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Association of Clinical Characteristics and Cessation of Tobacco, Alcohol and Illicit Drug Use during Pregnancy

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Abstract

Pregnancy is a time of relative urgency and opportunity for the treatment of substance use disorders in women, yet little is known about modifiable factors that contribute to successful abstinence. We examined self worth, depression, anxiety and novelty seeking in the context of substance use cessation during pregnancy in a sample of women with a high prevalence of substance abuse. Subjects were 448 birth mothers who participated in a prospective adoption study. Discontinuation rates were: tobacco 22.2%, alcohol 64.7%, marijuana 77.2%, and other drugs, 73.7 to 100 %. Depression, anxiety, and novelty seeking were lower among women who discontinued substance use, compared to those who did not. Self worth was higher in women who discontinued substance use. Among 110 polysubstance users, the number of substances discontinued during pregnancy was correlated with depression, anxiety and self worth in the hypothesized direction. Possible clinical implications are discussed.

Introduction

The harm associated with intrauterine exposure to alcohol, nicotine and illicit drugs of abuse is well known, extensive and intergenerational.[1–3] Although the prevalence of substance abuse is significantly lower in pregnant women compared to non-pregnant women,[4] some groups remain vulnerable to continued use, including those who did not intend to get pregnant[5,6] and those who are less educated, unemployed, unmarried and exposed to violence.[7] Less is known about modifiable clinical factors that may influence prenatal substance use.

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Declaration of Interest

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Recent literature suggests that clinical characteristics may be important. For example, increased and persistent substance use during pregnancy is associated with prenatal depression,[8] and mood disorders are barriers to successful abstinence in pregnant women in substance abuse treatment.[9] Persistent cigarette smoking during pregnancy has been linked to a history of problematic relationships, health behaviors, and adaptive functioning.[10] Literature on non-pregnant samples suggests additional areas where clinicians can intervene. In non-pregnant women, positive associations have been found between substance abuse, mood and anxiety disorders.[11] The personality trait of novelty seeking has been associated with both a predisposition to developing drug dependence[12] and more difficulty in sustaining abstinence.[13,14] Finally, self-esteem has been shown to be a mediator between negative life events and substance abuse in adults,[15] and interventions aimed at building self-esteem have had positive effects on reducing substance use.[16] Understanding the interaction between these clinical characteristics and discontinuing substance use during pregnancy is an important step in designing more targeted and effective interventions.

In this paper we describe a sample of birth mothers participating in an adoption study. Many women reported lifetime tobacco, alcohol and illicit drug use and cessation of use during pregnancy. Clinical characteristics (self worth, depression, anxiety and novelty seeking) of women exhibiting various patterns of use and discontinuation during pregnancy were examined.

Methods

Participants

Data were derived from the Early Growth and Development Study (EGDS), an ongoing, longitudinal multi-site study of adopted children, adoptive families, and birth parents. The primary goal of the EGDS is to examine the interplay of genes and environment on social and emotional development during early childhood. The EGDS drew its sample from 33 adoption agencies in 10 states across three regions in the United States: Northwest, Southwest, and Mid-Atlantic. These agencies reflect the full range of U.S. adoption agencies: public, private, religious, secular, those favoring open adoptions, and those favoring closed adoptions. Further information about the sample and recruitment methods have been described in detail elsewhere.[17]

The current study focused on substance use during pregnancy and therefore examined data from the birth mothers exclusively. Five hundred thirty women were interviewed between February 2003 and August 2006. Four hundred forty-eight provided complete data with respect to substance use, and were included in the analyses. Age at the time of assessment ranged from 14 to 48 years with an average age of 24.1 (*SD* = 6.3 years). The majority of individuals were single Caucasian women who had completed high school and some type of trade school, and reported an annual household income of less than $20,000. Demographic information is listed in Table 1.

Procedure

Participants completed in-person assessments at approximately four months postpartum using mailed questionnaires, interview administered questions, and computer assisted personal interviews (CAPI) that were administered privately to facilitate confidentiality and increase the likelihood of candid responses. A trained interviewer met the birth mother at a location convenient to her, most often her home, to conduct the in-person assessment.

