies show alcohol-preferring mice reduce their alcohol intake during pregnancy; this study questions if the same is true for humans. The current investigation compares women's pre-pregnancy and first trimester alcohol consumption, examines if women with problem drinking diminish their alcohol intake during pregnancy, and determines if prenatal alcohol reduction is associated with characteristics of pregnancy, patients or smoking.
*Methods:* 126 participants in weeks 1–12 of pregnancy, recruited from Obstetric and Family Practices, completed a survey during their initial prenatal visit including two gender-specific AUDITs (Alcohol Use Disorders Identification Tests) querying current and pre-pregnancy alcohol use. AUDIT-C (AUDIT items 1–3) scores measuring pre-pregnancy and first trimester alcohol consumption were compared, analyzed and tested using general linear model repeated. A $p \leq 0.05$ was accepted as significant.
*Results:* Most participants were multiparous, Caucasian high school graduates experiencing nausea and vomiting. Pre-pregnancy alcohol use was significantly ($p = 0.019$, Fisher's exact) higher among women seeing obstetricians. Pre-pregnancy AUDIT-C scores (m (mean) = 2.22, sd (standard deviation) = 2.19) were significantly higher ($p < 0.001$) than first trimester scores (m = 0.143, sd = 0.532). Among 49 with pre-pregnancy AUDIT-C scores $\geq 3$, 45/49 (92%) reduced their alcohol use to zero during the first trimester. Age, race, education, marital status, parity, nausea and vomiting, gestational age and smoking were non-factors in score reduction.
*Conclusions:* Women reported reducing their alcohol consumption during pregnancy, including those screening positive for pre-pregnancy problem drinking. First trimester alcohol reduction cannot be accounted for by smoking, patient or pregnancy characteristics; public health initiatives, psychological factors and hormonal mechanisms may be implicated.

## 1. Introduction

Alcohol aversion in pregnancy has been demonstrated in rats (Means & Goy, 1982), monkeys (Elton & Wilson, 1977), alcohol-preferring mice (Randall, Lochry, Hughes, & Boggan, 1980) and women with severe alcohol use disorders (Little, Schultz, & Mandell, 1976; Little & Streissguth, 1978). In a recent analysis of the prevalence of alcohol use among pregnant women in the United States, 8.7% used alcohol in the past 30 days compared to 58.2% of non-pregnant adults (Oh, Gonzalez, Salas-Wright, Vaughn, & DiNitto, 2017). Many have argued that nausea and vomiting resulting from the first trimester pregnancy hormone, beta human choriogonadotropin (beta hcg) may

be part of an endogenous embryo-protective mechanism to deter women from ingesting toxic substances like alcohol (Flaxman & Sherman, 2000; Cardwell, 2012). In addition to hormonal factors, public policy may play a role in alcohol use reduction during pregnancy.

In 2016, the Center for Disease Control (CDC) released new guidelines encouraging increased health education, alcohol use screening interventions, and contraception for women with reproductive potential who were using alcohol (Centers for Disease Control and Prevention, 2016). Psychological factors such as mother-infant bonding may also be implicated in gestational alcohol use reduction. Studies evaluating maternal-fetal attachment showed maternal health practices

like alcohol abstinence were significantly and positively correlated with fetal attachment and improved neonatal outcomes of normal birth weights (Maddahi, Dolatian, Khoramabadi, & Talebi, 2016; Lindgren, 2001).

It remains plausible that like alcohol-preferring mice, problem drinkers may experience a new aversion to alcohol during pregnancy. This aversion may be related to pregnancy characteristics such as nausea and vomiting. The objectives of the current study were to compare women's pre-pregnancy and first trimester alcohol consumption, examine if women screening positive for problem drinking diminish their alcohol intake during pregnancy's first trimester, and determine if the alcohol reduction is associated with characteristics of the pregnancy, patient or smoking status.

## 2. Material and methods

### 2.1. Study design

This study was a cross-sectional comparison of women's alcohol use three months before pregnancy and during the first trimester.

### 2.2. Participants

Participants were recruited by self-selection at five medical practices, in a rural and a small metropolitan area, (non-rural), in Illinois as follows: 2 family practice clinics (1 rural, 1 non-rural) and three private obstetric practices (non-rural). Recruitment occurred during the period of August to December 2011. Any woman in her first trimester of pregnancy was eligible for participation. Women > 12 weeks pregnant were excluded from the study to limit retrospective bias regarding pre-pregnancy alcohol use. Women of all ages were allowed to participate. A special waiver of informed consent by guardian for participation by minors was obtained from the IRB. As a result, the consent procedure for pregnant women under age 18 did not differ from those aged 18 and older.

