

# Alcohol Use during Pregnancy and Related Risk Factors in Korea

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**Objective** The number of Korean women of childbearing age who drink alcohol and binge drink has increased remarkably in recent years. In the present study, we examined self-reported rates of alcohol use before and during pregnancy and identified maternal characteristics associated with drinking in pregnancy.

**Methods** One thousand pregnant Korean women who visited the Department of Obstetrics and Gynecology (OB/GYN) completed a self-administered questionnaire that sought information on their demographic characteristics and incorporated features of the Alcohol Use Disorder Identification Test (AUDIT)-C to investigate their use of alcohol, including binge drinking, during three time periods (“in the year before this pregnancy,” “during this pregnancy,” and “in the previous 30 days”).

**Results** Of these participants, 16.4% reported using alcohol during their pregnancy, 12.2% had used alcohol in the previous 30 days, and 1.7% reported binge drinking during their pregnancy. In the year before pregnancy, 77.1% had used alcohol, and 22.3% had binge drunk. The group using any amount of any alcohol during pregnancy showed a lower educational level, a lower rate of planned pregnancy, a lower level of knowledge relating to the risks of drinking alcohol during pregnancy, and a higher frequency of alcohol drinking in the year before pregnancy when compared with the abstinent group. Low educational level and unplanned pregnancy were revealed to be significant risk factors for alcohol consumption in pregnant women.

**Conclusion** This is the first study to examine any alcohol and binge alcohol drinking during pregnancy in Korea. Clinical attention and monitoring system on alcohol use during pregnancy are necessary in Korea.

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**Key Words** Pregnancy, Alcohol, Korean women, Fetal alcohol syndrome.

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## Introduction

Recently, Korean society has experienced a dramatic increase in problems relating to alcohol use, including alcohol use among women. Following Confucian principles, traditional Korean society allowed drinking for men, but not for women. However, as society has changed, contemporary women do drink, and they are beginning to drink at younger ages and consume larger amounts of alcohol than in previous generations. The frequency of ‘any use’ of alcohol among women has increased from 32% in 1989 to 80% in 2007 according to National statistics.<sup>1</sup> Particularly conspicuous is the increase in rates of binge drinking, defined as the consumption of five or more drinks on a single occasion.<sup>2</sup> In the past, men’s drinking rate was much higher than women’s, but this gap is now decreasing. Alcohol use is highest amongst those aged in their 20s and gradually diminishes with increasing age.<sup>1</sup> Ninety-two percent of people in their 20s, 91% of those in their 30s, and 79% of those in their 40s report any use of alcohol during their lifetime. Alcohol consumption among women of childbearing age (18-44) is noteworthy. A self-report study on the frequency of alcohol use in the past year among Korean women aged from their 20s to their 40s showed that 48.6% of those in their 20s, 34% of those

in their 30s, and 37.6% of those in their 40s drank twice or more per month.<sup>1</sup> Furthermore, self-report of the frequency of binge drinking in the past year revealed that 52.1% of those in their 20s, 24.6% of those in their 30s, and 25.9% of those in their 40s binge drank once or more per month.<sup>1</sup> Alcohol consumption among women who are pregnant or who might become pregnant appears, therefore, to be a serious issue that can no longer be overlooked in Korea.

Alcohol is a teratogen, and prenatal exposure to alcohol can cause a variety of problems known as fetal alcohol spectrum disorders (FASDs). The most severe form of FASD, fetal alcohol syndrome (FAS), is characterized by abnormal facial features, growth deficiencies, and problems in the central nervous system (CNS). People with FAS might have a range of learning and behavioral problems, and people exposed to alcohol prenatally are at risk of developing disorders relating to alcohol and other drug use later in life.<sup>3</sup>

It has been reported that up to 1 in 100 children in the United States (US) is born with FASD.<sup>4</sup> Furthermore, 0.5 to 2.0 children in 1,000 are diagnosed with FAS in the US.<sup>5</sup> The highest fetal alcohol syndrome rate was documented in a South African community in Western Cape Province where FAS was reported to affect 40.5 to 46.4 children per 1,000 in the 5-9-year-old age group.<sup>6</sup> Many people in the Western Cape are involved in growing grapes and producing wine, and this has influenced their regional drinking patterns. For several centuries, wine was distributed among and consumed daily by workers as partial payment for labor.<sup>6</sup> Although some sporadic case reports have examined FAS or FASD in Korea, no attempt has yet been made to investigate FAS prevalence rates or rates of alcohol drinking during pregnancy.<sup>7-13</sup> All mothers of FAS or FASD children in these case reports consumed alcohol excessively during their pregnancies.<sup>7-13</sup>

In the present study, therefore, we examined for the first time rates of self-reported alcohol use before and during pregnancy in Korea and identified characteristics that were associated with drinking.

