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Pregnancy Intention and Maternal Alcohol Consumption

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Abstract

Objective—To evaluate whether women planning a pregnancy are less likely to use alcohol in early pregnancy than those with unintended pregnancies.

Methods—*Right From the Start* (2000–2012) is a prospective, community-based pregnancy cohort. Maternal demographic, reproductive, and behavioral data were collected in telephone interviews at enrollment (mean $\pm$ SD: 48 $\pm$ 13 days of gestation) and later in the first trimester (mean $\pm$ SD: 85 $\pm$ 21 days). Alcohol consumption characteristics were included in the interviews. We used logistic regression to investigate the association of pregnancy intention with alcohol use.

Results—Among 5,036 women, 55% reported using alcohol in the first trimester, with 6% continuing use at the first trimester interview. Pregnancy was planned by 70% of participants. Alcohol use occurred in 55% and 56% of intended and unintended pregnancies, respectively ($p=0.32$). Adjusting for confounders, women with intended pregnancies were 31% less likely to consume any alcohol in early pregnancy (adjusted OR (aOR): 0.69, 95% CI: 0.60–0.81) or binge drink (aOR: 0.68, 95% CI: 0.54–0.86). Most women, regardless of intention, stopped or decreased alcohol consumption in early pregnancy.

Conclusion—The majority of women, irrespective of intention, stopped or decreased drinking after pregnancy recognition. This suggests promoting early pregnancy awareness could prove more effective than promoting abstinence from alcohol among all who could conceive.

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INTRODUCTION

Since alcohol exposure can have devastating effects on the fetus, the Centers for Disease Control and Prevention (CDC) recently embarked upon a public health education effort with the primary aim of decreasing alcohol exposure in pregnancy[1]. Noting that 53% of US women in a large CDC study consumed alcohol within the previous 30 days and over half of pregnancies in the U.S. are unplanned[2, 3], the CDC recommends that all women who are planning a pregnancy or not using reliable contraception abstain from alcohol use[2, 3]. In response, women, the media, policy pundits, international health commentators, and care providers criticized the program as patronizing social engineering and asked pointed questions regarding the primacy of improved contraceptive access and lack of normative data about typical behavior [4, 5]. The guidance implies that women desiring a pregnancy will abstain from alcohol, but previous studies provide conflicting evidence on the effect pregnancy intention has on alcohol consumption[6, 7]. Despite being the focus of several large studies, consistent predictors of alcohol exposure in pregnancy have yet to be determined[8, 9]. Research also provides conflicting findings of which maternal characteristics are predictors of risky drinking behaviors in pregnancy, such as binge drinking, defined as consumption of five or more drinks on one occasion[9, 10].

Our objective was to examine the independent association of pregnancy intention with maternal alcohol consumption from the periconception period (30 days prior to missed menses) through the first trimester of pregnancy. Additionally, we sought to describe maternal characteristics associated with continued use of alcohol in pregnancy and binge drinking.

MATERIALS AND METHODS

Right from the Start (RFTS) is a prospective, community-based cohort study of women enrolled between 2000 and 2012 prior to 12 weeks of gestation. Participants were recruited from multiple metropolitan areas in North Carolina, Texas, and Tennessee. To be eligible for the cohort, a woman must be over the age of 18, speak English or Spanish, and not use assisted reproductive technology. Specific details about participant recruitment have been published previously[11]. RFTS consisted of three phases with multiple sources of funding and a wide range of aims. All phases share common methods and data elements.

A telephone **enrollment interview** captured baseline demographic and previous pregnancy information and was administered at a mean of 48 days $\pm$ 13 days of gestation. An extensive **first trimester** computer assisted telephone interview (CATI) was conducted near the end of the trimester (mean $\pm$ SD: 85 days $\pm$ 21 days). This interview assessed medical history, prior reproductive history, symptoms and events during the current pregnancy, health behaviors (caffeine, tobacco, illicit drug, and alcohol use), medication and supplement use, and physical activity. Participants had an early first trimester ultrasound to confirm gestational dating (mean gestational age at ultrasound, 9 weeks). Of the 6,288 pregnancies enrolled in RFTS, 5,036 were eligible for inclusion in this analysis (Figure 1). The institutional review board of Vanderbilt University School of Medicine, Nashville, Tennessee approved this study.

