

# DRUGS OF DEPENDENCY: THE PREGNANT WOMAN AND HER INFANT

GUEST EDITORS: JULEE OEI, ANNE BARTU, LUCY BURNS, MOHAMED E. ABDEL-LATIF,  
AND CHULATHIDA CHOMCHAI





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Guest Editors: Julee Oei, Anne Bartu, Lucy Burns,  
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## Editorial

# Drugs of Dependency: The Pregnant Woman and Her Infant

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The repercussions of drug abuse are particularly emphasized when a pregnant woman is affected. Gestational drug exposure is associated with significantly increased risks of poor maternal health, adverse perinatal outcomes, and unfavourable psychosocial consequences. Children affected by maternal drug use are at particular risk from their parent's drug seeking behavior as well as the toxicological effects of the drugs used. Early identification is key, and considerably more research is needed to develop the optimum means by which affected mother-infant dyads may be recognized and supported. In this special issue, we present six papers that deal with the problems caused by gestational drugs of dependency.

*"Pregnant and non-pregnant women in cape town, South Africa: drug use, sexual behavior, and the need for comprehensive services"* deals with the problem of methamphetamine use in pregnant women in South Africa, a country where poverty and HIV risk are high. The authors find that methamphetamine, a drug highly associated with adverse psychosocial sequelae, is proportionally used by more pregnant than non-pregnant women, a practice that could have far-reaching effects on their families.

*"Drug testing for newborn exposure to illicit substances in pregnancy: pitfalls and pearls"* in this special issue provides an overview of drug testing of newborns. Accurate recognition of a newborn whose mother has used illicit drugs during pregnancy influences decisions regarding healthcare of mother and infant whilst in hospital and following discharge. The difference between screening and confirmatory drug testing and the potential for false-positive results by

immunoassay screening are discussed. Testing of newborns for illicit drugs can be done on urine, blood, meconium, hair, and umbilical cord blood or tissue samples. The implications and limitations of drug testing are presented. The authors caution that illicit drug use in pregnancy is not an independent predictor of a mother's ability to adequately care for her child but needs to be considered in health care planning.

*"Initial feasibility of a woman-focused intervention for pregnant African-American women"* reports on the difficulties faced by drug-using women in accessing antenatal care and contraception compared to the general pregnant population. The authors discuss challenges faced in the development of innovative and effective systems to educate affected women and to provide adequate care for the women and their children.

*"Pharmacological treatment of neonatal opiate withdrawal: between the devil and the deep blue sea"* deals with the issues faced by clinicians on how to optimize treatment of the newborn infant withdrawing from maternal opiates. They emphasize that current clinical research and evidence on the long term development of children affected by in utero opiate exposure is limited as are the effects of pharmacological treatment on these infants, especially when there is an increasing body of evidence suggesting that opiates may not have a benign influence on fetal or, indeed, neonatal neurodevelopment.

*"Psychosocial characteristics and obstetric health of women attending a specialist substance use antenatal clinic in a large metropolitan hospital"* investigates the outcomes of a community-based intervention to improve drug-use

behavior and social circumstances of crack-using African-American women. It highlights, in particular, the benefits of training in social skills such as relationship support to alleviate lifestyle issues associated with highly dependent drug-use behaviors.

*“Effectiveness of a smoking cessation intervention for methadone-maintained women: a comparison of pregnant and parenting women”* examines the effects of an intervention aimed to reduce cigarette smoking for women in substance abuse programs. This is particularly important as cigarette smoking compounds the risk of adverse perinatal and neonatal outcomes in this population, and the paper highlights the benefits of addressing what would often be considered a trivial problem for the drug-using woman.

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## Research Article

# Effectiveness of a Smoking Cessation Intervention for Methadone-Maintained Women: A Comparison of Pregnant and Parenting Women

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Women in substance abuse programs have high rates of smoking. Pregnancy represents a unique opportunity for intervention, but few data exist to guide tailoring of effective interventions. In this study, 44 pregnant and 47 nonpregnant opioid-dependent women enrolled in comprehensive substance abuse treatment received a 6-week smoking cessation intervention based on the 5A's counseling model. The number of daily cigarettes decreased by 49% for pregnant patients and 32% for nonpregnant patients at the 3-month followup. Length of time in substance abuse treatment did not correlate with smoking cessation or reduction for either group. Factors predicting reduction of cigarette smoking differed for pregnant versus nonpregnant patients. For pregnant patients, lower levels of nicotine use prior to intervention and self-reported cigarette cravings predicted successful reduction in smoking. For nonpregnant patients, lower affiliative attachment to cigarettes, reliance on cigarettes for cognitive enhancement, and greater sense of control predicted more successful outcomes.

## 1. Introduction

Tobacco use represents a significant long-term risk to women's health [1, 2], and cigarette smoking is currently one of the leading preventable causes of poor pregnancy outcomes, as well as infant mortality and morbidity [3]. Smoking during pregnancy is associated with increased risk of preterm birth [4–6], placental abruption, placenta previa, low birth weight [6–8], and sudden infant death syndrome (SIDS) [9, 10]. The risks related to cigarette smoking continue following birth with child exposure to second hand tobacco smoke associated with an increased incidence of respiratory ailments such as asthma, respiratory infections, and bronchiolitis [11–13].

Estimates of the prevalence of smoking in participants in methadone maintenance programs range from 85 to 98% [14–17]. However, few substance abuse treatment programs offer smoking cessation interventions, and smoking cessation is often viewed as a low priority by treatment

program staff [18]. Treatment staff may perceive substance-dependent individuals as possessing low motivation for smoking cessation [19] or believe that engaging in efforts to reduce nicotine dependence may be overwhelming for substance-dependent individuals, particularly those early in their recovery [18]. Some studies have also suggested that methadone maintenance may compound difficulty quitting smoking with a dose-dependent effect on tobacco craving and nicotine withdrawal symptoms [20, 21] affected through increased rate of nicotine metabolism or alteration to the sensitivity of nicotine receptors [22]. The reinforcing effects of nicotine, such as enhancement of cognitive performance, may also be stronger in methadone-maintained individuals [23].

Fortunately, pregnancy often represents a unique motivation for smoking cessation among women who use nicotine [24], and substance-dependent individuals frequently self-report a desire to quit smoking [25]. However, efforts to encourage smoking cessation in methadone maintenance

programs have had limited success, with reduction in smoking appearing to be a more realistic goal than cessation [26]. Recently it has been suggested that smoking cessation interventions for pregnant women may need to be tailored to their specific needs, similar to intervention for dependence or abuse of other substances [27]. However, little data exist to suggest what factors are associated with effectiveness of smoking cessation interventions in pregnant women, or how these may differ from nonpregnant women in substance abuse treatment programs.

This study compares outcomes of a 6-week smoking cessation intervention for pregnant and nonpregnant methadone-maintained women enrolled in a comprehensive outpatient substance abuse treatment program. The effectiveness of the intervention is compared between the two groups, and factors associated with successfully reducing or eliminating cigarette use in pregnant and nonpregnant women are examined.

## 2. Methods

**2.1. Participants.** Participants were 44 opioid-dependent pregnant women and 47 opioid-dependent parenting women receiving comprehensive outpatient substance abuse treatment. Patients who were identified by their primary counselors as nicotine dependent were referred for a six-week group smoking cessation intervention based on the 5 A's counseling model [28]. The 5 A's counseling approach is a five-step intervention that has been proven effective for use with pregnant women and is consistent with strategies developed by the National Cancer Institute and American Medical Association [29]. The steps include: asking about tobacco use; advising to quit; assessing patient motivation to quit; assisting in quit attempt; arranging for followup. Group content included assessment of current nicotine use, education on risks of tobacco use and benefits of cessation, identification of patient motivations to quit and triggers to smoke, and coping skills. Groups ran from April 2009 to March 2010 and included 8–15 patients per group.

**2.2. Procedures.** The Timeline Follow Back (TLFB) was administered during the week prior to the intervention. At the initial administration, pregnant participants were asked to report on their cigarette use from one month prior to pregnancy to the present. Parenting patients were asked to report on their cigarette use for one month prior to the intervention. The TLFB was administered again at the group intervention's midpoint (3 weeks), at the conclusion of the six-week group, and then once monthly for three months postintervention. An anonymous 10-item group evaluation was also administered at the close of the six-week group. The evaluation assessed patient knowledge of the risks of tobacco use, skills for managing cravings, and satisfaction with the content and format of the group. The Wisconsin Inventory of Smoking Dependence Motives (WISDM) was also administered to all patient one week prior to the intervention and again at the 3-month followup.

## 2.3. Measures

**2.3.1. Timeline Follow Back (TLFB).** The TLFB is a calendar format measure that utilizes memory aids such as important dates and events to aid recall of substance use over a specified period of up to 12 months. It has been used for over thirty years in clinical and research settings [30].

**2.3.2. Wisconsin Inventory of Smoking Dependence Motives (WISDM).** The WISDM is a 68-item measure of smoking dependence to assess the underlying motivations for smoking [31]. It is based on the theory that multiple motives for tobacco use comprise the construct of tobacco dependence, not solely nicotine dependence. These motives may contribute to tobacco use, withdrawal, and relapse. It has 13 subscales with internal consistency estimates ranging from 0.78 to 0.89 [32]. Subscales are Affiliative Attachment, Automaticity, Behavioral Choice-Melioration, Cognitive Enhancement, Craving, Cue Exposure, Loss of Control, Negative Reinforcement, Positive Reinforcement, Social-Environmental Goads, Taste and Sensory Properties, Tolerance, and Weight Control. Participants are asked to rate each of the 68 items on a scale of 1–7 with 1 being “not at all true of me” and 7 being “extremely true of me”.

**2.3.3. Group Evaluation.** A ten-item anonymous questionnaire assessed increase in patient knowledge regarding risks of cigarette smoking, benefits of cessation, and response to cravings; perceived support for smoking cessation; readiness to change; satisfaction with group format and facilitator. Participants used a 5-point Likert scale to respond to items such as “I learned ways to control my cravings for cigarettes”, “The program taught me things I did know before about smoking”, and “I believe I am given the support I need to refrain from smoking”.