## Methods

### Subjects and procedure

One thousand pregnant women in Korea who visited the Department of Obstetrics and Gynecology (OB/GYN) at a university hospital for prenatal care were asked to fill out a survey questionnaire. Of these, 739 agreed to complete the questionnaire. Ninety-three of those who completed the questionnaire did not report on their drinking pattern, leaving 646 complete responses that were included in the analysis.

All subjects were given information about the nature of the study, and their consent was obtained by a psychiatrist. Other than those with a disorder preventing them from answering the survey questionnaire, no pregnant women were excluded

from this study. The psychiatrist gave each pregnant woman the self-reporting paper questionnaires individually, and each wrote her responses in private.

### Survey questionnaires

The questionnaire asked for information on participants' demographic characteristics and on their alcohol use during three time periods: "in the year before this pregnancy", "during this pregnancy", and "in the previous 30 days". Additional questions investigated participants' knowledge of the effects of alcohol on pregnancy outcomes, pregnancy history, and smoking habits.

### Alcohol consumption measures

Subjects were asked about the quantity and the frequency of their drinking using Alcohol Use Disorder Identification Test (AUDIT)-C,<sup>14</sup> a brief screening instrument that consists of the first three questions of the AUDIT: 1) frequency of alcohol drinking (any kind of alcoholic beverage), 2) quantity of alcohol consumed (typical number of drinks per day when alcohol is used), and 3) frequency of binge drinking ( $\geq 5$  standard drinks on one occasion). We used the Korean language version of AUDIT-C, and its reliability and validity had previously been demonstrated.<sup>15</sup> A standard drink in this study was defined as 10 g of ethanol. All women who reported any drinking were asked to describe their beverage-specific alcohol use. They reported their frequency of drinking each type of beverage and their usual number of drinks of that beverage. AUDIT-C was repeated using the time frames: "in the year before this pregnancy", "during this pregnancy", and "in the previous 30 days".

### Knowledge about alcohol effects on pregnancy outcomes and the fetal alcohol syndrome

Subjects were asked to mark the items whose probability was increased by excessive drinking during pregnancy, answering whether alcohol consumption definitely or probably increased the risk of each outcome: 1) miscarriage, 2) mental retardation, 3) low birth weight, and 4) congenital anomaly.<sup>16</sup> Participants checked 'yes' or 'no' for each item. In addition, they were asked whether they had ever heard of FAS.<sup>16</sup>

### Demographic characteristics

Subjects also answered questions on age, educational level, number of weeks of pregnancy, history of pregnancy or miscarriage, occupation, annual family income level, pregnancy planning and smoking.

### Statistical analysis

Statistical Package for the Social Sciences (SPSS) 12.0 for Windows was used for statistical analysis. A frequency analysis was conducted to examine the state of alcohol drinking in pregnant women. Chi-square tests were used to evaluate dif-

ferences in occupation, smoking status, presence of planned pregnancy, and level of recognition of FAS among women who reported alcohol use during pregnancy compared with women who abstained from alcohol use during pregnancy. When the frequency in cells was fewer than five, Fisher’s exact test was used. An independent-sample t-test was performed to verify group differences in continuous variables between alcohol drinkers and total abstainers in pregnancy. Correlation analysis was conducted to evaluate correlations between alcohol drinking and post-pregnancy risk factors. A logistic multiple regression analysis was carried out to verify the predictive value of risk factors for alcohol drinking among pregnant women.

