Prenatal Alcohol Intake in a Rural, Caucasian Clinic

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Background and Objectives: *This study examined prior use and psychosocial factors associated with alcohol and/or drug use in pregnant women from a predominantly Caucasian, rural clinic in northeastern Maine.* Methods: *We conducted archival record reviews of 217 pregnant women who delivered at the Family Practice Clinic of Eastern Maine Medical Center. As part of the standard initial prenatal visit during the first trimester, a nurse practitioner interviewed and collected data from pregnant women concerning pre-pregnancy and current-pregnancy use of alcohol, tobacco, and other drugs. Data were available for 212 subjects.* Results: *The reported prevalence of pre-pregnancy alcohol abuse in this sample was 25%. Women in this cohort reported a significant decrease in tobacco and alcohol use following pregnancy awareness. However, pre-pregnancy alcohol intake levels and years of alcohol use were associated with alcohol intake during pregnancy. Other markers of maternal alcohol intake during pregnancy included tobacco use patterns and history of drug use. Family history of alcohol problems and drug use were associated with maternal substance use history and use by the father of the baby. Levels of maternal alcohol use during the current pregnancy were negatively associated with an alcohol problem in the father of the baby.* Conclusions: *Alcohol and other substance use were relatively common in our sample of rural Caucasian women in Maine. Several risk factors can be identified, and awareness of these risk factors may assist physicians in the diagnosis of substance abuse among pregnant women.*

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It is well known that alcohol and drug use during pregnancy is causally linked to a variety of adverse neonatal outcomes, such as Fetal Alcohol Syndrome, growth retardation, central nervous system anomalies, and impairment of cognitive function.[1-4] Recent findings suggest that the teratogenic effects of alcohol are dose dependent and may act synergistically with other drugs, including tobacco, in harming the developing fetus.[5] It is important, therefore, to improve the family physician's ability to uncover and predict alcohol use during pregnancy.

This is particularly important among family practice clinicians in rural areas, since the pattern of prenatal substance use varies based on several demographic factors, including regional trends and ethnicity.[6-10] Studies of regional incidence of substance use demonstrate that rural versus urban samples have similar rates of tobacco, alcohol, and marijuana use. Women in rural areas, however, tend to have lower levels of other drugs, such as cocaine, opiates, and amphetamines.[11-14]

Other established risk factors for continued alcohol, tobacco, and drug use during pregnancy are patterns of prior substance use, including tobacco,[10] older age,[13] lower socioeconomic status,[14] and parity.[15,16] Several reports have implicated aspects of a pregnant woman's social environment, in particular the substance use habits of peer-aged male friends as particularly important in predicting substance use during pregnancy.[17-21]

To examine the relationship between alcohol and substance use during pregnancy and prior use patterns in a rural area and to "control" for the influence of ethnicity, we conducted a retrospective record review of a cohort of rural women from northeastern Maine, nearly all of whom were Caucasian. We also examined the role of the woman's family and current partner's substance use history on patterns of maternal substance use. We hypothesized that reported prior use and

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family history of alcohol and substance use would predict the women's alcohol and substance use during pregnancy.

Methods

Subjects

We examined prenatal intake records for calendar year 1996. These records included data on all of the pregnant women (n=217) who received prenatal care and subsequently delivered their infants through the Family Practice Clinic at Eastern Maine Medical Center (EMMC) in Bangor, Me. The Institutional Review Board of EMMC approved our review of these archival records with the provision that patient identities be removed from the records.

This clinic serves primarily low-income, Caucasian families from a large rural area of central and northeastern Maine. The majority of participants were Caucasian (93%), single (64.7%), young (<26 years= 70.3%), had less than 12 years of education (30.1%) or a high school diploma (69.9%), were unemployed outside the home (48%), and dependent on Medicaid (47%) or had no health insurance (34.6%).

Data Sources

Women met privately with a nurse practitioner as part of their enrollment in the practice's prenatal care program. Using a standardized form that we developed, a semistructured interview procedure was used to identify self-reported information concerning the frequency, intensity, and timing of tobacco, alcohol, marijuana, cocaine, barbiturates, amphetamines, opiates, and any other substance that could be recalled by the patient. We also asked about alcohol and substance use in the period immediately before pregnancy awareness and about current use.

In addition to collecting information about maternal substance use, recent patterns of use by the father of the baby (FOB) and historical and current use patterns within the family of origin (FO) were also evaluated. The nurse practitioner recorded each woman's responses to a prepared list of open-ended questions. Substance use by self, FOB, or FO was determined for alcohol, tobacco, and other drugs. Interpretation of the written interview data was done using a standardized form.

