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Determinants of alcohol use in pregnant women at risk for alcohol consumption☆

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Abstract

The purpose of this investigation was to identify determinants of alcohol consumption based on a number of demographic and psychosocial variables in a group of pregnant women at risk for alcohol consumption. Data were collected on a sample of 232 pregnant females who agreed to participant in a multistate alcohol prevention intervention. The variables of interest included demographic measures of race, age, education, marital status, health status, employment status and if they had been involved in physical abuse during the past year. Additionally, psychosocial variables were collected on social support, family functioning, mental health and illicit drug use. The dependent variables of interest were any alcohol use during the pregnancy and an abuse measure that was based on a composite score generated from questions related to problems associated with alcohol behavior. Logistic regression analysis was conducted to see if the independent variables (demographic and psychosocial variables) were predictive of any alcohol use. Multiple linear regressions were conducted to ascertain if the independent measures were predictive of alcohol abuse. The results showed that race, age, physical abuse and to a lesser extent health were associated to any alcohol use and alcohol abuse. The findings with the psychosocial variables were not as robust. Nevertheless, problematic psychiatric and drug use composite scores were associated with alcohol abuse.

Keywords: Alcohol; Fetal alcohol syndrome; Determinants of alcohol use; Pregnancy; Alcohol interventions

1. Introduction

Fetal alcohol syndrome (FAS) is a significant public health issue in the United States [14]. The impact of alcohol teratogenicity is significant and has been associated with a host of problems such as growth deficiencies, mental impairments, facial dysmorphology, visual impairment and behavioral problems [4,5,7,13]. Obviously, these outcomes have significant quality of life, financial, physical and psychosocial implications for a child throughout their life span.

In an effort to address this public health issue, it is important to identify the factors that are associated with alcohol use and abuse during pregnancy. Specifically, if the modifiable determinants for alcohol consumption in pregnant women are found, more effective interventions can be designed by health care practitioners.

Given the need and practical application of this information, researchers have initiated retrospective and prospective studies. Prospective studies [13] have identified factors associated with alcohol consumption in pregnant adolescents. Based on 378 interviews that were collected over a 2.5-year period on pregnant women, the investigators found that alcohol use during sexual activities and partner alcohol use were important consumption determinants during pregnancy. Having quit school, tobacco use and being Mexican American were other factors associated with drinking during a pregnancy.

A retrospective analysis of the 1998 National and Maternal and Infant Health Survey (NMIHS) was conducted by the Center for Disease Control and Prevention to identify sociodemographic and behavioral characteristics of alcohol consumption during pregnancies [14]. The investigators found that 20.7% of the 9953 person sample reported drinking after they were aware of their pregnancy but less than 1% drank six or more drinks a week (frequent drink-

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ing). The likelihood of any drinking increased with age (up to the 30- to 34-year age group), race (non-Hispanic White women), education (more than 16 years of education), income (over US$40,000) and cigarette smoking (more than 10 cigarettes a day). However, when "frequent" prenatal drinking was examined, different trends were found. For example, races other than White and individuals reporting less than US$10,000 income a year reported a greater likelihood of frequent drinking. Therefore, the determinants associated with use varied based on the amount of alcohol consumed during pregnancy.

These findings are consistent with epidemiologic studies that have shown economic social status to be critical markers or determinants for health status [8]. Consequently, occupation and income are often used as important predictors of health. As demonstrated in the Alameda county studies [2], those with low family incomes had over two times the risk of death than individuals with adequate family incomes. Similarly, employment grade was strongly associated with a variety of problematic health conditions such as obesity, hypertension, smoking and inactivity [9]. Therefore, measures of social/economic status are essential considerations when conducting evaluations that are designed to identify markers or determinants of health-related behaviors.

The purpose of this investigation was to identify determinants of alcohol consumption based on a number of demographic and psychosocial variables in a group of women at risk for alcohol consumption.

2. Methods

2.1. Baseline measures

A variety of baseline measures were collected on a sample of pregnant women who were involved in an intervention designed to decrease alcohol consumption in pregnant women. Data were collected on race, age, education, marital status, employment status, basic measures of health, history of pregnancy experiences (previous pregnancies, miscarriages, abortions) and experiences of physical abuse in the past year. Data were also collected on a number of psychosocial measures. The measures included social support, family functioning, mental health and drug use/abuse. This study examined the relationship between these measures and alcohol use and abuse during pregnancy.