Consent

The study was designed to maintain appropriate protection of participants by approaching potential participants after completion of adoption procedures so as not to influence their decision about adoption. All procedures were approved by the Institutional Review Board of the George Washington University Medical Center.

Measures

Lifetime Alcohol and Illicit Drug Use, Date of Last Use, and Patterns of Use— For the purposes of clarity in this paper, we use the term “substance use” to include tobacco, alcohol, illicit drugs and prescription narcotics used other than prescribed. The term, “illicit drug use” describes the use of illicit drugs *or* prescription medications, specifically opiates, benzodiazepines, barbiturates or non-benzodiazepine hypnotics, used other than prescribed. Substance use was assessed using a CAPI version of the Composite International Diagnostic Instrument- Short Form (CIDI-SF).[18] The modules pertaining to substance use were analyzed to assess the date of last use, frequency, and patterns of use of alcohol, marijuana (marijuana or hashish), painkillers (prescription opiates), sedatives (barbiturates and non-benzodiazepine hypnotics), hallucinogens (LSD, MDMA, mescaline), inhalants, amphetamines (included methamphetamine and prescription psychostimulants), cocaine, heroin, and tranquilizers (benzodiazepines).

Cigarette Smoking During Pregnancy—Information about cigarette smoking was obtained using the Pregnancy History Calendar derived from the Life History Calendar (LHC) method, a well-validated method for obtaining retrospective data.[19] Questions were answered by birth mothers using the CAPI method, and their responses were kept private from the interviewer, thereby maximizing participants’ comfort in providing honest responses.

Self Worth—Self worth was assessed using a CAPI version of the Adult Self-Perception Profile (ASPP), a 50-item scale measuring global and domain-specific self worth.[20] Each item includes two statements, one reflecting positive self worth, the other reflecting negative self worth. For example, one item reads, "Some adults like the way they are leading their lives BUT other adults don't like the way they are leading their lives." Participants were asked to select which statement was most like them, then rate whether the statement is "really true for me" or "sort of true for me." Each item is then scored from 1 to 4 with 1 indicating lowest self worth and 4 indicating the highest. Only the six-item global self worth subscale was used for analysis in this study (Cronbach’s alpha = .85). Thus, possible scores for this subscale ranged from 6 (lowest self-worth) to 24 (highest possible self worth).

Novelty seeking—Novelty seeking was assessed using the Temperament and Character Inventory (TCI),[21] which was mailed to participants for completion prior to the in-person interview. Novelty seeking is one of four temperaments measured by the broader 240-item TCI, which assesses several domains of personality. Only the novelty seeking subscale was hypothesized to be associated with substance use cessation; it was found to have adequate internal consistency in the current study (Cronbach’s alpha = .83).

Depression and Anxiety—Depression was assessed using a CAPI version of the Beck Depression Inventory (BDI). This 21-item self-report scale assesses physical and psychological manifestations of depression.[22] Anxiety was assessed using a CAPI version of the Beck Anxiety Inventory (BAI),23 a 21-item self-report scale, which measures subjective, somatic, and panic-related symptoms of anxiety. Internal consistency for the BDI and BAI were .89 and .88 for the current sample.

Analyses

Discontinuation rates were calculated for tobacco, alcohol, and illicit drugs. Use of prescription narcotics other than as prescribed was included in the category of "illicit drug use". Clinical characteristics of nonusers, pregnancy quitters and persistent users were examined. Analyses were performed for both casual users (i.e., women reporting any lifetime use but who did not endorse any DSM-IV criteria for substance dependence) and serious users (i.e., those who reported lifetime use and at least one DSM-IV criteria for substance dependence). Clinical characteristics of women who discontinued some substances, but not others, were examined in terms of specific substance classes (i.e., tobacco versus alcohol versus illicit drugs). Mean scores on the BDI, BAI, TCI (novelty seeking subscale) and ASPP (general self worth subscale) were compared across groups of participants using one-way analysis of variance for each comparison. All analyses were performed using PASW Statistics 17 for Windows, SPSS Inc.