We used information in the prenatal intake record to quantify the number of cigarettes and the number of drinks per week before and after pregnancy awareness, plus information about obstetrical history and other details of physical health.

Data Coding

From these various data sources, the following information was extracted: history of alcohol and drug use by the pregnant woman, her family, and her partner (if she had one). For the mother only, data were available on pre-pregnancy use and current use of alcohol and tobacco. All of the data were entered into a master database and checked for accurate data entry by at least two members of the study team.

Alcohol/Tobacco Use

Each woman was asked if she, the FOB, or FO had ever received counseling for alcohol addiction, attended Alcoholics Anonymous, experienced social criticism for drinking habits, or felt that it was necessary to stop or seriously curtail alcohol intake. A positive response to any of these questions was later coded as a positive history of alcohol problems.

Self-reported estimates of the amount of alcohol (number of drinks/day) and tobacco (cigarettes/day) were determined for the immediate pre-pregnancy period and currently following pregnancy awareness. However, the type of liquor and the precise ounces of absolute alcohol could not be deduced from these archival records. Therefore, quantification of alcohol use is an approximation of actual use. The number of years of prior use was also calculated.

Drug Use

History of drug use was binary coded as a negative (no use) or positive (use in past). History of use of any illegal substance or abuse of a prescription medication was interpreted as a positive drug history. Drug type (marijuana, cocaine, amphetamine, unknown, etc) was categorized separately for each drug, including a category for unknown drug type. Polysubstance use was coded for subjects who had used drugs with or without cocaine use. Cocaine was also coded for reported last use in a binary fashion ($>$ or $\leq$ 1 year ago). "Marijuana only" indicated drug use restricted to marijuana.

Data Analysis

Statistical analysis was performed using the SAS® version 6.12 statistical software package (SAS Institute, Carey, NC). All variable distributions were assessed for normality.

Maternal self-report data were examined for substance use type and combinations of use, age, education, and pregnancy history. For maternal alcohol and tobacco use patterns (Tables 1 and 2), Student's *t* test and Pearson's correlation methods were used for the continuous variables (eg, number of alcohol drinks per week, cigarettes per day, etc), and chi-square tests were used for categorical variables (eg, proportion or percent values) for statistically significant differences. Correlation and chi- square analysis were used to examined bivariate relationships between maternal alcohol and drug use and social factors such as FO and FOB substance use, use history, and history of sexual and physical abuse.

Table 1

Changes in Alcohol Use After Pregnancy Knowledge

% any use	
Before pregnancy	87%*
After pregnancy	30%
Years of use—mean (SD)	4.37 (4.44)
Number of drinks per week—mean (SD)	
Before pregnancy	2.36 (6.52)**
During pregnancy	.10 (.33)

* Chi-square analysis indicates a statistically significant association between pregnancy awareness and an increase in the number of nonusers of alcohol, P=.001.

** t test comparison of the number of drinks per week showed a similar decrease, t (145)=4.2, P=.0001.

SD—standard deviation

Table 2

Changes in Tobacco Use After Pregnancy Knowledge

% any use	
Before pregnancy	54%*
After pregnancy	42%
Years of use—mean (SD)	3.99 (4.07)
Cigarettes per day—mean (SD)	
Before pregnancy	19 (10.4)**
After pregnancy	8 (7.6)
Recent retrospective use levels	
Nonsmokers	54%
< 20 cigarettes/day	39%
>20 cigarettes/day	7%

* Chi-square analysis revealed a significant increase in nonusers with pregnancy awareness, P=.012

** t test analysis found a significant decrease in smoking levels from pre-pregnancy levels, t (145)=12.7, P=.001.

SD—standard deviation

For the multiple regression analyses (Table 3), a correlation matrix was created, and bivariate regression was performed on all significant correlation coefficients (.05 level). Multiple regression was used to identify significant determinants of alcohol use in pregnancy. The entered variables for this model were self, FOB, FO alcohol problems; self, FOB, and FO positive drug history; pre-pregnancy and pregnancy tobacco use levels; and years of alcohol use and pre-pregnancy alcohol use levels. Tobacco use variables (years of use, cigarettes per day) were strongly intercorrelated. To correct for multicollinearity, "years of tobacco use" was dropped from the model. Records with missing data were excluded from analysis.

Results

Alcohol and Drug Use

The frequency and intensity of alcohol abuse and other substances were high among the women in our study. The incidence of a positive substance use history prior to pregnancy awareness was categorized as follows: alcohol (any use) was reported by 86.70% of the women, marijuana alone by14.67%, polysubstance use without cocaine by 23.33%, and polysubstance use including cocaine by 7.62%. No opiate use was reported, and no women reported cocaine use without other substances.