For the purposes of this investigation, a number of categories were identified to determine risk for each of the psychosocial variables described in Table 1. Table 1 provides information related to the ISEL to evaluate three measures of support measures [3], the FAPGAR to evaluate family functioning [12] and the CES-D to evaluate the degree of depression in the last week [11]. Finally, the addition severity index (ASI) was used to evaluate measures associated with substance use and abuse, e.g., employment status, legal problems, etc. [10].

Table 1
Listing of logic domains, select baseline domain measures and at-risk classifications for each measure

Logic domain measure	Definition for at risk	Range	Highest risk
ISEL appraisal	≤ Median score 23	0–30	30
ISEL tangible	≤ Median score 24	0–30	30
ISEL belonging	≤ Median score 23	0–30	30
FAPGAR	≤ 6 norm	0–10	0
CES-D	≥ 16 norm	0–60	60
ASI psychiatric	≥ .15 median	0–1	1
ASI alcohol use composite	Any use	0–1	1
ASI alcohol abuse	> 0 (median)	0–1	1
ASI drug use composite	Any use	0–1	1
ASI drug abuse	> 0 (median)	0–1	1

2.2. Sample selection

The sample was selected from a group of pregnant women who were participating in a four-state FAS intervention. Women from the intervention and control groups within the States of Montana, North Dakota and South Dakota were included in the analysis. These states were selected because of the frontier/rural nature and the similarity of the clients within the sites, i.e., all were pregnant. The clients from Minnesota were not included in the analysis because they were in an urban setting (Minneapolis) and many were not pregnant.

2.3. Analysis

The sample was described based on a variety of personal and demographic characteristics for the states and the entire sample through a series of frequency distributions. Next, the probability of alcohol use was examined through logistic regression analysis. The binary dependent variable (any use and no use) was analyzed for the entire sample and by income status (high and low income). The sample was examined by income because income is an important determinant of health [2,8,9]. The multiple independent variables in the analysis included race, age, education, marital status, employment status, basic measures of health, history of pregnancy experiences (previous pregnancies, miscarriages, abortions) and experiences of physical abuse in the past year.

The analysis was conducted vertically in each column by the entire sample, high and low income. Due to the preliminary nature of the study and the small sample size, each variable was measured for significance differences ($P \leq 0.1$) against the first variable listed under the characteristics column. Therefore, within the category race, all characteristics were compared to the characteristic White. Using the same approach, a multivariate linear regression analysis was conducted for abuse by using the mean ASI composite score as a measure of substance abuse. Since the ASI score was continuous, a linear regression was conducted on each of the demographic characteristics.

A similar approach was used to measure the psychosocial domain measures. The probability of any use was first measured using simple logistic regressions. The vertical analysis of the psychosocial domains was conducted by comparing no-risk to the at-risk categories for the entire sample, high- and low-income status. The measure for abuse was a mean ASI composite score analyzed using simple linear regressions.

The final two logistic and linear regression analyses incorporated all the demographic variables with each psychosocial variable in eight separate regressions. These analyses were different from the simple regressions in that the demographic variables were used as covariates in the logistic and linear regressions. The logistic regression was used to predict any alcohol use, and a multivariate linear regression analysis was used to measure the relationship of the predictor variables to alcohol abuse.

3. Results

3.1. Description of the sample

The sample was described based on a variety of personal and demographic characteristics for each state and the entire sample (Table 2). The majority of the sample (51.3%) were Native American with almost 40% of the sample being classified as White. North Dakota had the highest proportion of the sample being classified as Native American (84.7%). A little over 68% of the population was between the ages of 20 and 29, with approximately 27% having some college (20.7%) or a college degree (6.9%). Approximate 21% were married, 41% were employed and almost 66% had been pregnant before. Almost 12% of the sample had experienced physical abuse in the past year, with Montana (11.8%) and South Dakota (15.2%) having a slightly higher rate than North Dakota (8.5%).