## Results

### Demographic characteristics (Table 1)

A total of 646 pregnant women were included in this study. Their mean age was 31.56±3.91 (20-43) years, and their mean number of years of education was 14.96±2.17 (6-28) years. The mean duration of pregnancy at the time of the survey was 27.87±8.58 (4-43) weeks. Forty-three (6.7%) subjects were in the first trimester of pregnancy, 213 (33.0%) were in the second trimester, and 390 (60.4%) subjects were in the third trimester of pregnancy. Of these participants, 634 (98.1%) subjects were married, and more than half (403, 62.4%) of this group were not employed.

### Self-reported patterns of alcohol consumption

#### Alcohol use in the previous 30 days (Table 2)

A total of 643 pregnant women answered this question-

**Table 1.** Demographic characteristics (N=646)

Variables		
Age	31.56±3.91	Range=20-43
Education (years)	14.96±2.17	Range=6-28
Week of pregnancy	27.87±8.58	Range=4-43
1st trimester	43	6.7%
2nd trimester	213	33.0%
3rd trimester	390	60.4%
Marital status		
Married	634	98.1%
Unmarried	8	1.2%
N/R	4	0.6%
Employment		
Employed	238	36.8%
Unemployed	403	62.4%
N/R	5	0.8%

N/R: nonresponsive

naire (n=643). On the date they responded to the questionnaire, 567 (87.8%) subjects had not drunk alcohol at all in the previous 30 days, 55 (8.5%) drank alcohol less than once a month, 19 (2.9%) subjects drank alcohol two to four times a month, and two subjects drank two to three times a week. Analysis of the quantity drunk in the previous 30 days showed that 73 (11.3%) subjects had consumed one to two drinks. Only three (0.5%) subjects had consumed three to four drinks, and none had consumed five drinks or more.

#### Alcohol use during this pregnancy (n=645)(Table 2)

Five hundred forty (83.6%) subjects reported that they did

**Table 2.** Alcohol consumption of pregnant women in Korea

Variables	N	%
Previous 30 days	643	
Frequency		
Didn't drink	567	87.8
Less than 1 time a month	55	8.5
2-4 times a month	19	2.9
2-3 times a week	2	0.3
More than 4 times a week		
Quantity		
1-2 glasses	73	11.3
3-4 glasses	3	0.5
5-6 glasses		
7-9 glasses		
More than 10 glasses		
This pregnancy	645	
Frequency		
Didn't drink	540	83.6
Less than 1 time a month	80	12.4
2-4 times a month	23	3.6
2-3 times a week	2	0.3
More than 4 times a week		
Quantity		
1-2 glasses	82	12.7
3-4 glasses	8	1.2
5-6 glasses	1	0.2
7-9 glasses	6	0.9
More than 10 glasses	4	0.6
The year before pregnancy	645	
Frequency		
Didn't drink	148	22.9
Less than 1 time a month	231	35.8
2-4 times a month	203	31.4
2-3 times a week	53	8.2
More than 4 times a week	10	1.5
Quantity		
1-2 glasses	220	34.1
3-4 glasses	131	20.3
5-6 glasses	60	9.3
7-9 glasses	53	8.2
More than 10 glasses	31	4.8

not drink alcohol at all. Nevertheless, 80 (12.4%) subjects drank alcohol less than once a month, 23 (3.6%) subjects drank two to four times a month, and two (0.3%) subjects drank two to three times a week. When they drank, 82 (12.7%) consumed one or two drinks on a single occasion, eight (1.2%) had three to four drinks, and six (0.9%) had seven to nine drinks. Four (0.6%) subjects reported that their usual quantity was 10 drinks on a single occasion.

#### Alcohol use in the year before pregnancy (n=645) (Table 2)

Examining the frequency and the quantity of alcohol consumption in the year before pregnancy, 148 (22.9%) subjects drank no alcohol at all, 231 (35.8%) subjects drank once or less per week, 203 (31.4%) subjects drank two to four times per week, 53 (8.2%) subjects drank two to three times per week, and

10 subjects drank alcohol four times or more per week.

The typical amounts consumed at each drinking session were one to two drinks for 220 (34.1%) subjects, three to four drinks for 131 (20.3%) subjects, five to six drinks for 60 (9.3%) subjects, seven to nine drinks for 53 (8.2%) subjects, and 10 or more drinks for 31 (4.8%) subjects.