**2.4. Data Analysis.** Descriptive statistics were obtained for all variables initially included in the model. *t*-tests were conducted for key variables (age at entry to substance abuse treatment, length of time in substance abuse treatment, number of daily cigarettes at the beginning of intervention, percent decrease in smoking reporting in months prior to intervention) to determine if significant differences existed between the pregnant and nonpregnant groups prior to intervention.

Four analyses were conducted utilizing multiple ordinary least squares regression. Outcome variables were the percent change in number of cigarettes smoked from beginning of the intervention to one month postintervention (PC1), and three months postintervention (PC3), for both the pregnant and nonpregnant groups. Stepwise regression was conducted to select variables for the final models. Initial predictor variables included maternal age, methadone dose, time in substance abuse treatment at start of the smoking cessation intervention (TimeTx), average number of cigarettes smoked daily prior to intervention (Cig Prior), percent change in number of cigarettes smoked daily from one month prior to intervention to week 1 of intervention (PC Base-Wk1),

TABLE 1: Descriptive statistics total sample.

	Pregnant Mean/percent (SD)	Nonpregnant Mean/percent (SD)	<i>P</i>
Maternal age	26.7 (5.0)	27.8 (6.0)	0.9
Race/ethnicity			
Caucasian	97.7%	87.5%	
African-American	2.3%	10.4%	
Latina	0%	2.1%	
Time in treatment (wks)	35.1 (5.6)	192.0 (22.7)	<b>0.0001</b>
Methadone dose (mgs)	143.6 (48.6)	128.7 (67.5)	0.2

TABLE 2: Average number of daily cigarettes by time point.

Time	Pregnant Mean (SD)	Nonpregnant Mean (SD)	<i>P</i>
Prior to intervention	18.8 (10.1)	13.2 (1.0)	<b>0.003</b>
Week 1 intervention	15.2 (13.8)	12.4 (1.1)	0.2
Week 6 (end intervention)	8.3 (6.5)	9.3 (5.6)	0.4
1-month followup	8.3 (5.9)	8.6 (5.9)	0.8
3-month followup	7.9 (7.5)	8.5 (6.4)	0.7

number of daily cigarettes smoked at week 1 of the intervention (Cigs Wk1), urine drug analysis positive for illicit or nonprescribed substances during the 6-week smoking intervention, satisfaction with the intervention as measured by total scores on the group evaluation (Satisfaction), and the 13 subscales of the WISDM. Six variables (PC base-Wk1, Cigs Wk1, Satisfaction, and three subscales of the WISDM: Loss of Control, Craving, Automaticity) were retained in the two models for pregnant patients, and five variables (five subscales of the WISDM: Affiliative Attachment, Cognitive Enhancement, Taste and Sensory Properties, Loss of Control, Automaticity) were retained in the two models for the nonpregnant women.

A multiple analysis of variance (MANOVA) was conducted to determine between group differences for pregnant versus nonpregnant patients on three variables: percent change in cigarette smoking from beginning of the intervention to the one-month followup (PC1), percent change from beginning of the intervention to the 3-month followup (PC3), and group satisfaction (Satisfaction).

### 3. Results

Descriptive statistics for pregnant and nonpregnant patients are presented in Table 1. No significant differences existed between the two groups on maternal age (26.7 yrs versus 27.8 yrs;  $P = 0.9$ ) or methadone dose (143.6 mg versus 128.7 mg;  $P = 0.2$ ). The overall sample was predominantly Caucasian, with a higher percentage of African-American and Latina patients in the nonpregnant group (Table 1). Length of time in substance abuse treatment (Time Tx) was significantly longer for the nonpregnant patients (35.1 wks versus 192.0 wks;  $P = 0.0001$ ) (Table 1).

TABLE 3: Correlates of decrease in smoking at followup: pregnant patients.

	1-month			3-month		
	<i>b</i>	<i>t</i>	<i>P</i>	<i>b</i>	<i>t</i>	<i>P</i>
PC Base-Wk 1	-0.12	-2.68	<b>0.01</b>	-2.52	-1.39	0.17
Cigs Wk 1	-1.33	-3.50	<b>0.001</b>	-2.26	-1.73	0.09
Satisfaction	-12.60	-2.03	<b>0.05</b>	-69.35	-2.19	<b>0.04</b>
Automaticity	-1.29	-1.87	0.07	-1.26	-0.56	0.58
Craving	-2.13	-2.22	<b>0.03</b>	-2.53	-0.81	0.43
Loss of control	-1.61	-1.85	0.07	-1.34	-0.48	0.64

\* PC Base-Wk1: percent change in daily cigarettes prior to intervention; Cigs Wk1: mean daily cigarettes at start of intervention; Satisfaction: satisfaction with intervention; WISDM subscales: Automaticity, Craving, Loss of control.

Pregnant patients reported a significantly higher number of daily cigarettes prior to the intervention (18.8 versus 13.2;  $P = 0.003$ ) (Table 2). However, no significance between group differences was found in number of cigarettes smoked at week 1 of the intervention, suggesting that pregnant women significantly decreased their rates of smoking prior to intervention. Mean number of daily cigarettes reported was not statistically significant between the pregnant and nonpregnant groups at the end (week 6) of the intervention, or at the 1-month or 3-month followups. However, mean number of cigarettes decreased over time for both groups and continued to decline during the 3-month postintervention followup (Table 2). Average number of daily cigarettes for the pregnant group decreased by 49% from week 1 of the intervention to the 3-month followup. For nonpregnant patients, mean number of daily cigarettes decreased by 32%.

**3.1. Multivariate Regression.** Following model selection utilizing stepwise regression, six variables were retained in the model to predict outcomes at the 1-month and 3-month followups for pregnant women. A greater percent decrease in number of daily cigarettes smoked prior the start of the intervention (PC Base-Wk1) ( $b = -0.12$ ;  $P = 0.01$ ), as well as a higher number of daily cigarettes reported at the beginning of the intervention (Cigs Wk1) ( $b = -1.33$ ;  $P = 0.001$ ) were both associated with smaller decreases in number of cigarettes at the 1-month followup for pregnant patients (Table 3). Greater patient satisfaction with the intervention correlated with smaller decreases in number of

cigarettes ( $b = -12.6$ ;  $P = 0.05$ ). Higher scores on the WISDM subscale craving were also associated with a smaller decrease in cigarette smoking at the 1-month followup ( $b = -2.13$ ;  $P = 0.03$ ) with subscales Automaticity and Loss of Control showing trends toward significance (Table 3). Only patient satisfaction with the intervention predicted number of daily cigarettes at the 3-month followup ( $b = -69.35$ ;  $P = 0.04$ ).

For the nonpregnant patients, five subscales of the WISDM were retained in the model to predict 1-month and 3-month outcomes. Only the Affiliative Attachment ( $b = -1.21$ ;  $P = 0.02$ ) and Cognitive Enhancement ( $b = -1.67$ ;  $P = 0.003$ ) predicted percent change in daily cigarettes at the 1-month followup (PC1), with higher scores on these WISDM subscales correlating with smaller PC1 (Table 4). The Taste and Sensory Properties subscale also showed a trend toward significance ( $b = -1.09$ ;  $P = 0.06$ ). Loss of Control and Automaticity were not significant in the final model predicting outcomes at the 1-month followup. Cognitive Enhancement remained a significant predictor for percent change in daily cigarettes for nonpregnant patients at the 3-month followup (PC3) ( $b = -2.17$ ;  $P = 0.01$ ). Higher scores on the Loss of Control subscale also predicted smaller decreases in PC3 ( $b = -2.02$ ;  $P = 0.05$ ). Affiliative Attachment, Taste and Sensory Properties, and Automaticity subscales all showed trends toward a negative impact on PC3, but none reached significance at the 0.05 level (Table 4).

**3.2. MANOVA.** MANOVA results indicate that there were no significant differences between pregnant and nonpregnant groups on the percent decrease in number of daily cigarettes from baseline at the 1-month (PC1) ( $f = 0.18$ ;  $P = 0.67$ ) or 3-month followups (PC3) ( $f = 0.03$ ;  $P = 0.87$ ). No significant differences were found between groups on satisfaction with the intervention ( $f = 1.46$ ;  $P = 0.21$ ).

## 4. Conclusions

While only a small percentage of patients in either the pregnant or nonpregnant groups ceased nicotine use entirely, reductions in number of cigarettes smoked daily were substantial for many patients, and these reductions were maintained, or even increased, over time. The number of people who quit smoking entirely increased from the end of the intervention to the 3-month followup, and the mean number of daily cigarettes decreased following the intervention for both groups as well, suggesting that it may take time to integrate new information and implement the coping skills learned in the group.

No significant differences were found in the number of cigarettes smoked at the 1-month or 3-month followups, or in the percent decrease of daily cigarettes from the beginning of the intervention to the followups between groups, suggesting that the intervention was equally efficacious for both pregnant and nonpregnant women. However, pregnant patients reported a greater self-imposed decrease in cigarette smoking leading up to the intervention. While both the pregnant and nonpregnant patient groups were similar in demographics and level of nicotine dependence prior to

TABLE 4: Correlates of decrease in smoking at followup: nonpregnant patients.

	1-month			3-month		
	<i>b</i>	<i>t</i>	<i>P</i>	<i>b</i>	<i>t</i>	<i>P</i>
Affiliative attachment	-1.21	-2.49	<b>0.02</b>	-1.42	-1.91	0.06
Cognitive enhancement	-1.67	-3.10	<b>0.003</b>	-2.17	-2.61	<b>0.01</b>
Taste and sensory properties	-1.09	-1.93	0.06	-1.53	-1.83	0.08
Automaticity	-0.66	-1.15	0.26	-1.51	-1.77	0.09
Loss of control	-0.98	-1.24	0.22	-2.20	-2.02	<b>0.05</b>

\* WISDM subscales: Affiliative attachment, Cognitive enhancement, Taste and sensory properties, Automaticity, Loss of control.

the intervention, the pregnant patients had also been in substance abuse treatment significantly fewer weeks than nonpregnant patients. This is expected since the discovery of pregnancy is a common motivator for entry into substance abuse treatment. The decrease in cigarette smoking prior to intervention may represent the effects of entry into substance abuse treatment, or the motivation of discovery of pregnancy on nicotine use behaviors.