Results

Patterns of substance use and cessation

Lifetime use and discontinuation during pregnancy for each substance are listed in Table 2. Prior to pregnancy, alcohol was most commonly used substance (89.7%), followed by tobacco (70.5%), marijuana (25.4%) and painkillers (12.9%). Women were most likely to discontinue illicit drugs (73.7 – 100%), and least likely to discontinue tobacco (22.2%), with alcohol desistence midway between the two (64.7%).

Cessation and measured clinical characteristics

In Table 3, women were grouped into the following categories: nonusers (never used any substance during lifetime), pregnancy quitters (lifetime use, with discontinuation during pregnancy) and persistent users (lifetime and pregnancy use). Women who continued any substance were categorized as persistent users, even if some substances were discontinued. Persistent users exhibited significantly higher depression, anxiety and novelty seeking than pregnancy quitters. Furthermore, self worth was higher in pregnancy quitters compared to persistent users. Nonusers reported the lowest anxiety, depression and novelty seeking traits and highest self worth. The differences were statistically significant between all groups as well as between pregnancy quitters and persistent users. Controlling for marital status, household income and highest level of educational achievement did not affect the statistical significance of the results. Correlation coefficients for anxiety, depression, self worth and novelty seeking were: .245*, .230*, −.231*, .160*, respectively (*$p < .05$).

Table 4 focuses on serious users, comparing those who discontinued substance use during pregnancy with those who did not. Differences in depression, anxiety and self worth between pregnancy quitters and persistent users became more pronounced, with persistent users exhibiting higher depression, anxiety, and significantly lower self worth compared to pregnancy quitters. Among serious users, novelty seeking did not differ between pregnancy quitters and persistent users. Controlling for marital status, household income and highest level of educational achievement did not affect the statistical significance of the results. Correlation coefficients for anxiety, depression, self-worth and novelty seeking were: .248*, .240*, −.212*, .021, respectively (*$p < .05$).

Table 5 describes the analysis of only polysubstance users (used tobacco, alcohol and one or more illicit drugs use prior to pregnancy) (n = 110). In this group, the number of classes of substances discontinued was associated with differences in measured depression and anxiety. Women who discontinued all classes (first row) exhibited the lowest depression and anxiety. The largest group among polysubstance users (n = 60), those who discontinued

alcohol and illicit drugs, but continued using tobacco throughout pregnancy, reported higher depression and anxiety. The third group, those who discontinued illicit drugs, but continued using tobacco and alcohol, showed even higher depression and anxiety. Finally, women who continued use of tobacco, alcohol and illicit drugs throughout pregnancy exhibited the highest levels of depression and anxiety. Measured self worth showed a trend in the anticipated direction though differences did not reach statistical significance. Notably, while differences in novelty seeking among all groups did not reach statistical significance, those who did not quit *any* substances during pregnancy appeared to exhibit higher novelty seeking relative to other groups.

Discussion

In this study of birth mothers completed an adoption plan, we examined discontinuation of tobacco, alcohol and illicit drug use during pregnancy among several measures with established relevance to cessation of abused substances: self worth, depression, anxiety and novelty seeking. Using computer-assisted personal interviews (CAPI) and the Life History Calendar (LHC) method, this study found that many women discontinued substance use during pregnancy, and statistically significant associations were observed between cessation of substances and the risk factors measured. Associations between discontinuation and self worth, depression, and anxiety were more pronounced when serious substance users were examined separately, suggesting that these factors may be more important in individuals with substance dependence. Furthermore, the severity of depression and anxiety was indirectly proportional to the number of substance classes discontinued, suggesting that depression and anxiety symptoms may have interfered with attempts to discontinue tobacco, alcohol or illicit drug use during pregnancy.

The higher prevalence of persistent prenatal tobacco use compared to alcohol and illicit drug use observed in our sample mirrors reports patterns of prenatal substance use nationally.24 While actual cessation rates of alcohol and tobacco use were lower in our sample (64.7% and 22.2%, respectively) than in the general population of pregnant women (69% and 58%, respectively),24 they are similar to those reported in other samples of low-income pregnant women who did not choose adoption placement (50–80% for alcohol and 12.6–28 % for tobacco, respectively).25⁻27 The prevalence of marijuana use during pregnancy in our sample was at least 3% (i.e., 15 out of 448 women did not discontinue use during pregnancy), similar to the prevalence reported in two large multi-site studies.28 Thus, despite the fact that women in this study chose adoption placement, cessation rates are consistent with those observed in women with otherwise similar sociodemographic characteristics who chose parenting.