Importantly, 25% of the women admitted to an alcohol problem (as defined earlier) with or without use of other drugs. Comorbid drug use was present in 64% of the women reporting an alcohol problem. There were no statistically significant differences between the use categories in age, education, or parity.

Pre-pregnancy Versus Pregnancy Use of Alcohol and Tobacco

Tables 1 and 2 compare changes in self-reported rates of pre-pregnancy and current use of alcohol and tobacco. Pre-pregnancy tobacco use was reported in 54% of all participants, and alcohol use was reported in 87% at the initial pregnancy visit. Alcohol and tobacco use patterns were well established prior to pregnancy (mean years alcohol=4.37, SD=$\pm$4.4; mean years tobacco= 3.99, SD=$\pm$ 4.1).

Following pregnancy awareness, chi-square analyses revealed a significant increase in the proportion of women who reported that they no longer used tobacco or alcohol, a decline from 87% to 30% positive users of alcohol (P<.0001) and from 54% to 42% for tobacco (P=.012). The reported rates of use of alcohol and tobacco also declined significantly with pregnancy awareness (Tables 1 and 2).

Tobacco and Other Substance Use

There was a statistically significant correlation between self-admitted alcohol problems and amount of tobacco use prior to (r=0.28), and after (r=0.26) pregnancy awareness, as well as with years of tobacco use (r=0.27). Slightly stronger relationships were found between self-reported drug use (pre-pregnancy tobacco use [r=.38], current-pregnancy tobacco use [r=.23], and years of tobacco use [r=.40]). There was also a weak but statistically significant correlation between level of alcohol and level of tobacco use in pregnancy (r=.20).

In contrast, no relationship was found between level of alcohol use in current pregnancy and pre-pregnancy tobacco use or years of tobacco use. Further, chi-square analysis revealed a statistically significant association between tobacco use during pregnancy and maternal alcohol problems (χ^2=12.1, *P*<.001, Cramer's V=.24) and history of drug use (χ^2=24.6, *P*<.001, Cramer's V=.34).

Social Factors and Maternal Substance Use

Mothers, FOB, and FO all had statistically significant associations between alcohol problems and drug use (mothers: χ^2=11.9, *P*<.001, Cramer's V=.24; FO: χ^2=17.1, *P*<.001, Cramer's V=.29; and FOB: χ^2= 26.9, *P*<.001, Cramer's V=.37). Maternal years of alcohol use was weakly correlated with maternal drug use (*r*=.23) but not with FO or FOB alcohol problems or drug use. A weak but significant relationship was found between FO drug use and FOB drug use (χ^2= 7.1, *P*<.01, Cramer's V=.19), as was the relationship between FO and FOB alcohol problems (χ^2=7.4, *P*<.01, Cramer's V=.19).

We also found a statistically significant association between self-reported alcohol problems and mothers and FO alcohol problems (χ^2=14.4, *P*<.001, Cramer's V=.26), as well as with FOB alcohol problem (χ^2=10.9, *P*<.01, Cramer's V=.23). Similarly, self-reported maternal drug use was significantly associated with FO drug use (χ^2=12.4, *P*<.001, Cramer's V=.24). Self-reported maternal drug use and FOB drug use were more strongly associated (χ^2= 35.6, *P*<.001, Cramer's V=.42).

Physical Abuse

Statistically significant, moderate associations were found between maternal history of physical abuse and self-reported alcohol problems (χ^2=17.6, *P*<.001, Cramer's V=.29) and drug use (χ^2=12.8, *P*<.001, Cramer's V=.24). Weaker associations were found between history of sexual abuse and self-reported alcohol problems (χ^2= 6.3, *P*<.05, Cramer's V=.17) and drug use (χ^2=6.9, *P*<.05, Cramer's V=.18). Interestingly, alcohol problems in the FO or the FOB were not associated with maternal physical or sexual abuse.

Social and Demographic Factors Associated With Alcohol Use Patterns During Pregnancy

Table 3 shows the results of multiple regression analysis of demographic and social environment variables in predicting levels of maternal alcohol use during pregnancy.

The results show that the severity of maternal alcohol use during pregnancy was significantly associated with pre-pregnancy alcohol use levels (*P*≤ .008), years of alcohol use (*P*≤ .006), and drug use history (*P*≤ .03). Interestingly, FOB alcohol problem was negatively associated with maternal alcohol use in pregnancy (*P*≤ .001). FO alcohol problems and drug history approached statistical significance (*P*< .086, *P*< .078, respectively).