Although outcomes were similar for pregnant and nonpregnant patients, different factors predicted successful outcomes for the two groups. Number of cigarettes smoked daily at the start of the intervention, as well as the decrease the individual was able to affect prior to intervention influenced outcomes for pregnant women. This is consistent with previous literature suggesting that the heavier nicotine use correlates with less successful outcomes in smoking cessation efforts [33, 34]. However, for pregnant women, level of craving for cigarettes appeared to be a significant factor, whereas for nonpregnant women, the affiliative attachment to cigarettes and their role in cognitive enhancement appeared to be more central. Perhaps the most puzzling finding is that those pregnant women who were more satisfied with the intervention demonstrated smaller decreases in smoking at followup. It is possible that these women represented patients in the precontemplation stage who appreciated receiving the information contained in the intervention but were not ready to commit to cessation of nicotine use.

**Limitations.** Conclusions are limited by reliance on self-report data, which is subject to recall bias and socially desirable responding. Patients may underestimate, inaccurately recall, or wish to downplay the number of cigarettes smoked, particularly pregnant patients. Further research on the effectiveness of smoking cessation interventions may benefit from use of additional biological measure, such as cotinine testing, to evaluate reports of reductions in or cessation of nicotine use.

This study is also limited by small sample size. Lack of power may have obscured relationships which would have reached significance had the *n* been greater. In particular,

subscales of the WISDM showed trends towards predicting decreases in number of daily cigarettes at the 1-month and 3-month followups but did not reach significance in the final models.

*Implications for Clinical Practice.* This study provides evidence that substantial reductions in cigarette smoking are possible for methadone-maintained patients, even following a relatively brief intervention. It also suggests that smoking cessation interventions may be effective even for patients that are relatively early in their recovery from substance abuse. However, as it appears that reductions occurred over time and required integration of the new skills, longer smoking cessation interventions or follow-up support may be useful in maintaining or increasing gains over time.

Results also indicate that the factors associated with success of smoking cessation interventions may differ for pregnant versus nonpregnant women. For pregnant women, pregnancy represents a unique motivation to decrease their nicotine use, and many pregnant patients appear to have begun this process prior to intervention and were able to further decrease their use following intervention. Heavier smoking as well as greater self-imposed decrease in cigarette smoking prior to intervention appeared to lessen the effectiveness of the intervention for pregnant women, consistent with previous literature. Higher scores on the craving subscale of the WISDM suggest that for pregnant women, particularly those who are newer to substance abuse treatment, increased focus on the management of cravings may be especially helpful. Further research is needed on efficacious treatment for nicotine dependence in this special population; however, this study does provide evidence that smoking cessation interventions are a worthwhile endeavor for women in substance abuse treatment programs.

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## Review Article

# Drug Testing for Newborn Exposure to Illicit Substances in Pregnancy: Pitfalls and Pearls

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Estimates of the prevalence of drug usage during pregnancy vary by region and survey tool used. Clinicians providing care to newborns should be equipped to recognize a newborn who has been exposed to illicit drugs during pregnancy by the effects the exposure might cause at the time of delivery and/or by drug testing of the newborn. The purpose of this paper is to provide an overview of the literature and assess the clinical role of drug testing in the newborn. Accurate recognition of a newborn whose mother has used illicit drugs in pregnancy cannot only impact decisions for healthcare in the nursery around the time of delivery, but can also provide a key opportunity to assess the mother for needed services. While drug use in pregnancy is not an independent predictor of the mother's ability to provide a safe and nurturing environment for her newborn, other issues that often cooccur in the life of a mother with a substance abuse disorder raise concerns for the safety of the discharge environment and should be assessed. Healthcare providers in these roles should advocate for unbiased and effective treatment services for affected families.

## 1. Introduction

Estimates of illicit drug use in pregnancy vary widely. Approximately 5–10% of women self-report the use of illicit drugs in pregnancy [1–3], while universal testing for illicit drugs in high-risk populations results in a significantly higher prevalence (10–40%) of usage than through self-reporting [2, 3]. There is a wide range of use varying from infrequent recreational use to high levels of use with physiologic addiction. Importantly, other substances that can have deleterious effects on the mother and infants health (such as nicotine and alcohol) are often used concurrently with illicit drugs [1].

Identification of newborns exposed to illicit drugs in pregnancy cannot only alert the practitioner to problems one might encounter in the delivery room and nursery, but can also serve as an opportunity to recognize and assess families with substance abuse disorders which can pose risks to the newborn after hospital discharge. However, since self-reports of illicit drug use are often inaccurate and universal drug

testing is neither practical for the clinician nor recommended by the American Academy of Pediatrics [4], every facility that provides care for newborns should establish their own testing protocol including establishing unbiased guidelines to identify those to be tested. Policies should be in place allowing for confirmation of test results that have been performed by screening methods which provide only presumptive results.

## 2. Possible Effects on Neonates due to Illicit Drug Use in Pregnancy

The short- and long-term adverse effects encountered by newborns exposed to illicit drugs in pregnancy can be difficult to accurately assess. *In utero* exposure to alcohol and nicotine has established potentials for negative effects on the newborn such as impairments in growth and later cognition [5]. While these substances are often used in conjunction with illicit drugs, they are rarely included in newborn

screening or reporting policies [6]. As a result, studies examining the health effects of newborns exposed to illicit drugs in pregnancy can be confounded by the presence of other nonillicit substances whose presence can be difficult to control for in study design (especially if relying on self-reported usage). *In utero* exposure to alcohol and nicotine are the premier confounders. Also, effects attributed to illicit substance exposure during pregnancy may be confounded by the problems associated with substance abuse disorders such as poor nutrition, overall health status, and attendance at prenatal visits [7–9].

Table 1 provides a summary of possible adverse effects associated with exposure to the most commonly encountered illicit drugs (stimulants, cannabinoids, opiates/opioids, hallucinogens, and sedatives). While cocaine and methamphetamine both behave pharmacologically as stimulants (increased arousal, vasoconstriction, elevated heart rate, and blood pressure), much of the information about long-term effects in this class is derived from cohort studies on cocaine-exposed children. While there has been a longitudinal cohort study of children exposed to amphetamines *in utero* [26], long-term studies on children exposed to specifically methamphetamine are underway, but it is not yet known if there will be significant differences in long-term outcome. Inappropriate use of prescription pain medications (narcotics) and benzodiazepines are included as illicit drug usage [34].

Beyond the possible short- and long-term health effects, concern for the welfare and safety of newborns exposed to illicit drugs in pregnancy exists due to the cooccurring problems that many women with substance abuse disorders struggle with including undiagnosed/undertreated mental health issues, intergenerational addiction disorders within the family support system, and involvement in relationships with interpersonal violence [35–38]. The Adverse Childhood Experiences study group has shown that as the frequency of interpersonal violence increases in a child's home, so does the risk of becoming a victim of child abuse [39].

All newborns exposed to illicit drugs during pregnancy will not have adverse short- or long-term health effects, and the identification of a mother with a substance abuse disorder does not automatically infer the child will become a victim of abuse or neglect [40, 41]. The adequacy of the home environment is a strong factor in neurodevelopmental outcome [21, 23, 42] further highlighting the need to use identification of a newborn exposed to illicit drugs in pregnancy as an opportunity to be aware of problems that may manifest in the delivery room or nursery and assess the safety of the newborn's home environment to be along with the psychosocial situation of the family for needed supportive services [15].

### 3. Drug Testing in Newborns

In 2003, the United States Congress amended the Child Abuse Prevention and Treatment Act (CAPTA) by passing the *Keeping Children and Families Safe Act*. With this amendment, lawmakers conditioned a state's receipt of federal

CAPTA funds on the establishment of procedures by the state to develop a plan of safe care when newborns exposed to illicit substances during pregnancy are reported by healthcare providers [43]. However, the Act leaves the decision on who should be tested to the healthcare provider. To avoid bias in testing towards newborns of women from poverty or minority backgrounds where substance abuse is sometimes assumed to be more of a problem, objective protocols for recognition of which newborns should be tested can be implemented [44–46]. The guideline from the authors' institution which was compiled from a previously published evidenced-based approach that identified maternal and newborn factors associated with illicit drug usage [43] and subsequently vetted with perinatal staff at the authors' institution is available in Table 2. The authors provide their guidelines and discussion and are not making a recommendation for adoption of what has been established at their institution as a universal standard.

Each healthcare facility should develop its own policy to address issues of consent in newborn drug testing. The intent of the test must be clearly defined. Testing for the purpose of guiding healthcare and followup after discharge may be covered on the general consent to treatment for the facility [47], whereas in the United States, testing for illicit substances in the absence of medical indications may be discipline break criminality and violate the patient's civil rights [48].

The healthcare provider has the responsibility to differentiate between screening and confirmatory drug testing results. This is especially true in cases in which a newborn has tested positive for an illicit drug and the mother has not admitted to usage. The potential for false positive testing by immunoassay screening should be acknowledged [49] and investigated further by ordering a direct identification, confirmation method such as gas chromatography-mass spectroscopy [44, 50]. The rate of false-positive immunoassay screening is particularly crucial with amphetamines and benzodiazepines [49].

Testing in newborns can be performed on urine, blood, meconium, hair, or umbilical cord blood or tissue samples. Immunoassay screening of urine and blood provide the most rapid results with urine usually preferred due to availability through noninvasive bag specimen collection. Drugs will clear rapidly from urine making false negative results possible when there is a delay in collection [8, 51, 52]. A laboratory's use of workplace standards for drug detection as opposed to lowest detectable limits can also lead to false negative screening results [44].