Participants voluntarily provided information about alcohol consumption prior to and during pregnancy in the first trimester interview. Information regarding pattern of use, frequency, quantity, and type of alcohol were also obtained. Women with a history of alcohol use within the four months prior to the interview were considered exposed. Information was also obtained on frequency of binge drinking, defined as consuming five or more drinks on any single occasion. For the purpose of the study, an alcoholic drink was defined as 14 grams of ethanol[12]. Some women reported alcohol use in the periconception and early pregnancy period but did not provide information on specific characteristics such as quantity or frequency (n=458). These women were considered exposed and included in the primary analyses, but were excluded from the secondary analyses that required more specific measures of exposure.

Pregnancy intention was assessed by maternal interview at enrollment, using the intendedness of pregnancy items developed by the CDC[13]. A pregnancy was considered intended if the participant affirmed that she desired to have a baby, or another baby, at some time in her life and became pregnant in what she deemed was “about the right time” or later than desired. Pregnancies considered sooner than desired or not desired entirely were classified as unintended.

Maternal demographic, reproductive, and behavioral data were collected in telephone interviews at enrollment and in the first trimester. Covariates, determined *a priori* based on literature review and biologic plausibility consisted of maternal education level (high school/less, some college, college graduate/more), maternal age, race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, other), marital status (married, other), first trimester BMI, maternal prenatal vitamin use, history of spontaneous and therapeutic abortion, household income, smoking status, and illicit drug use (use of any illegal substance in the past 4 months) were also obtained to assess association between these variables and alcohol consumption during pregnancy.

We tested for bivariate differences in maternal characteristics between women with intended and unintended pregnancies using the chi-squared test. Mean and median alcohol consumption were calculated as the average number of drinks per week from the periconception period through the first trimester interview. If the study participant reported a change in pattern of alcohol consumption during this time, mean and median consumption was calculated for before and after the change taking into account gestational week in which change in consumption was reported, Chi-squared tests were used to examine patterns of use by intendedness. We used univariate and multivariable logistic regression models to investigate the independent association of pregnancy intention with alcohol use in early pregnancy. All covariates determined *a priori* were included in the final logistic regression model. Interaction terms were generated for pregnancy intention and maternal age at enrollment, history of spontaneous/therapeutic abortions, parity, and maternal education to test for effect modification. No effect modification was noted ($p>0.20$). Univariate and multivariable analyses were also generated for the given maternal demographic/reproductive characteristics to determine association with alcohol consumption in pregnancy. All analyses were conducted in R-software version 3.1.2 (www.r-project.org) or Stata version 14.0 (StataCorp, College Station, TX).

RESULTS

The final cohort population consisted of 5,036 women. Among them, 70% were reported the pregnancy was intended. Intended pregnancies were more common among women who were older ($p<0.001$), white ($p<0.001$), college educated or greater ($p<0.001$), married ($p<0.001$), and of higher income ($p<0.001$), (Table 1).

Fifty-five percent of women in the study reported using alcohol in the 12 weeks preceding the first trimester interview with use occurring in 55% and 56% of intended and unintended pregnancies, respectively ($p=0.32$). Six percent of all women reported current use of alcohol at the first trimester interview, and this did not differ by pregnancy intention ($p=0.20$). In the youngest age group (ages 18 to 20) who are not old enough to drink legally, 35% consumed alcohol at some point during pregnancy and this was significantly more likely among those with unintended pregnancies (39% vs 27%, $p<0.001$).