Table 3

Alcohol in Pregnancy

	Regression Coefficient	*Parameter Estimate*	t	P *Value (two tail)*
Years of alcohol use	.225	.165	2.82	.006*
Drinks/day before pregnancy	.216	.011	2.70	.008
Drug history	.174	.110	2.14	.034
FO alcohol problems	.134	.088	1.73	.086
FOB alcohol problems	-.202	-.143	-2.63	.001
FO drug history	-.145	-.096	-1.78	.078

FO—family of origin
FOB—father of the baby

Multiple regression was used for social variables and maternal use history. Additional variables were self alcohol problems, FOB drug history, tobacco before and during pregnancy, and abuse victimization. Regression solution was F (6,138) = 6.66, *P*< .0001.

Discussion

These results confirm and extend previous findings regarding the prevalence and risk factors associated with alcohol and tobacco use in pregnant women.[23-25] We know from previous literature that such use is associated with risk to the fetus before and after birth.[1-4,24,26] This study suggests that by using careful assessment of pre-pregnancy alcohol and substance use history, family practice clinicians may improve their ability to identify women at risk for alcohol use during pregnancy. This approach will make it possible to recommend proactive intervention before pregnancy is advanced, and the fetus is further harmed.

Following pregnancy awareness, a significant decline in both alcohol and tobacco use was reported by the patients in our study. Despite this decline, a significant proportion of women continued to use alcohol (30%) and tobacco (42%). Pre-pregnancy alcohol and tobacco use were associated with the persistence of alcohol use into pregnancy and can be used as a marker of continued use. This is especially important because use of these substances is typically underreported during pregnancy. Our results also suggest that it is important to maintain careful monitoring of tobacco use throughout

pregnancy, which is typically more readily admitted by pregnant women than alcohol or drug use. For some women, tobacco history and current use indicates risk of alcohol use during pregnancy.

In this study, pre-pregnancy levels of alcohol consumption, years of alcohol use, and a positive drug history were significantly associated with alcohol rates of use during the current pregnancy. These findings support the view that longstanding alcohol dependence does not end during pregnancy, and the best indication of patterns of use during pregnancy may be pre-pregnancy self-report. Hence, maternal use patterns prior to pregnancy are a valid assessment measure of fetal teratogenic risk from alcohol use in the current pregnancy. Further, persistent tobacco addiction may inform providers of a useful marker of risk for alcohol use during pregnancy.[19,26,27]

Clearly, prior history of drug use, years of alcohol use, and average alcohol intake levels before pregnancy are risk factors for levels of alcohol use in the current pregnancy. Interestingly, FOB alcohol patterns were negatively associated with maternal alcohol use in pregnancy. This finding may represent some unique aspect of our cohort or, alternatively, may represent a protective factor for maternal use during pregnancy. Given the high alcohol use patterns in this cohort, the latter explanation would be interesting to explore.

FO substance abuse, both alcohol and drug use, were identified in the regression analysis for alcohol use in pregnancy. Maternal history of alcohol problems was correlated with FO and FOB alcohol problems. Further, FOB drug use and maternal drug use history were correlated significantly. Undoubtedly, developmental experiences may be important in determining alcohol and drug lifestyle patterns that carry over into adult relationships and pregnancy. Maternal alcohol use patterns become established in the years prior to pregnancy, and this patterning is probably influenced by early exposure and parental modeling.[20,29] Importantly, physical abuse and, to a lesser extent, sexual abuse were weakly associated with alcohol and drug abuse history.

Limitations

The present study's limitations should be mentioned and addressed in future work. These data were extracted from an archival source rather than gathered prospectively. There was no assessment of pregnancy outcome, which would have informed the relationship between pre-pregnancy use, pregnancy use, and infant risk. Finally, a more-standardized measure of maternal alcohol patterns, such as the standard adult measures of alcohol use, would have provided additional information.[28]

Conclusions

Rural, Caucasian women are at particular risk for both alcohol and tobacco use during pregnancy.[9,10] This study indicates that careful assessment of pre-pregnancy substance use at the initial prenatal visit can aid family physicians in identifying women at risk for alcohol use during pregnancy. Given the well-established link between substance use during pregnancy and a wide variety of adverse neonatal outcomes and the high use rates in this demographic sample, identifying at-risk patients early in pregnancy is especially important. By adding a few questions as part of the standard procedure at initial prenatal visits,[28] physicians may be able to assist at-risk pregnant women to curb or eliminate substance use and improve neonatal outcomes.

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