Meconium formation begins in 2nd trimester, and positive results typically reflect exposure in the last month or longer prior to delivery [44, 52]. Tests of meconium will more accurately identify a history of drug use rather than immediate drug use and are often more accurate than urine due to collection issues [3, 51]. First time drug usage just before delivery may result in a false negative meconium as the drug may not have had time for deposition. Therefore, urine testing may still be needed to cover the possible time periods of exposure prior to delivery. Results may not be available for several days after collection as meconium specimens

TABLE 1: Possible effects on newborns due to illicit drug use in pregnancy (not a complete list).

Drug	Possible effects on the newborn
<i>Stimulants:</i>	<i>Perinatal:</i>
	Low birth weight [10–12]
	CNS irritability/lability of state [13–15]
	—crying, jittery, sleep/wake alterations may have continued exposure through breastfeeding
Methamphetamine, Cocaine....	Neurodevelopmental alterations [16]
	Necrotizing enterocolitis [17]
	(Teratogenicity suggested by case studies but not confirmed by larger cohort or animal studies) [18]
	<i>Long term:</i>
	Modest but measurable longitudinal differences of <i>cocaine-exposed</i> infants in growth [19, 20], cognition [21], language [22], and impaired behavioral self-regulation [23, 24]. Other risk and protective factors can moderate outcome [23–25].
	Longitudinal cohort of <i>amphetamine</i> -exposed infants showed school and behavioral problems (but environment impacts as well) [26].
	Longitudinal <i>methamphetamine</i> studies are underway [27].
<i>Opiates/Opioids:</i>	<i>Perinatal:</i>
	Low birth weight [8, 9]
	Neonatal Abstinence Syndrome (NAS) [15, 28] scoring system available:
	(i) CNS irritability
	(ii) Autonomic dysfunction
	(iii) Respiratory symptoms
	(iv) GI disturbances
Heroin, morphine, codeine, oxycodone, hydrocodone, meperidine, fentanyl, (and others)	<i>Long term:</i>
	Longitudinal studies limited, problems with behavioral self-regulation reported [27].
<i>Cannabinoids:</i>	<i>Perinatal:</i>
	Low birth weight with heavy exposure [29]
Marijuana	Lability of state [15]
	<i>Long term:</i>
	Impulsivity [8] and effects on executive functioning later in life [8, 30]
<i>Hallucinogens:</i>	<i>Perinatal:</i>
	Low birth weight [7, 8, 13]
PCP, MDMA, LSD	CNS irritability [13]
	Neurodevelopmental alterations [31]
	<i>Long term:</i>
	Longitudinal studies not available
<i>Sedatives:</i>	<i>Perinatal:</i>
	Low birth weight [32]
Benzodiazepines, barbiturates	Respiratory depression, Hypotonia [33]
	<i>Long term:</i>
	Longitudinal studies not available

TABLE 2: Sample guideline for newborn drug testing.

Medical indications for NEWBORN drug testing for possible exposure to illicit drugs
<i>University of Arkansas for Medical Sciences, ANGELS Neonatal Guidelines</i> [46]
(1) History of maternal drug use or agitated/altered mental status in the mother
(2) No prenatal care
(3) Unexplained placental abruption
(4) Unexplained CNS complications in the newborn (seizures, intracranial hemorrhage)
(5) Symptoms of drug withdrawal in the newborn (tachypnea, hypertonicity, excessive stooling/secretions)
(6) Changes in behavioral state of the newborn (jittery, fussy, lethargic)

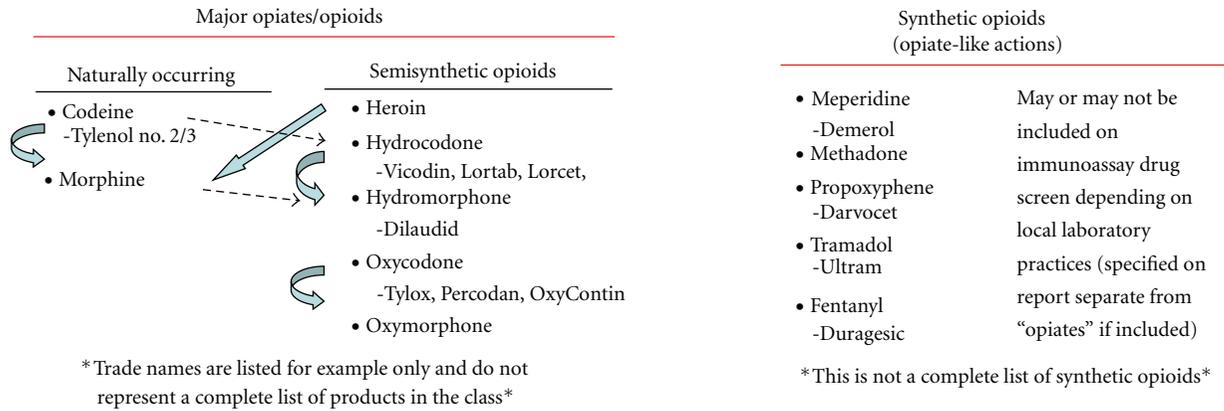


FIGURE 2

FIGURE 1: High morphine can show up with some hydromorphone, but generally hydro will break to hydro and oxy to oxy. Codeine can go to morphine and hydrocodone (not a metabolite of other opiates). Heroin breaks down to morphine and 6MAM. Codones can break to morphones but not backwards. Hydrocodone can go to hydrocodol (= dihydrocodeine) and hydromorphone. Hydromorphone can go to hydromorphol (same for oxy but separate).

that screen positive for drugs are typically confirmed by a direct identification method in a reference laboratory that performs such testing. While meconium results offer a wider window of exposure and more routine usage of confirmatory methods [53], it is not possible to clearly distinguish when in the last several weeks-months exposure occurred, and specimen collection can be difficult in newborns who have passed meconium *in utero* prior to delivery and in those who are very small/critically ill.

Neonatal hair growth begins in the third trimester [44, 52]. While not all newborns will have sufficient hair growth to allow for adequate specimen collection, hair drug testing may be helpful if meconium is not available due to transition to neonatal stool or clinical condition of the baby [52, 54]. Testing of the umbilical cord for *in utero* drug exposure is an alternative to meconium collection [55], but it is difficult to know how far back into pregnancy exposure would produce a positive test.

Clinicians in the nursery may be asked if it is reasonable that second hand smoke inhalation by the mother resulted in a positive newborn drug test. Passive exposure to heavy amounts of second-hand marijuana or crack cocaine smoke can result in a positive drug test in an exposed adult, but low levels of second-hand smoke exposure do not typically result in positive drug tests [56, 57]. If a mother is in an environment with others using drugs to the point that it is causing the mother and her newborn to test positive from passive exposure, the same concerns about home stability and cooccurring psychosocial risk factors should be communicated to personnel assessing the mother's situation since the newborn would be exposed to the same environment at discharge.

Confirmatory drug testing results may report either the parent drug and/or its metabolites. Therefore, the clinician should be familiar with basic drug metabolism of commonly abused drugs in order to account for exposure to certain

parent compounds by the metabolites being detected during testing instead of the parent drug. In the stimulant class of drugs, methamphetamine is metabolized to amphetamine by the liver, but prescription amphetamine compounds will not metabolize to methamphetamine. Cocaine can metabolize to benzoylecgonine, norcocaine, ecgonine methyl ester (methylecgonine from crack), and if coingested with alcohol, cocaethylene [58]. Clinicians with questions about the consistency of clinical history with drug test results should consider consultation with a scientist from the reference laboratory that performed the confirmatory testing for the clinician's facility.

The opiate/opioid class of medications can be one of the most complex in regards to interpreting drug testing results [59]. These medications may be used legitimately for medical management of labor and delivery pain in the mother, neonatal pain after delivery, chronic medical conditions in the mother, and in addiction rehabilitation programs. Positive opiate results (morphine) can also be observed due to dietary intake of poppy seed containing foods although confirmation and quantitation of morphine will generally reveal urinary levels less than 800 ng/mL. However, they are also one of the most commonly inappropriately used/abused classes of prescription medications. Consultation with clinical toxicology experts is recommended to fully explore the interpretation of positive opiate results. Figure 1 shows the division of this group of medications into primary opiates, semisynthetic opioids, and synthetic opioids with listing of common metabolites. It is important for the clinician in the nursery to understand that the synthetic opioids such as fentanyl or methadone would not be detected on routine toxicology screen for opiates. Specific testing would be required so their usage during labor and delivery or post delivery for pain management would not account for a positive screening test for opiates as is often assumed (see Figure 2).

#### 4. Beyond the Nursery

As part of discharge planning, all newborns exposed to illicit drugs in pregnancy should have a primary care provider specifically designated to allow flow of information on risk status, referrals, and followup [60]. Caregivers with a substance

abuse disorder are more likely to perceive care of a child as stressful and miss well-child visits [61]. Early intervention services should be considered because they can positively impact drug-exposed newborns at risk for developmental delay [62]. Nurse home visitation may be an appropriate referral in select cases [63]. Such programs may aid in reduction of subsequent encounters for ingestions, injuries, and maltreatment compared to controls [63, 64], or behavioral problems in children and in parental distress [65]. Perinatal healthcare providers should work collaboratively to educate state legislators that identification of drug use alone is not adequate to address the problems related to pregnant women with substance abuse disorders. States must develop a plan to assess families at risk by providing supportive services through their child welfare departments and include access to evidence-based substance abuse treatment programs. Providers should advocate for appropriate funding in child welfare budgets to ensure manageable case loads and staff training time. Prevention and family preservation instead of punishment will benefit the state in the long term by decreasing many of the other public health expenditures related to untreated substance abuse disorders.

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## Review Article

# Pharmacological Treatment of Neonatal Opiate Withdrawal: Between the Devil and the Deep Blue Sea

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Illicit drug use with opiates in pregnancy is a major global health issue with neonatal withdrawal being a common complication. Morphine is the main pharmacological agent administered for the treatment of neonatal withdrawal. In the past, morphine has been considered by and large inert in terms of its long-term effects on the central nervous system. However, recent animal and clinical studies have demonstrated that opiates exhibit significant effects on the growing brain. This includes direct dose-dependent effects on reduction in brain size and weight, protein, DNA, RNA, and neurotransmitters—possibly as a direct consequence of a number of opiate-mediated systems that influence neural cell differentiation, proliferation, and apoptosis. At this stage, we are stuck between the devil and the deep blue sea. There are no real alternatives to pharmacological treatment with opiates and other drugs for neonatal opiate withdrawal and opiate addiction in pregnant women. However, pending further rigorous studies examining the potential harmful effects of opiate exposure in utero and the perinatal period, prolonged use of these agents in the neonatal period should be used judiciously, with caution, and avoided where possible.