Women who recently quit using alcohol had higher median weekly alcohol consumption prior to quitting compared to women who continued to drink throughout pregnancy in both intended and unintended pregnancies (Table 2). Among women who stopped drinking during pregnancy, those with intended and unintended pregnancies consumed a median of 2 drinks per week (Interquartile Range [IQR]: 1.0–3.0 for both groups, $p=0.96$). In the group that continued to drink alcohol at the first trimester interview, women with intended and unintended pregnancies consumed a median of 1 drink per week (IQR for both: 0.25–3.0, $p=0.25$). During pregnancy, 90% of women with alcohol consumption reported a change in drinking pattern. Of these women with a change in pattern, 90% ceased consumption, 8% reduced consumption, and 2% of women increased alcohol intake. In women that changed drinking pattern, the median number of alcoholic beverages consumed was 2 per week before the change (IQR: 0.92–4.0). At the first trimester interview, the median number of alcoholic beverages consumed among those still drinking was 0.92 drinks per week (IQR: 0.23–2.0) and did not differ based on pregnancy intention ($p=0.36$). The median gestational age at which a change in drinking status occurred was 29 days (IQR: 15–35) (Figure 2). When stratifying this change in alcohol use by pregnancy intention, women with intended pregnancies made the change an average of 3 days earlier (28 days, IQR: 14–34, vs 31 days, IQR: 17–38).

After adjusting for maternal age, race/ethnicity, marital status, maternal education level, income, parity, BMI, prenatal vitamin use, spontaneous or elective abortion history, smoking, and drug use women with intended pregnancies had 31% lower odds of alcohol consumption in pregnancy compared to women with unintended pregnancies (aOR: 0.69, 95% CI: 0.60–0.81). Women who were older, white, college educated, had higher incomes, and having their first pregnancy were most likely to use alcohol in pregnancy (Table 3).

Women with intended pregnancies were 32% less likely (aOR: 0.68, 95% CI: 0.54–0.86) to have at least one episode of binge drinking at any point in pregnancy compared to participants with unintended pregnancies. Women with intended pregnancies were 39% (aOR: 0.61, 95% CI: 0.41–0.92) less likely to have five or more episodes of binge drinking in pregnancy compared to those with unintended pregnancies ($p=0.02$). Characteristics

associated with binge drinking included younger age, being unmarried, past or current smoking, and illicit drug use.

DISCUSSION

Even though women with intended pregnancies are less likely to report using alcohol in early pregnancy than women with unintended pregnancies, alcohol use is still prevalent among women intending to conceive. The use of alcohol among women with intended pregnancies in the cohort was 55%, which parallels CDC findings of alcohol use among approximately 50% of women of childbearing age[2].

The majority of women with periconception alcohol exposure stop or curtail use around the time of a positive pregnancy test as indicated by mean gestational age at which women stopped or decreased alcohol use in this study (23.4 days $\pm$ SD: 19). This mean time of change is shortly after conception suggesting that women hoping to be pregnant may reduce use until missed menses and then return "to normal" if they are not pregnant. If pregnancy is achieved, the woman may maintain abstinence from alcohol or decrease use shortly after pregnancy recognition. Taking into account confounders, continuing to use alcohol in pregnancy is less likely but still occurs among those with intended pregnancies.

Women who continue to use alcohol in the range of two to three drinks per week may be overlooked because they defy clinical and cultural biases about who may be most likely to drink during pregnancy (white, older, more educated women with higher income). These predictors are consistent with findings by Tan and colleagues using the Behavioral Risk Factor Surveillance System (BRFSS), a state-based random digit telephone survey to collect data on multiple maternal behaviors [2]. Providers should not conflate wanting a pregnancy with likelihood that an individual will avoid all potential risks. This population demonstrates substantial voluntary risk reduction before the onset of prenatal care. However we do not find that elimination of all alcohol use when planning a pregnancy is the norm before the awareness of pregnancy.

Our study has limitations. As no reliable marker for alcohol use is readily available, our data on alcohol exposure and timing were obtained from interviews that can be subject to reporting and recall bias. It has been noted in multiple studies that there is always a concern for underreporting of maternal alcohol use in pregnancy, largely due to social stigma. We attempted to minimize recall bias by obtaining the exposure information early in pregnancy via a non-clinical interview in which confidentiality was assured. Another important limitation is the self-reported pregnancy intention. It is possible that some women did not desire a pregnancy initially but reported an intended pregnancy after becoming pregnant. Finally, some mothers failed to provide detailed information on quantity and frequency of alcohol consumption.