### 2.3. Procedures

Participants received a one-time anonymous survey from nursing staff at their initial prenatal visit and were allowed to complete the survey, while alone in an exam room. Due to the sensitive nature of reporting alcohol use during pregnancy and to encourage full patient disclosure on alcohol use, survey procedures to ensure patient anonymity were conducted: survey responses were anonymous, locked ballot boxes were provided at all of the sites and participants were instructed to deposit the completed surveys inside them. For similar reasons, no follow up assessment was done. To reduce a social desirability bias in participant responses, surveys were completed in the privacy of an exam room and locked in ballot boxes to protect anonymity. Women were asked by questionnaire to complete two identical measurement tools regarding alcohol. One pertained to current first trimester alcohol habits, while the other elicited retrospective history from three months prior to pregnancy. No other materials or behavioral interventions were offered.

### 2.4. Measurement

The two outcomes of interest were pre-pregnancy and first trimester alcohol consumption, measured using the Alcohol Use Disorders Identification Test (World Health Organization, 2001) questions 1 through 3 (AUDIT-C) (Bradley et al., 2003). The AUDIT-C is an effective tool for screening hazardous drinking and alcohol use disorders (Bradley et al., 2003) and has been validated for use in primary care settings (Bradley et al., 2007), among female Veteran populations (Bradley et al., 2003; Chavez, Williams, Lapham, & Bradley, 2012) and pregnant females (Burns, Gray, & Smith, 2010). In order to mirror

the female specific definition of risk drinking provided by the National Institute on Alcohol Abuse and Alcoholism (2013), and improve the sensitivity of screening for risk drinking in a female population (Dawson, Grant, Stinson, & Zhou, 2005), the female specific version of AUDIT question 3 was included (Bradley et al., 2003; Chavez et al., 2012). Question 3 of this study frames frequency of drinking on one occasion as "four or more drinks" rather than the standard AUDIT's "six or more drinks" (World Health Organization, 2001).

Each AUDIT-C question is scored from 0 to 4 points, with a summed total score ranging from 0 to 12 points. Problem drinking was assumed positive with an AUDIT-C score $\geq 3$, which was the cutoff observed to balance sensitivity and specificity for problem drinking in female Veterans Affairs patients (Bradley et al., 2003; Chavez et al., 2012), and pregnant females (Burns et al., 2010). Participants were classified as non-drinkers (AUDIT-C = 0), mild drinkers (AUDIT-C = 1–2), and problem drinkers (AUDIT-C $\geq 3$). Problem drinkers included those who engaged in hazardous drinking and were at-risk for an alcohol use disorder, whereas mild drinkers are assumed not to engage in drinking that puts their health at risk (Bradley et al., 2003, 2007).

### 2.5. Explanatory variables

To understand if alcohol consumption was associated with patient demographics or pregnancy characteristics, the following variables were included in the self-reported survey: age, race, education, marital status, parity, number of weeks pregnant, and nausea and vomiting of pregnancy (identified as none, mild, moderate, or severe). As smoking status may be associated with alcohol consumption, we asked participants to report their smoking status, using an ordinal scale with quantity of cigarettes smoked, three months prior to pregnancy as well as their current first trimester smoking status. Community survey site was recorded by medical office location, and practice provider was recorded by medical practice type.

## 3. Theory/calculation

Analyses compared patient demographic and pregnancy characteristics across AUDIT-C score groups using chi-square for nominal and one way anova for interval variables such as age and weeks pregnant. The difference between pre-pregnancy and first trimester AUDIT-C scores was analyzed using a repeated general linear model and descriptive demographic. Smoking and pregnancy variables were tested as independent variables to determine if they influenced the AUDIT-C change from pre-pregnancy to first trimester. Secondary analyses examined smoking differences by comparing patient demographic and pregnancy characteristics with first trimester smoking status using chi-square for nominal variables and *t*-test for interval variables such as age and weeks pregnant. Pre-pregnancy and first trimester AUDIT-C means for first trimester smokers and non-smokers were analyzed for significance using matched *t*-tests. All data were obtained from self-report surveys and entered into EXCEL with analysis done by SPSS ver 21.0.0.0.

## 4. Results

### 4.1. Patient & pregnancy characteristics

Among the 126 women who participated in the study, most were in their late twenties, Caucasian, had an advanced education, lived in a non-rural community and were non-smokers (Table 1). The mean for gestational age was 8.28 (sd (standard deviation) = 1.97), with most women reporting a prior pregnancy and experiencing some amount of nausea and vomiting during the current pregnancy's first trimester.