Table 2
Characteristics of the sample for all states

	Characteristics	All states	Montana	North Dakota	South Dakota
		Percentages			
Race	White	39.7	41.7	5.1	78.3
	Black	1.3	2.4	0.0	0.0
	Native American	51.3	48.0	84.7	17.4
	Other	7.8	7.9	10.2	4.3
Age	Less than 20	17.7	26.0	8.5	6.5
	20–24	45.7	42.5	55.9	41.3
	25–29	22.8	20.5	23.7	28.3
	30 and older	13.8	11.0	11.9	23.9
Education	Less than high school	39.2	37.8	54.2	23.9
	High school diploma	33.2	41.7	23.7	21.7
	Some college	20.7	18.1	16.9	32.6
	College degree or more	6.9	2.4	5.1	21.7
Marital status	Married	21.1	16.5	23.7	30.4
	Living together	28.0	33.9	25.4	15.2
	Single	35.3	40.9	23.7	34.8
	Other marital status	15.5	8.7	27.1	19.6
Employment	Employed now	40.9	40.2	25.4	63.0
Health	Good health	88.8	83.5	98.3	91.3
Pregnancies	Pregnant before	65.9	66.1	62.7	69.6
Miscarriage	Miscarriage before	22.8	26.0	22.0	15.2
Abortion	Abortion before	9.5	12.6	1.7	10.9
Abuse	Physically abused in past year	11.6	11.8	8.5	15.2
Number of observations		232	127	59	46

3.2. Logistic regression of alcohol use and demographic characteristics

The probability of using alcohol by demographic variables was conducted by examining the characteristics within each category with the first variable listed under the characteristics column (Table 3). For instance, under the category race Black, Native Americans and other classifications were all compared to the White group. This vertical comparison was done with the entire sample and by the two income classifications. There was a significantly lower probability of Native Americans (4.2%) using any alcohol than the White comparison group (16.3%). However, this relationship did not exist when the sample was divided by income status.

Age was the strongest determinant of any alcohol consumption in pregnant women (Table 3). Specifically, all women who were 30 years of age or older (21.9%) were significantly more likely to drink than their less than 20-year-old counterparts (12.2%). This relationship was also significantly different for women classified in the high (18.2% vs. 12.5%)- and low-income groups (30% vs. 12%).

The general health and physical abuse categories were also two additional characteristics where significant relationships were identified (Table 3). Women who classified themselves as being in good health and were in the high-income group were significantly less likely to drink any alcohol (8.2%) than women in the poor health group (28.6%). However, this relationship was not seen for the low-income group or the entire sample. Finally, experiencing physical abuse in the last year proved to be an important predictor of alcohol use. All women who had experienced physical abuse in the past year were significantly more likely to drink (22.2%) than their nonabused counterparts (8.8%). This association was also found with the low-income group with the physically abused group more likely to drink (25%) than the nonabused group (8.4%). However, a significant difference was not seen with the high-income group.

3.3. Regression of alcohol abuse and demographic characteristics

An examination of mean alcohol abuse (dependent variable) by demographic variables (independent variables) was

Table 3
Probability of using alcohol by demographic characteristics and low and high income

Category	Characteristics	Probability of using alcohol		
		All[a]	Higher income[b]	Low income
		Percentages		
Race	White	16.3	17.5	14.3
	Black	0.0	0.0	0.0
	Native American	4.2*	0.0	6.8
	Other	22.2	0.0	25.0
Age	Less than 20	12.2	12.5	12.0
	20–24	7.5	7.0	7.9
	25–29	7.5	4.2	10.3
	30 or older	21.9*	18.2*	30.0*
Education	Less than high school	9.9	0.0	11.8
	High school diploma	10.4	11.1	9.4
	Some college	10.4	9.7	11.8
	College degree or more	12.5	14.3	0.0
Marital status	Married	12.2	15.2	6.3
	Living together	12.3	6.3	18.2
	Single	7.3	4.5	8.3
	Other marital status	11.1	11.1	11.1
Employment	Not employed	8.0	4.3	10.0
	Employed now	13.7	13.8	13.5
Health	Bad health	19.2	28.6	15.8
	Good health	9.2	8.2*	10.2
Pregnancies	Not pregnant before	8.9	9.5	8.1
	Pregnant before	11.1	9.5	12.2
Miscarriage	No miscarriage before	9.5	10.3	8.7
	Miscarriage before	13.2	5.6	17.1
Abortion	No abortion before	10.5	9.5	11.3
	Abortion before	9.1	10.0	8.3
Abuse	No physical abuse in past year	8.8	9.2	8.4
	Physical abuse in past year	22.2*	14.3	25.0*
Number of observations		232	105	127

[a] Comparisons are made vertically with the first characteristic in each category being the comparison variable. Comparisons were made for the entire sample and by income levels.