#### The kind of alcoholic beverage (Table 3)

The kinds of alcohol pregnant women mainly drank are shown in Table 3. In response to questions based on the period of one year prior to pregnancy, the soju beverage group made up 40.85% of the total alcohol consumed. However, during pregnancy and one month prior to the responding date, soju consumption accounted for 19.05% and 6.58% respectively of the alcohol consumption, showing a decline during that period.

**Table 3.** Beverage-specific quantity of the pregnant women in Korea

Type of alcoholic beverage (%)	Beer	Soju	Wine	Western liquors	Ricewine (Makgeolli)
Last 30 days (N=76)	56 (73.68)	5 (6.58)	15 (19.74)	1 (1.32)	1 (1.32)
This pregnancy (N=105)	75 (71.43)	20 (19.05)	11 (10.48)	1 (0.95)	1 (0.95)
The year before pregnancy (N=497)	332 (66.80)	203 (40.85)	50 (10.06)	2 (0.40)	2 (0.40)

**Table 4.** Differences of risk factors between abstainers and drinkers during pregnancy (N=646)

Variables		Abstainers (N=516)	Drinkers (N=130)	Statistics	p
Age		31.60±3.86*	31.29±4.11	0.801	0.423
Education		15.07±2.17*	14.53±2.14	2.529	0.012
Income		4847.36±2691.13*	4488.79±2512.28	1.251	0.212
Employment	Yes	197 (38.4)	41 (32.0)	1.518	0.218
	No	316 (61.6)	87 (68.0)		
Smoking	No	506 (98.6)	128 (100.0)	0.729	0.355
	Yes	7 (1.4)	0 (0.0)		
Planning of pregnancy	Yes	361 (70.2)	61 (47.7)	22.199	0.000
	No	153 (29.8)	67 (52.3)		
Frequency of alcohol drinking in the year before pregnancy <sup>†</sup>		2.72±3.43*	3.45±3.67	-2.034	0.042
Knowledge of Alcohol effects <sup>‡</sup>		2.18±1.05*	1.98±0.97	2.061	0.041
Miscarriage	No	294 (57.2)	79 (61.7)	0.685	0.408
	Yes	220 (42.8)	49 (38.3)		
Mental retardation	No	158 (30.7)	49 (38.3)	2.334	0.127
	Yes	356 (69.3)	79 (61.7)		
Low birth weight	No	304 (59.1)	80 (62.5)	0.351	0.554
	Yes	210 (40.9)	48 (37.5)		
Birth defects	No	181 (35.2)	51 (39.8)	0.762	0.383
	Yes	333 (64.8)	77 (60.2)		
Awareness of FAS	Yes	300 (58.4)	74 (57.8)	0.000	0.989
	No	214 (41.6)	54 (42.2)		

\*mean score and standard deviation, †frequency per month, ‡numbers of yes to each item. FAS: fetal alcohol syndrome

**Differences of risk factors between abstainers and drinkers during pregnancy**

Based on reported alcohol consumption in the previous 30 days or during this pregnancy, 516 (79.88%) participants were classified as “abstainers,” and 130 (20.12%) were classified as “drinkers during pregnancy.”

As shown in Table 4, the result of the analysis of differences between “abstainers” and “drinkers during pregnancy” by risk factor showed no statistically significant differences in age, family income, smoking rate, and rate of employment.

However, “drinkers during pregnancy” had a relatively lower educational level, a lower rate of planned pregnancy, and a higher frequency of alcohol use in the year before pregnancy than did “abstainers.” Also, “drinkers during pregnancy” had a lower level of knowledge relating to alcohol drinking during pregnancy than did “abstainers” (based on total points for five items)( $t=2.061, p=0.041$ ).

**Correlations between variables** (Table 5)

No statistically significant correlations were found between age and either frequency or drinking or quantity of alcohol consumed during pregnancy. However, a significant negative correlation was found between age and quantity of alcohol

consumed in the year before pregnancy. Thus, as the age increased, the quantity of alcohol consumed in the year before pregnancy decreased. Furthermore, a statistically significant negative correlation was found between educational level and frequency of alcohol drinking during this pregnancy, as well as between educational level and frequency and quantity of alcohol consumption in the year before pregnancy. In other words, as the educational level increased, the frequency of alcohol drinking during this pregnancy and the frequency and quantity of alcohol consumption in the year before pregnancy decreased. Statistically, planning of pregnancy was shown to have a significant negative correlation with frequency of alcohol drinking in the previous 30 days, quantity of alcohol consumption during this pregnancy, and frequency and quantity of alcohol consumption in the year before pregnancy. That is, planned pregnancy led to decreased frequency and quantity of alcohol consumption before and during pregnancy. On the other hand, frequency and quantity of alcohol consumption in the year before pregnancy had a statistically significant positive correlation with both frequency and quantity of alcohol consumption in the previous 30 days and with alcohol consumption during this pregnancy.