Our study provides unique insight into the alcohol use patterns of pregnant women. This study, in contrast with previous studies, prospectively examines maternal alcohol use in the periconception period as well as during the first trimester. This cohort was also comprised of

a large proportion of intended pregnancies, which provides a unique ability to observe alcohol use in women who wish to become pregnant.

As a public health strategy, our data suggest that the majority of women, regardless of pregnancy intention, stop or decrease alcohol use around the time of a positive pregnancy test. This implies that promoting earlier pregnancy awareness by testing near the time of anticipated menses may be a more beneficial strategy for decreasing alcohol use in pregnancy than encouraging abstinence from alcohol among all women who could conceive. The latter does not seem likely to be achieved while the former results in relatively prompt reductions in alcohol consumption. Any remaining use, and evaluation for high risk behaviors such as underage alcohol use and binge drinking (a separate phenomenon), can then become the focus of early clinical encounters but must be extended to all pregnant women not just those perceived as high risk based on traditional socioeconomic markers of risk for poor pregnancy outcomes. Reducing unintended pregnancy is another important public health endeavor and can be accomplished by enhanced contraceptive access, improved counseling, and anticipatory guidance.

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Figure 1.
Study population, exclusions, and sample size.

Figure 2.

Distribution of gestational age at time of pregnancy testing and change in alcohol use by pregnancy intention (**A**. Intended pregnancies. **B**. Unintended pregnancies).

Table 1

Descriptive statistics of women enrolled in Right from the Start

	Intended pregnancy (n=3,563)		Unintended pregnancy (n=1,473)	
	N	%	N	%
Age (years)				
18–20	101	2.8	181	12.3
21–24	305	8.6	385	26.1
25–29	1,298	36.4	453	30.8
30–34	1,313	36.9	321	21.8
35 or older	546	15.3	133	9.0
Missing	0		0	
Maternal education				
High school/less	434	12.2	428	29.1
Some college	501	14.1	385	26.2
College grad	2,628	73.7	659	44.7
Missing	0		1	
Income				
<\$80,000	2,171	62.3	1,139	81.9
>\$80,000	1,315	37.7	252	18.1
Missing	77		82	
Marital status				
Married	3,414	95.8	1,116	75.7
Unmarried	149	4.2	357	24.3
Missing	0		0	
Parity				
0	1,735	49.1	669	46.6
1 or more	1,797	50.9	768	53.4
Missing	31		36	
Race & Ethnicity				
Non-Hisp White	2,767	77.7	811	55.1
Non-Hisp Black	431	12.1	470	31.9
Hispanic	211	5.9	119	8.1
Other	151	4.2	71	4.9
Missing	3		2	
BMI				
Underweight (<19.8)	301	8.5	131	9.0
Normal weight (19.8 to 25.9)	2,058	58.4	691	47.5
Overweight (26.0 to 28.9)	477	13.5	217	14.9
Obese (≥ 29)	691	19.6	417	28.6
Missing	36		17	
Prior spontaneous abortions				

	Intended pregnancy (n=3,563)		Unintended pregnancy (n=1,473)	
	N	%	N	%
0	2,732	77.3	1,131	78.7
1 or more	800	22.7	306	21.3
Missing	31		36	
Prior elective abortions				
0	3,071	86.9	1,177	81.9
1 or more	461	13.1	260	18.1
Missing	31		36	
Prenatal vitamin use				
No	66	1.9	89	6.1
Yes	3,494	98.1	1,380	93.9
Missing	3		4	
Smoking status				
Never	2,727	76.6	989	67.1
Former	760	21.3	390	26.5
Current	75	2.1	94	6.4
Missing	1		0	
Current illicit drug use				
No	3,426	96.1	1,284	87.3
Yes	137	3.9	187	12.7
Missing	0		2	

* Percentages obtained only from values provided for given maternal characteristics. Missing values listed for each covariate but not accounted for in percentages.