[b] High income category is based on a yearly household income of US$10,000 or more per year.

* Represents areas where significant differences existed ($P < 0.1$).

conducted through multivariate linear regressions analysis. Again, the demographic variables listed within each category were compared with the first variable listed under the characteristics column (Table 4). For instance, under the category race Black, Native Americans and Other classifications were all compared to the White group. This vertical comparison was done with the entire sample and by the two income classifications. Significant differences were seen through the age group classifications with the 30 and older women having more alcohol-related problems (abuse) than the less than 20-year-old women. This relationship was found within the entire sample and low-income groups. However, significant differences were not observed in the high-income group. Women in good health were significantly less likely to abuse alcohol than their less health counterparts. Significant differences were also seen through the physical abuse category. Physically abused women for the entire sample and both income groups all had significantly more alcohol-related problems than the nonabused women.

Table 4
ASI alcohol composite means by demographic characteristics and high and low income

Category	Characteristics	ASI alcohol composite score[a]		
		All	Higher income[b]	Low income
		Means		
Race	White	0.0131	0.0126	0.0140
	Black	0.0000	0.0000	0.0000
	Native American	0.0169	0.0074	0.0226
	Other	0.0188	0.0000	0.0211
Age	Less than 20	0.0188	0.0000	0.0211
	20–24	0.0085	0.0054	0.0104
	25–29	0.0051	0.0027	0.0068
	30 and older	0.0432*	0.0189*	0.0969
Education	Less than high school	0.0197	0.0167	0.0204
	High school diploma	0.0082	0.0067	0.0103
	Some college	0.0180	0.0078	0.0366
	College degree or more	0.0164	0.0187	0.0000
Marital status	Married	0.0171	0.0152	0.0212
	Living together	0.0103	0.0027	0.0176
	Single	0.0157	0.0157	0.0157
	Other marital status	0.0211	0.0068	0.0354
Employment	Not employed	0.0190	0.0070	0.0251
	Employed now	0.0101	0.0125	0.0064
Health	Bad health	0.0326	0.0123	0.0400
	Good health	0.0131*	0.0099	0.0161
Pregnancies	Not pregnant before	0.0118	0.0119	0.0118
	Pregnant before	0.0171	0.0088	0.0229
Miscarriage	No miscarriage before	0.0130	0.0113	0.0147
	Miscarriage before	0.0230	0.0038	0.0328
Abortion	No abortion before	0.0145	0.0087	0.0193
	Abortion before	0.0233	0.0229	0.0236
Abuse	No physical abuse in past year	0.0091	0.0072	0.0108
	Physically abused in past year	0.0626*	0.0492*	0.0673*
Number of observations		232	105	127

[a] Comparisons are made vertically with the first characteristic in each category being the comparison variable. Comparisons were made for the entire sample and by income levels.

[b] High income category is based on a yearly household income of US$10,000 or more per year.

* Represents areas where significant differences existed ($P \leq 0.1$).

3.4. Analysis of alcohol use/abuse and psychosocial measures

The probability of using alcohol (dependent variable) was examined through simple logistic regression analysis by select psychosocial measures (independent variables). The analysis was achieved by comparing the no-risk clients with their at-risk counterparts (Table 5). For example, the no-risk individuals in the appraisal measure for social support were compared to the individuals at risk for the appraisal measure to see if they were more likely to use alcohol. This vertical comparison was done with the entire sample and by the two income classifications. The association of alcohol abuse (dependent variable) by psychosocial variables (independent variables) was also evaluated using simple linear regression analysis (Table 6). No significant relationships were found between the alcohol use or abuse and the psychosocial variables. This relationship was consistent when the sample was examined collectively and by high- and low-income classifications.