## 1. Introduction

Illicit drug use in pregnancy and the associated adverse effects for both mother and child are important public health issues in most developed countries. Recent Australian data has shown that the prevalence of newborns with neonatal withdrawal has surged more than 30-fold over the past two decades, causing a major strain on the health system [1]. Opiates and to a lesser extent barbiturates are the main pharmacological agents administered for the treatment of neonatal withdrawal. In the past, these agents have been considered by and large inert in terms of their long-term effects on the central nervous system [2–5]. However, a growing body of evidence from animal studies and recent clinical studies in children suggests a more cautious approach towards uncritical use of these drugs for neonatal withdrawal.

## 2. Current Approaches to Opiate Treatment of Neonatal Withdrawal

Undoubtedly, neonatal withdrawal is a potentially fatal condition, which requires early recognition and appropriate

pharmacological treatment [6]. It is accepted that neonatal withdrawal requires treatment due to its associated morbidity, increased incidence of seizures [7–11], difficulties with weight gain [12–15], increase in infant mortality and sudden infant death syndrome (SIDS) [11, 16–21], and evidence of infant suffering [22]. With these potentially serious consequences, an exclusively nonpharmacological approach to neonatal abstinence cannot be recommended and widespread use of pharmacological agents for neonatal withdrawal is the recognised and accepted practice [6, 13, 23–29].

Monitoring of babies exposed to chronic intrauterine amphetamines, cocaine, or opiates is generally recommended for 5–7 days after birth [30], with more than 50% of newborns developing symptoms that require treatment [31]. Treatment in the first instance may include nonpharmacological measures such as swaddling or breastfeeding. Pharmacological interventions using an opiate most commonly or alternatively a barbiturate are then frequently added [26, 29], with pharmacological management of neonatal withdrawal required in 45–80% of cases [32]. A step-up

approach usually follows with the aim to titrate medication to an optimal level at which symptoms are controlled. Once effective levels are reached, a weaning process follows which can last from a few days to several months.

### 3. Duration of Opiate Treatment for Neonatal Withdrawal

Length of pharmacological treatment for weaning depends on several factors, such as the maximum dose required or individual withdrawal patterns. It also varies, quite significantly, with the type of weaning strategy employed. For example, rapid weaning involves dose reduction several times per week depending on tight and frequent assessments for withdrawal symptoms. Rapid weaning is generally performed in hospital and can be quite work intensive for nursing staff, parents and carers. On the other hand, slow weaning has become a more frequent practice, with a weekly or fortnightly dose reduction occurring in the home setting. Slow weaning is often used with the rationale of minimising the disruption to maternal-infant bonding by allowing a more gradual reduction of opiates in the home environment, as well as the advantage of reduced costs.

The downside of slow weaning, however, is the potential for more prolonged exposure to either opiates or barbiturates and increased cumulative doses in early infancy. From our own review of 232 cases, the average length of treatment was 49 days for those patients managed in the home setting versus 23 days for in patient weaning. It is important to note that this increased postnatal pharmacological exposure is in addition to the already prolonged exposure to opiates or other illicit drugs whilst in utero. At this stage, there is no data to guide choice of one strategy over another (i.e., rapid versus slow weaning). Therefore, choice of weaning strategy remains subject to the resources and services available at different centres [25, 33].

As a result, the risks of prolonged and increased total cumulative pharmacological exposure to opiates require some attention, particularly given the growing body of evidence that argues *against* opiates as an inert substance for neurodevelopment.

### 4. Effects of Opiates on the Developing Central Nervous System

Opiates exhibit significant effects on the growing brain. This includes direct dose-dependent effects on reduction in brain size and weight, protein, DNA, RNA, and neurotransmitters—possibly as a direct consequence of a number of opiate-mediated systems that influence neural cell differentiation, proliferation, and apoptosis [32]. The animal evidence also suggests that these adverse effects on central nervous system development translate into abnormalities in later animal neurodevelopment and behaviour [34–39].

More specifically opiates appear to interfere with the GABAergic system. While in the mature brain the primary role of the GABAergic system is inhibition, in the immature brain the GABAergic system is predominantly excitatory, a

function required for normal brain development. Chronic opiate exposure in utero and in the perinatal period can interfere with normal GABA system development and influence brain excitability and seizure susceptibility [35, 40]. Excessive excitation of brain cells—excitotoxicity—is a well established mechanism of cell injury and death, resulting from an imbalance between excitatory and inhibitory signals. Furthermore, the switch in GABA function is regulated by certain transporter proteins, which have been implicated in excessive excitation and opiate addiction [41].

Superimposed on an already excitatory and compromised environment, prolonged treatment with medications that enhance inhibition in a mature brain could paradoxically lead to potentially damaging levels of excitation in a developing newborn brain. Some evidence of potential adverse effects due to enhanced GABAergic activation includes recent association with impaired cognitive function at 3 years and in utero exposure to valproic acid—an agent that directly targets the GABA system [42].

### 5. Clinical Evidence for Adverse Effects of Opiates in Early Life

Although animal data strongly suggests adverse neurodevelopmental outcomes due to opiate exposure in early life, clinical data in humans remains insufficient, conflicting, and inconclusive [28, 43–48]. So far there is little clinical evidence to support either harmful or benign long-term effects of opiate exposure in utero or the perinatal period. However, the great challenge here is to differentiate between harms directly due to opiates [32, 46, 47, 49] and indirect effects associated with the medical and social complications that cooccur with illicit drug use [2, 43–45, 50, 51].

Many studies do not control for social variables, such as socioeconomic status, early childhood education, maternal education level, and income, home social and psychological environment or family stressors [49, 52–54]. Given the enormous social challenges that face children raised in a drug-exposed environment, it is not possible to draw any meaningful conclusion about the relationship between opiate exposure and harm without controlling for these variables. Some studies attempted to eliminate the social variables by matching children on social environment—for example, by comparing drug-exposed children raised in foster care to non-drug-exposed children [5, 49, 52–56]. However, this introduces additional confounders of foster parents who may be more educated and provide greater support to help overcome the initial adversity faced by the drug-exposed child [55].

In addition to social variables, there are numerous other potential maternal and neonatal confounders to match or statistically control for in order to make valid comparisons between exposed and nonexposed groups [44, 46, 47, 57–59]. This includes, but is not limited to, confounders such as, maternal age, nutrition status, IQ and psychiatric history, neonatal birth weight, gestational age, perinatal complications and congenital and developmental anomalies, and sources of bias, such as selection bias, for example, selecting children who are already suspected of developmental delay

[57]. Unfortunately, the majority of available studies are limited or incomplete in their analysis and control for these potential confounders [5, 33, 49, 53–56, 60–63].

In addition, most studies fail to differentiate between exposure to heroin, methadone, or both heroin and methadone, and no studies analyse for the differential effect of additional opiate exposure in the neonatal period. Much of the research also fails to adequately discuss, analyse, or control for the effects of polydrug use [5, 33, 49, 53–56, 60–64]. Even the largest and most well-designed study—the landmark Maternal Lifestyle Study—failed to adequately account for the differential effects of opiate as opposed to cocaine exposure [65, 66]. Overall, it appears that control for the main drug of interest (i.e., opiate versus other drug exposure) is often lost in the complexity of attempting to control for the myriad of maternal, neonatal, and social variables found in this population.

In summary, the current clinical research on neurodevelopmental outcomes of opiate exposure in utero and/or the perinatal period is best limited to small studies and, at worst, methodologically flawed. This highlights the urgent need for well-controlled, preferably large, studies in this area that examine the relationship between opiate use, maternal, neonatal, and social variables, and neurodevelopmental outcomes. The need is particularly urgent given the increasing body of theoretical and animal research suggesting likely harmful effects of opiate exposure on later neurodevelopment and behaviour.

## 6. Are There Alternatives to Opiate Treatment for Neonatal Withdrawal?

The current guidelines certainly suggest that opiates are the most effective pharmacological agent in reducing the symptoms of neonatal withdrawal [6, 13, 24, 26–28]. In particular, it is acknowledged that opiates compared to other pharmacological agents (e.g., phenobarbitone, diazepam, chlorpromazine) appear to reduce the duration of treatment [67–69], the need for a second agent to reduce withdrawal symptoms [8, 68, 69], and the admission rate to neonatal units [68, 69]. They also may reduce the incidence of seizures [27]. It is generally agreed that opiates are superior to other sedative agents such as chlorpromazine and diazepam in controlling abstinence-associated seizures, preventing treatment failure and the need for a second pharmacological agent [24, 25, 27, 28]. They are also considered to have less adverse effects in the neonate compared to sedatives [6, 24]. If a second agent is required, the current recommendations are for the use of phenobarbitone [28] which, when combined with opiates, may assist in the management of seizures, improve behaviour and interaction [70], and reduce the duration of therapy required to minimise symptoms [71]. It is also recommended that, as much as possible, the pharmacological agent used to assist withdrawal should match the agent of in utero addiction (e.g., opiates for opiate addiction, phenobarbitone for amphetamine addiction, etc.) [6, 13, 25].

Another pharmacological agent, which demonstrates some promise and may have the potential to be an alternative

to opiates, is clonidine, an  $\alpha_2$ -adrenergic receptor agonist. Preliminary trials have suggested that clonidine compared to, or in addition to, opiates markedly reduces treatment failure, withdrawal symptoms, duration of therapy, and/or duration of opiate use and maximum dosage required [72–74]. Given the possible safety issues associated with clonidine, however, the guidelines recommend that further clinical trials are required to establish its efficacy and safety in the long term [6, 28].