Observations of novelty seeking were difficult to interpret. In our sample, novelty seeking distinguished users from nonusers (Table 3), and casual from serious users (Table 4). These patterns were not surprising, as novelty seeking may increase the risk of substance use disorders.[12] However, its association with substance cessation during pregnancy was less robust for casual users, and not significant in serious users. Furthermore, among the polysubstance users (Table 5), novelty seeking appeared to distinguish between women who did not discontinue illicit drug use during pregnancy from those who did. It has been suggested that novelty seeking may be associated with more socially deviant behavior, and may mediate the association between affective disorders and the development of substance use disorders.[29] Our observations support this hypothesis. However, with regards to cessation during pregnancy, particularly for those with substance dependence, other factors may be more important.

Patterns of discontinuation of substances and the effects of social pressure

The patterns of use and discontinuation observed in this study raise some interesting questions about what factors may be important in behavior change during pregnancy. Women were most likely to discontinue illicit drugs, followed by alcohol, and were least likely to discontinue tobacco use. In fact, illicit drug use cessation occurred in women who had relatively high levels of depression and anxiety, whereas smoking cessation failed to occur in women with significantly lower levels. Our findings mirror other studies of pregnant substance abusers[25–27] as well as epidemiologic data on substance use during pregnancy showing the greatest prevalence of cigarette smoking in pregnant women, followed by alcohol use, with illicit drug use being the least common.[7,24]

These results seem contrary to commonly held notions of the "addictive potential" of different substances. The World Health Organization (WHO) uses animal self-administration data as a baseline for assessing a drug's abuse liability.[30] By WHO animal-testing criteria, cocaine is most highly addictive, with alcohol less addictive, and nicotine even less addictive. One would expect, then, that women in the study would be least likely to quit cocaine and amphetamines, and most likely to quit smoking. However, the opposite was true. In addition to the physiological issues that affect the application of animal models to human behavior, it is likely that psychological factors and social pressure influenced women to discontinue one drug class versus another. For example, there may have been differences in perceived harm to the fetus between different substances, with more stigmatized substances such as illicit drugs seeming more harmful than legal substances such as tobacco and alcohol. While it is also possible that factors related to pregnancy itself such as changes in energy, appetite, or other physiologic symptoms contributed to a preference of licit versus illicit substances, it is likely that social expectations contributed to motivation to change drug use behavior. The importance of social pressures is further supported by the observation that women who continued illicit drug use throughout pregnancy exhibited higher levels of novelty seeking, which has been associated with greater social deviance29 compared to women who continued cigarette smoking and alcohol use only.

Another result that suggests social pressure was important in cessation during pregnancy is the observation the majority of women who discontinued substance use did so during the second and third trimesters, when the pregnancy became increasingly physically apparent to others. While it is difficult to determine whether their cessation coincided with knowledge of pregnancy alone, it is possible that as the pregnancy progressed and became more physically apparent, motivation to quit was affected by how they were perceived by themselves and others. Continued use of cocaine, for example, may be felt by women, and viewed by others, as a sign of flagrant disregard for the health a growing fetus, whereas drinking alcohol or smoking cigarettes may evoke milder forms of social condemnation. These social pressures during pregnancy make this time particularly opportune for intervention and treatment of substance use disorders in women.