3.5. Logistic regression of alcohol use

The series of multivariate logistic regressions for alcohol use are shown in Table 7. Each regression run included all the personal and demographic variables and one of the psychosocial domain variables. The analysis revealed that three variables were important predictors for any alcohol use. The first variable was race. The results of the regressions showed that there was a lower likelihood for Native Americans using any alcohol than Whites. The second variable was age. As with the other comparisons, all age categories were compared to the youngest clients (less than 20-year-old group). In all of the regression runs, the 30-year-old and over clients were significantly more likely to use alcohol than their younger counterparts. The final demographic characteristic that was found to be significant through the regression runs was physical abuse. Specifically, women who were abused in the last year were more likely to use alcohol than non-abused women.

None of the psychosocial variables were significantly related to any alcohol use.

Table 5
Probability of using alcohol by psychosocial domain measures (at risk no risk) and high and low income

Category	Characteristics	Probability of alcohol use		
		All	Higher income[a]	Low income
		Percentages		
Appraisal	At risk[b]	9.32	8.89	9.59
	No risk	11.40	10.00	12.96
Tangible	At risk	11.21	9.76	12.00
	No risk	9.48	9.38	9.62
Belong	At risk	9.92	6.67	11.84
	No risk	10.81	11.67	9.80
ISEL composite	At risk	11.02	9.76	11.69
	No risk	9.65	9.38	10.00
FAPGAR	At risk	14.29	14.81	13.89
	No risk	8.88	7.69	9.89
CESD	At risk	10.75	6.90	12.50
	No risk	10.07	10.53	9.52
ASI psychiatric	At risk	8.26	6.12	10.00
	No risk	12.20	12.50	11.94
ASI drug	At risk	9.80	5.26	12.50
	No risk	10.50	10.47	10.53
Number of observations		232	105	127

[a] High income category is based on a yearly household income of US$10,000 or more/year.

[b] Comparisons are made vertically with at-risk category compared to the no-risk category variable. Comparisons were made for the entire sample and by income levels.

* Represents areas where significant differences existed ($P \leq 0.1$).

Table 6
ASI alcohol composite scores by psychosocial domain measures (at risk and no risk) and high and low income

Category	Characteristics	ASI alcohol composite score		
		All	Higher income[a]	Low income
		Percentages		
Appraisal	At risk[b]	2.26	1.24	2.89
	No risk	0.78	0.83	0.72
Tangible	At risk	1.76	1.36	1.98
	No risk	1.30	0.78	1.95
Belong	At risk	1.96	1.07	2.49
	No risk	1.06	0.95	1.19
ISEL composite	At risk	2.15	1.36	2.56
	No risk	0.89	0.78	1.05
FAPGAR	At risk	1.87	2.12	1.69
	No risk	1.40	0.62	2.08
CESD	At risk	2.61	1.65	3.04
	No risk	0.81	0.76	0.87
ASI psychiatric	At risk	1.97	1.11	2.67
	No risk	1.14	0.91	1.34
ASI drug	At risk	3.03	1.71	3.81
	No risk	1.11	0.85	1.34
Number of observations		232	105	127

[a] High income category is based on a yearly household income of US$10,000 or more per year.

[b] Comparisons are made vertically with at-risk category compared to the no-risk category variable. Comparisons were made for the entire sample and by income levels.

* Represents areas where significant differences existed ($P < 0.1$).

3.6. Regression of alcohol abuse

A series of multivariate linear regression for alcohol abuse are shown in Table 8. Each regression run included all the personal and demographic variables and one of the psychosocial domain variables. Age proved to be a strong predictor of alcohol abuse. This relationship was true for women in the 30 and older group and the 25- to 29-year-