## 7. Conclusion

At this stage, we are stuck between the devil and the deep blue sea. On the one hand, methadone maintenance treatment for pregnant women who are illicit drug users has consistently been shown to reduce harmful outcomes for both the mother and newborn [3, 32, 58]. Furthermore, there are no real alternatives to pharmacological treatment with opiates and other drugs for neonatal opiate withdrawal and opiate addiction in pregnant women. On the other hand, there is increasing animal and theoretical evidence to challenge the general assumption that opiates are a benign substance to neurodevelopment and, at this stage, there is inadequate clinical research to guide our prescription of opiates for this already vulnerable and at-risk population.

As a result, pending further rigorous studies examining the potential harmful effects of opiate exposure in utero and the perinatal period, prolonged use of these agents in the neonatal period should be used judiciously, with caution, and avoided where possible.

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## Research Article

# Psychosocial Characteristics and Obstetric Health of Women Attending a Specialist Substance Use Antenatal Clinic in a Large Metropolitan Hospital

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*Objective.* This paper reports the findings comparing the obstetrical health, antenatal care, and psychosocial characteristics of pregnant women with a known history of substance dependence ( $n = 41$ ) and a comparison group of pregnant women attending a general antenatal clinic ( $n = 47$ ). *Method.* Face-to-face interviews were used to assess obstetrical health, antenatal care, physical and mental functioning, substance use, and exposure to violence. *Results.* The substance-dependent group had more difficulty accessing antenatal care and reported more obstetrical health complications during pregnancy. Women in the substance-dependent group were more likely to report not wanting to become pregnant and were less likely to report using birth control at the time of conception. *Conclusions.* The profile of pregnant women (in specialised antenatal care for substance dependence) is one of severe disadvantage and poor health. The challenge is to develop and resource innovative and effective multisectoral systems to educate women and provide effective care for both women and infants.

## 1. Introduction

There has been a wealth of literature examining the impact of substance use in pregnancy with findings consistently noting the association between maternal substance use and negative fetal outcomes including fetal respiratory distress, preterm delivery, small-for-gestational-age birth, and higher infant mortality in the first year of life [1–4]. Moreover, this association is complicated by the significant physical and psychosocial morbidity associated with substance use disorders. Studies have previously found high exposure to violence, poor physical health, and moderate/severe psychological distress among substance-using pregnant women [5–7]. It is often argued that integrated service delivery and intensive case management is needed to ensure the well-being of the mother-infant dyad throughout pregnancy and into the longer term.

The health care system in Australia is largely divided into specialist streams and segregated levels of care. Such a system is often criticized for being too divisive and inadequate for the wholistic care of patients who present with multiple problems [8, 9]. In New South Wales, different models of integrated care for substance-using pregnant women exist. This includes perinatal consultation and liaison services operated from drug and alcohol treatment centres and multidisciplinary teams situated within antenatal clinics.

This paper reports on a specialist antenatal clinic of a large public hospital in Sydney, where a collaborative approach to the care of pregnant women with known substance use problems has been adopted. The specialist clinic is conducted weekly from the Maternal and Child Health Department and is convened by staff from a number of different departments including Obstetrics and Gynaecology,

Maternal and Child Health, Drug Health, and Social Work. The objective of the specialist clinic is to address the myriad of physical and psychosocial problems that substance using pregnant women present with in order to improve maternal and infant outcomes for the duration of the pregnancy and into the postpartum period. Referral to the specialist antenatal clinic can occur via a number of pathways including community-based general practitioners, the Drug Health Service, the Aboriginal Medical Service, and women attending other antenatal clinics who screen positive for substance use (all women are assessed for substance use, domestic violence exposure, nutritional status, and depression using a standardised psychosocial screening tool at their first booked appointment regardless of the antenatal clinic they attend).

The aim of the present study was to describe the clinical and psychosocial characteristics of pregnant women attending the specialist substance use antenatal clinic of a large public hospital in Sydney, Australia, and to compare these to the characteristics of a group of women attending a generalist antenatal clinic. This information was collected as a prerequisite to the design of a clinical service that could better meet the needs of both mother and child.

## 2. Materials and Method

The present study is a retrospective, cross-sectional study examining the characteristics of women with a known history of substance dependence accessing antenatal care from a clinic of a large public hospital in Sydney, Australia. A specialist clinic for women with substance use problems is run in conjunction with the general antenatal clinic and provides additional support around substance use and associated psychosocial issues. Women with a known history of substance use were approached to participate by the Drug Health Service Perinatal Clinical Nurse Consultant. All women attending the general antenatal clinic or birth centre of the same hospital were eligible to participate in the comparison group. Women in the comparison group were either invited to participate by a researcher while waiting for an appointment, or responded to advertisements posted in the clinic waiting room. Face-to-face interviews were conducted by researchers trained to administer structured clinical interviews, at either the antenatal clinic or the National Drug and Alcohol Research Centre, and took on average 1 hour to complete. All women provided written consent prior to participating. While no women were screened and deemed to be ineligible, a number of women declined to participate with the majority citing they were too busy or had too many other things going on. As such, it took approximately 18 months of recruitment to achieve the sample size reported. The study was approved by the University of New South Wales Human Research Ethics Committee (ref: 06254 and 08224) and the Ethics Review Committee (RPAH Zone) of the Sydney South West Area Health Service (ref: X06-0285 and 08/RPAH/218).

The interview included sections on the following: demographic characteristics, previous and current pregnancy characteristics, antenatal care, physical health service utilization,

substance use history, injecting risk behaviour, exposure to violence, and mental and physical functioning. Health status was measured using the Short Form 12-item Health Survey (SF-12) [10]. The SF-12 generates two summary scores reflecting general physical and mental health functioning. The Depression Anxiety Stress Scale short version (DASS21) [11] was used to measure symptoms of depression, anxiety, and stress. The DASS21 has good reliability and validity and includes normative data for the Australian population. The Opiate Treatment Index (OTI) [12] was used to measure social functioning and the extent of substance use. The OTI provides an estimate of substance use based on the last three occasions of use. All other questions were derived from previous research conducted by the National Drug and Alcohol Research Centre (NDARC) (details can be provided by the authors on request).

## 3. Statistical Analyses

The data were analysed using PASW version 18 [13]. *t*-tests were used for continuous variables with means reported. Odds ratios and 95% confidence intervals were reported for nondichotomous categorical variables (OR, 95% CI) to determine if differences existed between substance dependent and comparison groups. There was no missing data for either sample.

## 4. Results

The results are based on interviews with 41 pregnant women with a known history of substance dependence (i.e., substance dependent group), and a comparison group of 47 women attending the general antenatal clinic (i.e., comparison group). Twenty-eight (70%) women in the substance dependent group were currently receiving substance use treatment, the majority (71%) of whom were enrolled in opioid pharmacotherapy (with a median duration of 11 months).

Table 1 displays the demographic and psychosocial characteristics of the women.

**4.1. Antenatal Care.** The women in the substance-dependent group were significantly more likely to present for their first antenatal visit later in their pregnancy than the comparison group (mean 14 versus 11 weeks pregnant,  $t_{63} = -3.02$ ,  $P < .05$ ). While this is still within the hospital's protocol for low-risk pregnancies (i.e., by 20 weeks gestation), the women in the substance dependent group would be considered high-risk, and just over a third (34%) of the women presented before 12 weeks, as per the hospital's protocol for high-risk pregnancies. A small proportion of women in the substance-dependent and comparison group (11% versus 2%, resp.) presented after 20 weeks gestation. The majority of the women in the substance-dependent group (76%) experienced some difficulty in accessing antenatal care (compared to only 20% of the comparison group): 40% (versus 15%) were unable to get an appointment; 24% (versus 0%) had "too many other things going on;" 17% (versus 0%) had insufficient money; 15% (versus 2%) had no transport to

TABLE 1: Demographic and psychosocial characteristics of pregnant substance dependent women and comparison group.

	Substance dependent group (n = 41)	Comparison group (n = 47)	Statistical comparison
Age (in years) mean (SD)	28.8 (5.3)	33.3 (4.2)	$t_{86} = 4.47^{**}$
Years of completed schooling mean (SD)	10.3 (1.6)	11.9 (0.5)	$t_{46} = 6.12^{**}$
% Currently married/de facto	46.3	93.6	OR 0.06 (95% CI 0.02–0.22)**
% ATSI	26.8	0	N/A
% Unemployed	80.5	21.3	OR 15.3 (5.4–43.2)**
% Currently homeless	12.2	2.1	not significant
% Exposed to violence in past year	24.4	8.5	OR 3.5 (1.00–12.08)*
SF-12 Mental functioning score mean (SD)	43.2 (12.7)	52.5 (7.3)	$t_{60} = 4.1^{**}$
SF-12 Physical functioning score mean (SD)	41.4 (9.4)	44.7 (7.8)	not significant
DASS Depression score mean (SD)	9.9 (11.2)	4.4 (5.2)	$t_{55} = -2.9^*$
DASS Anxiety score mean (SD)	6.7 (6.3)	3.0 (5.3)	$t_{77} = -2.9^*$
DASS Stress score mean (SD)	12.5 (10.5)	7.7 (7.5)	$t_{69} = -2.4^*$

\* $P < .05$ .

\*\* $P < .001$ .

get the hospital clinic; 7% (versus 2%) could not get time off work; 12% (versus 0%) did not want others to know of their pregnancy; 10% (versus 0%) reported not having childcare available. None of the women reported difficulty accessing antenatal care due to lack of a Medicare card. All Australians are entitled to free ambulatory medical care upon presentation of their Medicare card, but if misplaced, procedures to access free care are more cumbersome.

**4.2. Physical Health.** Women in the substance-dependent group were more than 3 times more likely to report at least one obstetrical health complication during pregnancy (63% versus 34%, OR 3.36, 95% CI 1.40–8.07,  $P < .05$ ). Severe vomiting and dehydration (54% versus 23%) was the most commonly reported health problem by women in both groups, followed by vaginal bleeding (27% versus 9%), problems with the placenta (12% versus 2%), and foetal growth retardation (12% versus 0%). Blood clots, kidney/bladder infection, and very high fever were each reported by 7% of the women in the treatment sample for each condition. Women in the comparison group were more likely to report high blood pressure (6% versus 2%). One woman in the substance-dependent group reported an incompetent cervix. None of the women in either group experienced gestational diabetes.