**Table 5.** Correlations matrix

	Age	Ed	Income	Pl	F1	Q1	F2	Q2	F3	Q3
Age	1.00									
Ed	0.12**	1.00								
Income	0.16**	0.26**	1.00							
Pl	0.04	0.08*	0.05	1.00						
F1	-0.14	-0.07	-0.15	-0.29*	1.00					
Q1	-0.09	-0.05	0.25*	-0.21	0.16	1.00				
F2	0.03	-0.27**	0.01	-0.13	0.69**	0.04	1.00			
Q2	0.02	-0.14	0.03	-0.33**	0.16	0.11	0.13	1.00		
F3	-0.04	-0.13**	-0.10*	-0.16**	0.61**	0.24*	0.31**	0.22*	1.00	
Q3	-0.13**	-0.20**	-0.12*	-0.10**	0.14	0.31**	0.11	0.39**	0.46**	1.00

\* $p<0.05$ , \*\* $p<0.01$ . Ed: education, Pl: planning of pregnancy, F1: frequency of alcohol drinking in the previous 30 days, Q1: quantity of alcohol drinking in the previous 30 days, F2: frequency of alcohol drinking during this pregnancy, Q2: quantity of alcohol drinking during this pregnancy, F3: frequency of alcohol drinking in the year before pregnancy, Q3: quantity of alcohol drinking in the year before pregnancy

**Table 6.** Predictors of alcohol consumption during pregnancy

Variables	B	SE	Wald	df	p	Odd ratios	95% CI for odd ratios
Ed	-0.115	0.052	4.888	1	0.027	0.892	0.806 to 0.987
Pl	-0.871	0.217	16.078	1	0.000	0.418	0.273 to 0.641
F3	0.012	0.032	0.138	1	0.710	1.012	0.950 to 1.078
Q3	0.072	0.099	0.530	1	0.466	1.074	0.886 to 1.304
Kn	-0.145	0.108	1.803	1	0.179	0.865	0.700 to 1.069

SE: standard error, CI: confidence interval, Ed: education, Pl: planning of pregnancy, F3: frequency of alcohol use in the year before pregnancy, Q3: quantity of alcohol use in the year before pregnancy, Kn: knowledge of alcohol effects

### Predictors of drinkers during pregnancy (Table 6)

The result of the verification of the predictability of alcohol drinking during pregnancy based on those variables that showed significant differences between groups (education, planning of pregnancy, frequency of alcohol drinking in the year before pregnancy, and level of knowledge about alcohol drinking in pregnancy) revealed that the model fit was statistically significant ( $\chi^2=8.744$ ,  $df=8$ ,  $p=0.364$ ). However, among the six anticipated variables listed, only level of education and planning of pregnancy significantly predicted alcohol drinking during pregnancy. Frequency and quantity of alcohol consumption in the year before pregnancy had relatively less influence on alcohol drinking during pregnancy.

## Discussion

In the present study, two thirds of the subjects reported stopping drinking during pregnancy. Of participants in this study, 22.9% had already been abstainers prior to pregnancy, 60.7% had drunk alcohol before pregnancy but had stopped during pregnancy, and 16.4% continued to drink during pregnancy.

The Behavioral Risk Factor Surveillance System (BRFSS) surveys<sup>17</sup> conducted by the Centers for Disease Control and Prevention in the US indicated that, between 1991 and 2005, 12.2% of pregnant women (about 1 in 8) reported any alcohol use in the previous 30 days, and 1.9% of pregnant women (about 1 in 30) reported binge drinking. So, the findings seem to be quite similar. Also, according to studies performed on three occasions in the state of Washington in the Western part of the US, the rate of alcohol drinking for the entire period of pregnancy decreased from 30% in 1989 to 12% in 2004.<sup>18</sup> They have conducted continuous studies, case monitoring, and follow up assessments on a regional level since FAS was first recognized in the US thirty years ago.