Prenatal drug exposure versus genetic transmission

In addition to the contribution to the prevention of various sequelae of prenatal drug *exposure* to tobacco, alcohol and illicit drugs, our findings may also have methodological implications. While the association of prenatal drug exposure and internalizing and externalizing behavior problems in offspring has been widely documented,[31–33] the mechanism of causality remains unclear. It can be tempting to ascribe offspring behavioral problems to the effects of *in utero* exposure. However, our findings suggest that women who use drugs during pregnancy differ in important ways from those who do not. That is, they may carry inherited traits that, when passed on to their offspring, may contribute to the

development of such problems as ADHD and substance use disorders, both of which have been associated with prenatal drug exposure.[34,35] Stated differently, *in utero* exposure to substances is confounded with genetic risk factors in maternal substance abusers which themselves may increase the risk for child behavior problems through both genetic and gene-environment interactions both prenatally and postnatally.[36,37]

Implications for intervention

Pregnancy may be a time during which better substance abuse treatment outcomes can be achieved because of the emergence of new motivating factors that have the potential to support positive behavior change.[38] It has been suggested that cessation of substance use during pregnancy involves different correlates than cessation in non-pregnant adult populations[10] and that pregnancy itself may represent a teachable moment in a substance abuser's life.[39] Thus, public health efforts and current obstetrical screening and interventions have focused on a substantial minority of women who are responsive to brief prenatal interventions, based on the assumption that knowledge of the deleterious effects of substance use on a growing fetus provides motivation to abstain during pregnancy.[39,40] However, the prevalence of continued use during pregnancy, especially of cigarette smoking,[4,7,24] highlights the need for a better understanding of motivational factors during pregnancy.

Beyond general intrinsic factors (sense of self-control, concern about individual health) and general extrinsic factors (social pressure, threat of legal problems), pregnancy may be associated with pregnancy-specific motivation (concern for fetal health) and parenthood motivation (being a good role model to children).[41] The observation that many women in this study made significant changes despite making an adoption plan for their child suggests that there may be advantages to delivering interventions specifically designed to build upon the motivating aspects of pregnancy. As motivational interviewing techniques have been successful in the treatment of adult substance abusers42 and family-based motivational interviewing techniques capitalize on the investment parents have for their children in bringing about changes in parenting style,43,44 such approaches also may be particularly effective for motivating women to stop substance use during pregnancy.

Limitations

While substance use versus discontinuation was associated with measured characteristics in the hypothesized direction, causality cannot be inferred. Depression, anxiety, and lower self worth may have interfered with active attempts to quit, or diminished interest in making an attempt. Alternatively, failure to quit may have increased vulnerability to anxiety or depression and diminished self-esteem. There may have been other factors that were not examined in this study that affected substance use.

Next, data collected in this study depended on the accuracy of subjects' memories, which does not permit the same degree of accuracy as could be achieved with a prospective design. Furthermore, as participants reported on all measures, reporting bias may have inflated the associations between self worth, depression, anxiety and substance use. However, the use of computer-assisted personal interviews,45 combined with the well-validated life history calendar method for obtaining retrospective data[19] promoted optimal accuracy given the ethical and methodological constraints of the adoption design. Furthermore, the rates of discontinuation (greatest with illicit drugs, lowest with cigarette smoking) as well as timing of discontinuation (greater rate of discontinuation as pregnancy progressed) are both consistent with those observed in other, larger samples to date[7,24] lending validity to our findings. While corroboration of substance use reports by a household member could have

strengthened our results, retrospective reports by pregnant smokers have been shown to be quite accurate when compared to family reports.46

Finally, while examination of birth mothers in an adoption study allowed for a sample in which substance use and the clinical characteristics measured were prevalent, there may have been factors unique to these women that impacted substance use, and generalizeability of findings to all pregnant women may be limited. For example, reasons given by women who choose adoption placement over parenthood include financial constraints, unreadiness for parenthood, desire to finish school, pressure from family, and the desire to provide their babies with families.[47] Any or all of these reasons may have affect the variables examined in this study.

Conclusion

Pregnancy is a time of both urgency and opportunity for the treatment of substance use disorders in women. The present and future health of both mother and fetus are at stake. The association between cessation rates and clinical characteristics observed in this study raises the possibility that by specifically intervening to reduce anxiety and depression while supporting self worth, the process of behavior change in this important time may be facilitated.