**4.3. Obstetric Health.** Most of the women (61%) in the substance-dependent group were in their third trimester of pregnancy at the time of being interviewed (mean 30 weeks; range: 11–40 weeks), whereas the comparison group were more likely to be in the second trimester when interviewed (mean 27 weeks; range 12–39 weeks). Seventy-five percent of the substance-dependent group and 57 percent of the comparison group had at least one prior pregnancy. Among these women, the substance-dependent group were significantly more likely to report a previous live birth (65% versus 43%,

OR 2.49, 95% CI 1.03–6.06,  $P < .05$ ) and report a previous termination (62% versus 19%, OR 6.94, 95% CI 2.59–18.57,  $P < .001$ ), compared to the comparison group. Additionally, the women in the substance-dependent group were more likely to report a previous premature delivery (14% versus 6%), a previous cesarean section (11% versus 6%), and a previous miscarriage (46% versus 28%), compared to the comparison group, but these differences were not statistically significant. One woman in each group reported they had an infant who died within the first year. None of the women in either group reported a still birth.

**4.4. Pregnancy Planning.** While the majority of the women in the comparison group (79%) reported “wanting to become pregnant,” only 29% of the women in the substance-dependent group reported the same feelings (i.e., 9 times less likely (95% CI 3.39–23.81,  $P < .001$ ). A substantial proportion of women in the comparison group reported they had not thought about becoming pregnant (49% versus 21%, OR 3.52, 95% CI 1.39–8.92,  $P < .05$ ). Whilst 22% of the women in the substance dependent group specifically stated they had not wanted to become pregnant (compared to 0% in the comparison group). Of those who had not thought about being pregnant or did not want to become pregnant (29 women in the substance-dependent group and 10 women in the comparison group), only 14% of the substance-dependent group (versus 40% comparison group) reported using birth control at the time of conception.

**4.5. Mental Health.** The substance-dependent group had poor psychosocial functioning as evidenced by the low mean scores on the SF-12. The SF-12 is standardised to have a mean of 50 and a standard deviation of 10; thus, the average scores indicate that these women are more than half a standard deviation below the population norm for mental functioning and almost one standard deviation below the population

TABLE 2: Lifetime and 1-month prevalence of substance use among substance-dependent women and comparison group.

		Substance dependent group (n = 41)	Comparison group (n = 47)	Statistical comparison OR (95% CI)
<i>ALCOHOL</i>	% Ever used	95.0	97.9	not significant
	% Used last month	22.5	48.9	0.30 (0.12–0.77)*
	Mean days used month (SD)	3.4 (2.9)	3.9 (2.3)	not significant
<i>NICOTINE</i>	% Ever used	97.6	74.5	13.70 (1.70–111.11)*
	% Used last month	78.0	4.3	80.0 (16.19–395.37)**
	Mean days used month (SD)	27.9 (6.8)	20.0 (14.1)	not significant
<i>CANNABIS</i>	% Ever used	95.1	83.0	not significant
	% Used last month	34.1	0.0	N/A
	Mean days used month (SD)	18.2 (12.6)	0	N/A
<i>HEROIN</i>	% Ever used	75.6	4.3	71.43 (14.29–333.33)**
	% Used last month	17.1	0.0	N/A
	Mean days used month (SD)	5.3 (6.9)	0	N/A
	% Ever injected	56.1	0.0	N/A
	% Injected last month	12.2	0.0	N/A
<i>AMPHETAMINE</i>	% Ever used	80.0	46.8	4.55 (1.73–11.90)*
	% Used last month	2.5	0.0	N/A
	Mean days used month (SD)	2.0 (0.3)	0	N/A
	% Ever injected	47.5	0.0	N/A
	% Injected last month	0.0	0.0	N/A
<i>COCAINE</i>	% Ever used	68.3	40.4	3.17 (1.32–7.63)*
	% Used last month	4.9	0.0	N/A
	Mean days used month (SD)	1.5 (0.7)	0	N/A
	% Ever injected	41.5	0.0	N/A
	% Injected last month	0.0	0.0	N/A
<i>BENZODIAZEPINE</i>	% Ever used	75.6	14.9	17.86 (6.06–52.63)**
	% Used last month	12.2	0.0	N/A
	Mean days used month (SD)	13.6 (15.0)	0	N/A
	% Ever injected	7.3	0.0	N/A
	% Injected last month	0.0	0.0	N/A

\* $P < .05$ .\*\* $P < .001$ .

norm for physical functioning. While the comparison group had a significantly higher SF-12 score for mental functioning, their physical functioning score was fairly comparable to the substance-dependent group. It is likely that the health effects of pregnancy account for below population norm scores on the physical functioning subscale for this group.

The mean scores for the DASS subscales show the majority of women in the substance dependent and comparison groups scored in the normal/mild range for depression (81% versus 92%, resp.), anxiety (73% versus 89%, resp.), and stress (75% versus 94%, resp.). A higher proportion of women in the substance-dependent group, compared to the comparison reported high levels of distress (thus elevating the mean score for the sample): 15% (versus 0%) of the women were rated as severe/extremely severe for depression, 10% (versus 6%) as severe/extremely severe for stress, and 10% (versus 2%) as severe/extremely severe for anxiety.

**4.6. Substance Use.** The mean age at first use of any substance was 14 years for the substance-dependent group (range: 9–20 years) and 13 years for the comparison group (range: 9–19 years). Alcohol was the drug first used by the majority of women in both the substance-dependent and comparison groups (46% versus 98%, resp.), followed by cannabis (37% versus 2%, resp.), and heroin (12% versus 0, resp.). Table 2 shows the prevalence of lifetime and recent substance use.

The women in comparison group reported no illicit drug use in the past month. Cannabis was the most prevalent illicit drug used in the past month by women in the substance-dependent group (34%). Among those women who used cannabis in the preceding month, the mean number of days used was 18, with most women using multiple times per day. Just under one fifth (17%) of the women had used heroin in the preceding month, on average once every five to six days. Benzodiazepine use was reported by 12% of

the substance dependent group; however, the majority of the women reported one dose per day which possibly reflects prescribed use. With regard to licit drug use, women in the comparison group were significantly more likely to report alcohol use in the preceding month (49% versus 23%), with most women in both groups reporting just under 4 days of alcohol use during this period. An examination of individual OTI scores revealed no evidence of binge drinking in the past month. Seventy-eight percent of the women in the substance dependent group had smoked a cigarette in the preceding month (compared with 4% of the comparison group). While the women in the substance-dependent group reported smoking more days in the past month, the women in the comparison group reported smoking more cigarettes per day (mean 13 compared to 10).

Twelve percent of the women in the substance-dependent group reported injecting heroin in the month preceding the interview, with the majority reporting this occurred once a week or less (95%). Of the women who reported injecting in the past month, half reported needle sharing on at least one occasion. Fifty-five percent of the women in the substance-dependent group had hepatitis C. The mean age at which they were first diagnosed with the disease was 22 years old. None of the women reported hepatitis B or HIV/AIDS infection.

*4.7. Exposure to Violence.* Women in the substance-dependent group were more than 3 times more likely to report being the victims of violence in the preceding twelve months, compared to the comparison group. Despite this, a small proportion of women in the comparison group reported being a victim of violence in the past year, but the context was very different to that of the substance-dependent group. The majority of women in the substance-dependent group reported the violence occurred multiple times within the year at home, and it was perpetrated by their partner. While in the comparison group, the incidences of violence reported were mostly isolated, occurring in the workplace; for example, the violence was perpetrated by a mental health patient towards a nurse.

## 5. Discussion

This study documents a broad spectrum of physical and psychosocial concerns among pregnant women with a known history of substance dependence attending a specialist antenatal clinic, and a comparison group of women attending the general antenatal clinic, of a large public hospital in Sydney. The findings indicate that while a comprehensive model of care has been implemented, this may still be inadequate to meet clinical needs of this group. The results suggest the profile of pregnant women (in specialised antenatal care for substance dependence) is one of severe disadvantage and poor health.

Many of the current pregnancies were unplanned, and there was low use of birth control practices among the women. A number of women commented that they did not think they could get pregnant. This may be related to the high

rate of menstrual dysfunction among opioid-dependent females [14, 15] and suggests that there is a need for education regarding the importance of birth control even in the context of absent or irregular menses. In addition, cost-effective strategies to increase the use of contraception in this population need to be developed and implemented. This is a complex issue, as women with substance use problems may find the daily adherence to an oral or barrier method of contraception difficult, given their often chaotic lifestyle.

Women in the substance-dependent group reported substantially higher rates of severe vomiting and dehydration compared to the comparison group. This difference may in part be explained by the fact that nausea and vomiting are direct actions of opioid drugs. While individuals stabilised on methadone with an established tolerance typically will not experience these adverse effects, an increase in dose (which may be required in pregnancy) can precipitate a recurrence [16, 17]. The majority of the women evidenced normal mental health as measured by the DASS21. This is somewhat surprising, given the high prevalence of psychiatric comorbidity consistently reported among substance use populations [18–21] but may be a reflection of the level of care the women received through this antenatal clinic. However, a proportion of the women in this study continued to report severe levels of psychological distress. This is of significant concern, given that psychological distress is associated with an increased risk for low birth weight and preterm delivery [2, 22] as well as an increased risk for maternal depression in the postpartum period [23].

Exposure to violence is also a significant concern for a proportion of the women in this sample, especially as partners were the predominant perpetrators of the violence for women in the substance-dependent group, and many of these women may continue in these relationships following the birth. This has a number of implications for the well-being of both mother and infant in the longer term, as the risk for a range of adverse outcomes, such as child maltreatment and homelessness, are strongly associated with family violence [24, 25]. Additionally, physical violence has been found to be an independent risk factor for low birth weight infants, possibly mediated by the impact of maternal stress on foetal development [26]. Studies examining violence, psychological stress, and depression show there is significant interplay between these factors, suggesting that concurrent management of these issues is warranted [5]. Almost all the women in the substance-dependent group were interviewed in their last trimester of pregnancy, and most had been attending the specialist antenatal clinic since early in their second trimester. The continued use of illicit drugs within this context is disquieting and underscores the chronic nature of substance dependence.