The Korean National Health and Nutrition Examination Survey<sup>1</sup> revealed that 80.5% of women in their 20s, 73.2% of those in their 30s, and 68.5% of those in their 40s claimed to have consumed alcohol within the past year. Seventy-seven percent of the pregnant women in our study reported any use of alcohol in the year before pregnancy. Considering that our subjects' age range was 20 to 43, the prevalence of alcohol use found among the women appears to be compatible with that of the nationwide study.

Our findings differ from results of a Russian study<sup>16</sup> that found a yearly rate of alcohol drinking among Russian women capable of bearing children higher than that found in our study at 95.9%, but the rate of excessive alcohol drinking was lower than in our study at 18.4%. According to the BRFSS investigation in the US, the monthly rate of alcohol drinking was 54.2%,<sup>19</sup> and the rate of excessive alcohol drinking was 15.5%, which is lower than the findings in this study.<sup>20</sup>

We used AUDIT-C because AUDIT is one of the most wide-

ly used screening tools in Korea. However, AUDIT-C has several disadvantages. AUDIT-C has not been well evaluated in terms of its use in prenatal settings.<sup>21</sup> A safe cut-off point is not yet established in pregnant women. AUDIT-C has been found to be less sensitive to female alcohol use disorders than the TWEAK and less sensitive to pre-natal alcohol consumption than T-ACE. However, it was not used as a screening tool in this study and had the advantage of being a short, easy, and useful way to obtain information about quantity and frequency of alcohol consumption. AUDIT-C is also known to be approximately equal in accuracy to the full AUDIT.<sup>22</sup>

Unplanned pregnancy was one of the risk factors for drinking during pregnancy in the present study. Encouraging drinking women to use effective contraceptive measures, therefore, seems important for reducing unintended or unplanned pregnancies.

Frequency and quantity of alcohol use in the year before pregnancy had a positive correlation with use during pregnancy, according to our results. Binge drinking in the preconception period is known to be associated with unintended pregnancies. Therefore, all women of childbearing age should be screened for drinking and educated about the potential risks to the fetus of alcohol use during pregnancy. Although about 50% of pregnant women in this study had heard of FAS, the drinker group had a significantly lower level of knowledge about drinking in pregnancy.

This study has several limitations. First, the sample used was not randomly selected from all socio-demographic groups, but was obtained by selecting a location where large numbers of pregnant women could be found. It was not designed to be a prevalence study, but as the demographic data show, the subjects participated in this study were not particularly young, and they were largely in the middle class and relatively highly educated. So, women at high risk might not have been included. Although the study results cannot be generalized, they may provide a limited reflection of the extent of the problem of alcohol use in pregnancy and may identify categories of women who are most likely to be problem drinkers.

Second, data were obtained by self-report, and some women may have under-reported their alcohol use. To prevent this, it would be helpful to combine the self-report information with other more objective measures. However, as with any other test, ethical considerations need to be taken into account. Because more than half of the participants were in their 3rd trimester, even though they were asked about their drinking during the entire pregnancy, their answers might have referred to the period after their recognition of their pregnancy. Therefore, alcohol use prior to their awareness of pregnancy recognition might have been missed.

Third, the rate of refusal to complete the questionnaire was 26.1%. Most women who refused said they were busy and did not clearly explain the reason for the refusal. In the process

of obtaining written consent from these subjects, pregnant women who consumed relatively large amounts of alcohol did not want to reveal their names. Furthermore, pregnant women with any suspicion of fetal deformity in the basic prenatal tests tended to refuse the survey questionnaire.

In conclusion, we performed an assessment of alcohol consumption in pregnant Korean women. Of the respondents, 16.4% reported use of alcohol during pregnancy, and 12.2% reported use of alcohol in the previous 30 days. Binge drinking during pregnancy was reported by 1.7%. Low educational level and unplanned pregnancy were found to be risk factors for alcohol consumption in pregnant women. Future studies on the prevalence of FAS or FASD should be carried out in Korea.

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