Table 7
Logistic regression summary of any alcohol use

Variable	Parameter estimate							
Intercept	−1.7830	−1.5573	−1.8136	−1.8015	−0.6922	−1.4607*	−1.0384	−1.4215*
Race, Indian	−1.7718*	−1.7907*	−1.7998*	−1.7823*	−1.7955*	−1.8011*	−1.8804*	−1.8036*
Age, 20–24	0.0456	0.0180	0.0420	0.0370	−0.0158	0.0126	0.0752	−0.0073
Age, 25–29	0.1521	0.1302	0.1381	0.1431	0.1485	0.1147	0.2581	0.0887
Age, 30 and older	1.6382*	1.6261*	1.6538*	1.6358*	1.6624*	1.6249*	1.7825*	1.6013*
High school diploma	−0.5102	−0.4899	−0.5062	−0.5041	−0.4732	−0.4805	−0.5463	−0.4619
Some college	−0.8509	−0.8523	−0.8647	−0.8606	−0.7718	−0.8360	−0.8593	−0.8147
College degree or more	−0.8759	−0.8904	−0.8856	−0.8811	−0.9804	−0.8927	−0.8530	−0.8595
Married	−0.0939	−0.1020	−0.0961	−0.0938	−0.1909	−0.0988	−0.1848	−0.0988
Employed	0.3405	0.3560	0.3329	0.3337	0.3731	0.3731	0.3920	0.3793
Good health	−0.5475	−0.5158	−0.5317	−0.5492	−0.3749	−0.4638	−0.6879	−0.4825
Physical abuse	1.1847*	1.1724*	1.1795*	1.1860*	1.1301*	1.1461*	1.2509*	1.1468*
ISEL appraisal	0.0180							
ISEL tangible		0.0077						
ISEL belonging			0.0198					
ISEL summation				0.0065				
FAPGAR Scale					−0.1091			
CESD Scale						0.0025		
ASI Psychiatric Scale							−1.6248	
ASI Drug Scale								1.9496
−2 Log-likelihood	131.4	131.5	131.3	131.4	129.8	131.5	130.6	131.5

* Represents areas where significant differences existed ($P<0.1$).

old age group. Therefore, there was a positive relationship between alcohol abuse and age. Good health was a significant predictor in the second regression analysis that included the ISEL tangible, belonging, composite and the ASI Drug subscale. However, none of the other runs were significant. Physical abuse proved to be a strong and consistent marker of alcohol abuse. Specifically, in all of the regressions, women who reported physical abuse were associated with alcohol abuse.

Two psychosocial variables were found to be significant predictors of alcohol abuse. The ASI Psychiatric Scale was significantly associated with alcohol abuse, i.e., the more abnormal the score for the psychiatric problem, the greater the alcohol abuse problem. Similarly, clients who had more drug-related problems tended to have significantly greater alcohol problems. No other psychosocial variables were significantly related to alcohol abuse.

Table 8
Multivariate linear regression summary of alcohol abuse (ASI alcohol composite)

Variable	Parameter estimate							
Intercept	0.0208	−0.0020	0.0143	0.0106	0.0171	0.0074	0.0047	0.0124
Race, Indian	−0.0022	−0.0012	−0.0019	−0.0017	−0.0019	−0.0021	0.0000	−0.0038
Age, 20–24	0.0090	0.0089	0.0091	0.0091	0.0090	0.0089	0.0074	0.0058
Age, 25–29	0.0305*	0.0324*	0.0310*	0.0313*	0.0309*	0.0299*	0.0278*	0.0260*
Age, 30 and older	0.0473*	0.0477*	0.0476*	0.0477*	0.0475*	0.0467*	0.0440*	0.0425*
High school diploma	−0.0079	−0.0097	−0.0084	−0.0087	−0.0083	−0.0070	−0.0076	−0.0045
Some college	−0.0102	−0.0128	−0.0107	−0.0111	−0.0105	−0.0090	−0.0108	−0.0078
College degree or more	−0.0145	−0.0167	−0.0148	−0.0151	−0.0147	−0.0133	−0.0155	−0.0107
Married	−0.0011	−0.0005	−0.0009	−0.0008	−0.0011	−0.0002	0.0013	0.0008
Employed	−0.0058	−0.0078	−0.0063	−0.0066	−0.0061	−0.0063	−0.0055	−0.0031
Good health	−0.0163	−0.0207*	−0.0174*	−0.0181*	−0.0169	−0.0138	−0.0113	−0.0173*
Physical abuse	0.0505*	0.0523*	0.0509*	0.0512*	0.0507*	0.0487*	0.0478*	0.0454*
ISEL appraisal	−0.0002							
ISEL tangible		0.0009						
ISEL belonging			0.0001					
ISEL summation				0.0001				
FAPGAR Scale					−0.0001			
CESD Scale						0.0004		
ASI Psychiatric Scale							0.0500*	
ASI Drug Scale								0.5598*
Adjusted R^2	15.7	16.4	15.7	15.7	15.7	16.3	17.3	21.0

* Represents areas where significant differences existed ($P<0.1$).