Table 2

Quantity of alcoholic beverages consumed per week, prior to change in use, stratified by intention and usage status

	Periconception Consumption*		Consumption at 1 st Trimester Interview	
	Intended pregnancy (n=1,750)	Unintended pregnancy (n=761)	Intended pregnancy (n=205)	Unintended pregnancy (n=65)
Drinks per week				
Median (IQR)	2.0 (0.92–4.0)	2.0 (0.92–5.0)	0.92 (0.23–2.0)	0.69 (0.23–1.0)
Drinks per week [^]	N (%)	N (%)	N (%)	N (%)
Less than 1	435 (25.1)	197 (27.0)	68 (51.9)	27 (52.9)
1 to 5	949 (54.8)	356 (48.8)	50 (38.2)	21 (41.2)
Greater than 5*	347 (20.0)	176 (24.1)	13 (9.9)	3 (5.9)
Didn't answer	19	32	74	14
Binge drinking in pregnancy [†]	326 (18.6)	209 (27.5)	26 (12.7)	19 (29)

Calculated for those participants who provided quantities of alcohol consumed. IQR, interquartile range.

* Periconception consumption defined as alcohol intake between 30 days prior to last menstrual period to time of change in consumption or interview, whichever is earlier

[^] Difference in weekly drinking by intendedness in periconception window, p=0.02; difference in weekly drinking by intendedness in first trimester, p=0.68

[†] Binge drinking defined as five or more drinks on any one occasion. Difference in binge drinking by intendedness in periconception window, p<0.001; difference in binge drinking in first trimester, p=0.002

Table 3

Relationship between maternal characteristics and alcohol use

	Unadjusted odds ratio, 95% confidence interval		Adjusted odds ratio, 95% confidence interval	
Pregnancy intention				
No	1.00		1.00	
Yes	0.93	0.83–1.06	0.69	0.60–0.81
Age (yrs)				
18–20	1.00		1.00	
21–24	1.84	1.38–2.45	2.03	1.42–2.90
25–29	2.08	1.60–2.70	2.13	1.49–3.05
30–34	2.73	2.10–3.56	2.90	1.99–4.20
35 or older	3.03	2.27–4.05	3.40	2.28–5.07
Maternal education				
High school/less	1.00		1.00	
Some college	1.42	1.18–1.72	1.22	0.97–1.53
College grad	1.98	1.70–2.31	1.53	1.22–1.92
Income				
\$80,000	1.00		1.00	
>\$80,000	1.94	1.71–2.20	1.63	1.41–1.89
Marital status				
Married	1.00		1.00	
Unmarried	0.91	0.76–1.09	1.55	1.19–2.01
Parity				
0	1.00		1.00	
1 or more	0.64	0.58–0.72	0.62	0.54–0.71
Race & Ethnicity				
Non-hisp white	1.00		1.00	
Non-hisp black	0.47	0.40–0.54	0.52	0.42–0.63
Hispanic	0.60	0.48–0.75	0.90	0.69–1.18
Other	0.66	0.50–0.86	0.61	0.45–0.82
BMI				
Underweight (<19.8)	1.00		1.00	
Normal weight (19.8 to 25.9)	1.20	0.98–1.47	1.15	0.92–1.44
Overweight (26.0 to 28.9)	0.99	0.78–1.27	1.11	0.85–1.45
Obese (>29)	0.82	0.65–1.01	0.99	0.77–1.27
Prior Spontaneous abortions				
0	1.00		1.00	
1 or more	0.78	0.69–0.90	0.79	0.68–0.92
Prior elective abortions				
0	1.00		1.00	
1 or more	1.51	1.28–1.78	1.47	1.22–1.77
Prenatal vitamin use				

	Unadjusted odds ratio, 95% confidence interval		Adjusted odds ratio, 95% confidence interval	
No	1.00		1.00	
Yes	1.51	1.09–2.08	0.81	0.54–1.21
Smoking status				
Never	1.00		1.00	
Former	1.38	1.01–1.89	1.38	0.95–2.01
Current	2.29	1.99–2.63	2.13	1.82–2.50
Current illicit drug use				
No	1.00		1.00	
Yes	3.31	2.52–4.36	3.98	2.84–5.57

* Models adjusted for maternal age, race/ethnicity, marital status, maternal education level, income level, parity, BMI, prenatal vitamin use, spontaneous and elective abortion history, smoking, and drug use.