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Table 1

Demographics of Participants

	Mean	SD
Age (in years)	24.1	6.3
Marital status	n	%
Single	332	62.6
Married	47	8.8
Divorced	32	6.0
Other or did not answer	119	22.5
Race and ethnicity	n	%
White, non-Hispanic	368	69.4
Black	55	10.4
Hispanic	10	3.8
Asian	7	1.3
Native American	5	1.0
More than one race or ethnicity	12	4.3
Did not answer	52	9.8
Mean educational level	Completed high school and trade school	
Mode of educational attainment	High school graduate	
Mean personal annual income	$7,416	
Median household income	< $20,000	

Table 2

Patterns of use of all substances and combinations (N = 448).

	Use prior to pregnancy		Discontinued during pregnancy	
	n	**% of total**	**n**	**% of users**
Alcohol	402	89.7	260	64.7
Tobacco	316	70.5	70	22.2
Illicit drugs				
Marijuana	114	25.4	99	86.8
Painkillers (Prescription opiates)	58	12.9	57	98.3
Amphetamines	38	8.5	37	97.4
Sedatives (barbiturates and non-benzodiazepine hypnotics)	35	7.8	29	82.9
Cocaine	25	5.6	24	96.0
Tranquilizers (benzodiazepines)	19	4.2	14	73.7
Hallucinogens	12	2.7	12	100
Inhalants	8	1.8	8	100
Heroin	5	1.1	5	100
Used at least one substance	422	94.2		
Used more than one substance	337	75.2		
Used tobacco, alcohol *and* at least one other substance	110	24.6		

Table 3

Clinical characteristics of women based on pattern of *any* substance use

		Self worth*		Depression†		Anxiety‡		Novelty seeking§	
	n	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Nonusers (never used in lifetime)	26	19.4	3.5	5.3	6.4	4.4	5.1	9.2	3.5
Pregnancy quitters (Lifetime use, quit during pregnancy)	161	18.2	3.9	9.0	8.2	8.0	6.9	10.0	4.0
Persistent users Use throughout pregnancy)	261	17.0	4.5	12.5	10.0	11.0	9.1	11.0	3.7
F (Nonusers excluded)		7.876		13.890		13.291		5.096	
p (Nonusers excluded)		< .05		< .001		< .001		< .05	

*Adult Self-Perception Profile, Global Self Worth Subscale,

†Beck Depression Inventory,

‡Beck Anxiety Inventory,

§Temperament and Character Inventory.

Table 4

Clinical characteristics of women based on pattern of *serious* substance use, defined as meeting at least one DSM-IV criteria for substance dependence

		Self worth[a]		Depression[†]		Anxiety[‡]		Novelty seeking[§]	
	n	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Never exhibited serious use in lifetime	239	18.6	3.8	8.1	7.6	7.1	6.4	9.8	3.8
Lifetime serious use, quit during pregnancy	108	17.0	4.0	12.5	8.5	10.4	7.0	11.3	3.8
Lifetime serious use continuing through pregnancy	101	16.1	5.0	15.5	11.9	14.2	11.1	11.4	3.8
F (serious users only)		8.522		15.262		19.406		.061	
p (serious users only)		< .01		< .001		< .001		NS	

[a] Adult Self-Perception Profile, Global Self Worth Subscale,

[†] Beck Depression Inventory,

[‡] Beck Anxiety Inventory,

[§] Temperament and Character Inventory.

Table 5

Clinical characteristics of poly-substance users[//] based on patterns of cessation during pregnancy

		Self worth[*]		Depression[†]		Anxiety[‡]		Novelty seeking[§]	
	n	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Quit all substances	21	18.6	3.8	11.0	8.1	10.0	6.0	11.5	4.1
Quit alcohol and illicit drugs only	60	16.5	4.5	14.4	8.8	12.7	9.4	11.2	3.8
Quit illicit drugs only	22	15.6	4.4	15.7	12.7	13.7	12.1	11.5	3.6
Quit none	7	13.4	6.5	24.1	14.3	22.9	11.3	15.6	2.8
Total	110								
F		2.819		3.146		3.166		2.823	
p		NS		< .05		< .05		NS	

[*] Adult Self-Perception Profile, Global Self Worth Subscale,

[†] Beck Depression Inventory,

[‡] Beck Anxiety Inventory,

[§] Temperament and Character Inventory.

NS = not statistically significant.

[//] Poly-substance users were women who reported use of tobacco, alcohol *and* illicit drugs prior to pregnancy.