4. Discussion

The purpose of this preliminary investigation was to identify determinants of alcohol consumption based on a number of demographic and psychosocial variables in a group of women at risk for alcohol consumption. Based on a sample of 232 pregnant women, a number of variables were found to be predictors of any alcohol use and alcohol abuse. The alcohol use variable was examined because investigators have concluded that any alcohol consumption may pose a risk to a fetus [6]. Furthermore, risk of compromising the health of the fetus is in part related to the amount and frequency of alcohol consumption during a pregnancy (these factors are considerations in determining abuse of alcohol). Consequently, the findings were analyzed in relation to any use and abuse patterns.

4.1. Race

The demographic determinants were the strongest predictors of any alcohol use and alcohol abuse. Throughout the analysis, White women reported a higher likelihood of drinking any alcohol than Native American women. This consistent pattern is shown in Tables 3 and 7. However, this pattern was not seen when the abuse variable was examined. These findings are different than the findings of other researchers who found more alcohol use with minority populations [15]. Consequently, additional research is needed to clarify this relationship.

4.2. Age

Age was a very strong and consistent predictor of any alcohol consumption and alcohol abuse by the pregnant women. A robust association between any alcohol consumption and women 30 years of age or older was shown (Tables 3 and 7). Additionally, the regression analysis of abuse shown in Table 8 demonstrated that women in the 30 and over as well as the 25- to 29-year-old age group were significantly more likely to abuse alcohol than women in the less than 20-year-old group. These findings are congruent with the findings of other researchers [14].

A hypothetical explanation for this relationship is that the legal drinking age is 21. Therefore, it is possible that women under 20 had not yet started drinking because it would require them to engage in an illicit activity. However, almost 18% of the sample were under 20 years of age and all of the women in the sample were at risk for alcohol consumption. Furthermore, the problematic consumption of alcohol in pregnant adolescent women has been well documented [1,15]. Therefore, the legality argument may not fully explain why this relationship exists. Nevertheless, being older was associated with any alcohol use and abuse of alcohol.

4.3. Health

General health was also associated with select measures of any alcohol use. Specifically, there was some support for the notion that women in better health tended to have a lower likelihood of drinking any alcohol than unhealthy women. However, this was only true for women in the higher income group (Table 3), and the relationship was not found in any of the logistic runs with covariates (Table 7). Similar findings were found when the alcohol abuse criteria were examined. Therefore, some support was provided to suggest that healthier pregnant women have more favorable drinking patterns than nonhealthy woman.

4.4. Physical abuse

Physical abuse was a consistent and strong predictor of any alcohol use and alcohol abuse of the variables examined through the analyses. The results revealed that if women reported physical abuse in the last year, they were more likely to have consumed any alcohol and abused alcohol compared to women who had not been physically abused. As with many of these findings, the direction of the relationship is not known. That is, does abuse help facilitate drinking or are women with problematic drinking behaviors more likely to be physically abused. Despite the uncertainty of this relationship, the possibility of using physical abuse as a marker for drinking problems is promising especially since a small portion of the sample (approximately 12%) reported being abused.

4.5. Psychosocial variables

The at-risk/no-risk classifications by income showed no significant association between any alcohol consumption and alcohol abuse and the psychosocial variables. However, when regression analyses were conducted with covariates included in the model, some of the variables proved to be significant predictors. Specifically, the ASI measures related to psychiatric and drug problems were identified as significant predictors of alcohol abuse (Table 8). The results indicated that the psychiatric and drug scores were positively related to alcohol abuse. It was interesting to see that the mental health measure of depression (CES-D) was not related to the alcohol abuse variable. Possibly, these differences are explained because the ASI psychiatric scores include questions related to anxiety, hallucinations, depression and suicidal thoughts. It may be that this more comprehensive measure is a better indicator of alcohol-related abuse than the one-dimensional measure of depression in the last week. Nevertheless, the ASI psychiatric and drug composites were found to be significant predictors of alcohol abuse.

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