Whilst the proportion of women who had used heroin in the past month was relatively low, most had used the drug regularly and almost all had injected it. Whilst pregnancy is commonly thought to be associated with positive changes in substance use in the general population, it may not have the same impetus among women with severe substance dependence. Why is it that these rates of drug use are reported among women attending a specialist antenatal clinic

designed specifically for them? It is possible the women are reticent to disclose ongoing drug use to clinic staff for fear of notification to child protection authorities. This suggests that screening for substance use during pregnancy among women already receiving drug treatment may need to be reviewed. In particular, nicotine use has been associated with an increased risk for use of other substances [27] and could be seen as a flag for a more detailed inquiry of substance use throughout the pregnancy. This could be coupled with information and advice regarding the supportive role that child protection agencies and health service providers can have in ensuring the long-term well-being of both the women and their infants.

In addition, the substantially high rates of nicotine use are of a concern considering the adverse health effects which are consistently identified for both mother and foetus including pregnancy complications and poor birth outcomes (e.g., placental abruption, low birthweight, neonatal death, and preterm birth [28, 29]). Women in the substance-dependent group were smoking on average 10 cigarettes per day (less than the comparison group), indicating they may have been aware of such adverse effects and have tried to cut down but find it extremely difficult to quit. The findings imply the dependence severity of nicotine is severe, with research suggestive that the addictive properties of nicotine are comparable to other illicit drug types [30, 31]. In addition, a recent Cochrane review suggests alternative interventions (i.e., providing incentives through use of vouchers or financial rewards) should be considered [32]. This suggestion seems particularly salient among at risk groups, as it is likely that the high cost of nicotine-replacement therapies make them inaccessible to disadvantaged groups within the community.

Of concern is the finding that just under half of the women in the comparison group reported alcohol use in the past month, with the majority reporting alcohol use on average once a week. Current Australian and international guidelines recommend that no alcohol during pregnancy is the safest option [33], as a threshold for negative effects on the neonate are yet to be determined. The results combined with anecdotal reports from the women that they received conflicting advice from doctors supports previous findings that there is a lack of knowledge about the risks to the foetus and uncertainty regarding safe levels of alcohol use in pregnancy [34, 35]. More research is required to ease uncertainty, and public health campaigns would assist in educating women about the risks of alcohol use in pregnancy.

A number of limitations require mentioning. First, this study relied on retrospective self-report. Reluctance to answer sensitive questions such as substance use and exposure to violence may have resulted in an underestimate of these problems. Studies comparing urine toxicology and self-report measures of substance use have shown that this is likely for illicit but not licit substances [31]. Secondly, the study is based on a conservative sample of pregnant women who are engaged in health care and who consented to being interviewed. The recruitment process was difficult and protracted (approximately 18 months). It is possible that the more chaotic women declined to participate (possibly due to fears that child protection services would become involved),

and therefore, the study findings are likely to be an underestimate of the extent of psychosocial and physical health problems associated with substance dependence in pregnancy. Finally, the study utilised a sample of pregnant women attending a specific substance use antenatal clinic in a large inner metropolitan hospital; the results, therefore, may not be applicable to all substance-dependent pregnant women. All women in the substance-dependent group had a history of problematic substance use, and it should be noted as a limitation that not all women were currently receiving pharmacotherapy treatments. This may have influenced some of the results related to mental health and antenatal care outcomes.

## 6. Conclusions

These limitations notwithstanding, the findings of the present study highlight the need to look beyond the neonatal impact of substance use during pregnancy and consider both neonatal and maternal indices of well-being. Maternal and infant health is interdependent; in order to achieve the best outcomes for infants, improvements in antenatal care are required to address the complexity of physical and psychosocial problems in the mother. In particular, there is a need to further develop comprehensive and integrated strategies that address (1) the complex interplay between interpersonal violence, psychological stress, low mood, and substance use, (2) the continued use of substances commonly perceived by substance-dependent persons to be less problematic (i.e., nicotine and cannabis), and (3) the poor understanding of female reproductive health and limited use of contraception. These health concerns are readily treatable. What is lacking is a coordinated approach that targets multiple problems within a single intervention. More specifically, the women reported difficulties in accessing health care suggesting that a more coordinated and flexible model of care may be warranted to both engage and maintain an effective line of care and treatment.

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## Research Article

# Pregnant and Nonpregnant Women in Cape Town, South Africa: Drug Use, Sexual Behavior, and the Need for Comprehensive Services

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The multiple risks associated with methamphetamine use are of serious concern for women. These risks and consequences are magnified during pregnancy. This secondary analysis of a parent study compared 26 pregnant to 356 nonpregnant women in Cape Town, South Africa, on selected demographic, psychosocial, and HIV-risk domains to identify their treatment service needs. Proportionally, more pregnant than nonpregnant women are using methamphetamine,  $P = .01$ , although a very high rate of women used methamphetamine. Women reported similar monthly rates of sexual intercourse, but pregnant women were significantly less likely to report condom use,  $P < .0001$ , maintaining their risky behavior. Both groups reported elevated Center for Epidemiological Studies Depression Scale CES-D means, suggesting a need for depression treatment. Results demonstrate a pervasive need for women's comprehensive treatment, regardless of pregnancy status. Moreover, findings support the urgent need for women-focused and pregnancy-specific treatment services for methamphetamine use. Finally, a job-skills training/employment component focus is suggested.

## 1. Introduction

Cape Town, South Africa is experiencing a devastating level of methamphetamine use, with an estimated 7% of the adult population reporting the use of this drug [1, 2] (locally referred to as "tik"). While methamphetamine use is cause for concern in both sexes, South African social history and structure may provide a context that makes women, especially women of color who live in the township communities, Black (African and Xhosa-speaking) and Coloured (mixed racial ancestry and Afrikaans-speaking), vulnerable to intersecting risks [1–4]. If the woman remains untreated for her methamphetamine use, and then gets pregnant, the adverse consequences are likely to be exacerbated by continued drug use.

Not only is dependence a danger for both pregnant and nonpregnant South African women who use methamphetamine, but use also increases risk of exposure to sexual

risk behavior, sexual violence, and HIV, which co-occur with methamphetamine use [3–7].

Similar to the use of other substances, women typically begin using methamphetamine before they become pregnant. Once pregnant, they are often unable to stop using. In South Africa, women who live in poor communities do not usually seek antenatal care, are not very informed about drug treatment, are afraid of stigma from health care providers, and are especially vulnerable to drug-related sexual risk behaviors [7–9]. In addition to the maternal vulnerabilities associated with methamphetamine misuse, prenatal stimulant exposure has been associated with full-term birth but small gestational age [10], a risk factor for later developmental problems [11].

In Black and Coloured women in South Africa, the intersection of drug use, particularly methamphetamine use, HIV risk behaviors, and unplanned pregnancy must be addressed to improve the lives of these women and their

children. Facing a methamphetamine epidemic, Cape Town is especially challenged with how to best reduce drug use in childbearing-age women who often do not enter formal drug treatment services.

To develop effective women-specific drug treatment services designed to meet the particular needs of South African women, it is necessary to first examine the presenting issues that pregnant and nonpregnant drug users face. This secondary analysis of a parent study addresses this need by examining the baseline characteristics of pregnant and nonpregnant female drug users who signed informed consent to participate in an adapted evidence-based women-focused HIV behavioral intervention: the Western Cape Women's Health CoOp. Specifically, we compared pregnant and nonpregnant women on a priori selected baseline variables that were collected as a part of the main study. These baseline variables encompassed demographic, psychosocial, and HIV-risk domains to identify their shared and unique profiles of service needs.

## 2. Methods

**2.1. Parent Study.** The Western Cape Women's Health CoOp is an on-going community-based randomized control trial in Cape Town, South Africa that compares the effectiveness of a women-focused HIV behavioral intervention empowering women to reduce substance use, sexual risk, and victimization relative to two control conditions. The Western Cape Women's Health CoOp intervention was adapted from the original North Carolina Women's CoOp (an HIV intervention) that focused on empowering women to reduce their drug use and sexual risk behaviors [12]. The original Women's CoOp was culturally adapted for use among vulnerable sex-trading women in Pretoria, South Africa, to include a component on drug-related gender-based violence that focused on addressing sexual risk among vulnerable South African women [13]. Further changes in Cape Town for vulnerable women were piloted for group process [4].

**2.2. Recruitment.** Recruitment for study participation involved outreach that was conducted in targeted communities, namely, poor, mainly Black and Coloured communities surrounding the airport in Cape Town. A detailed sampling plan took into account the number of inhabitants of each community to help calculate the desired number of women to be recruited from that community. A targeted sampling plan was used to balance recruitment communities (i.e., outreach zones), and field staff worked in pairs to recruit study participants. Staff canvassed these streets and local hang-out spots frequented by women who use alcohol and other drugs and posted fliers and distributed leaflets to market the study. The field staff then approached and engaged women and verbally requested permission to administer a brief screening instrument to determine whether they were eligible to participate in the study. Recruitment began in September 2008 and ended in January 2011.

**2.3. Participants.** To be eligible, participants had to provide informed consent, be female and between the ages of 18 and

33, live in one of the target communities, report using at least two drugs once per week for the past 3 months, and report being sexually active with a male partner in the past month. At the time this smaller secondary study was conducted, a total of 382 participants were randomized into one of the study conditions, and their data are included in this analysis. Based on a pregnancy test administered at study entry, it was determined that 26 women were pregnant while 356 women were nonpregnant.

**2.4. Measures.** The Western Cape Women's Health CoOp Revised Risk Behavior Assessment (RRBA), adapted from the RRBA [14] was administered at study entry via computer-assisted participant interviews. The RRBA has 10 sections that contain questions about demographics and social characteristics, nutrition/health knowledge, alcohol use, drug use, drug injecting, sexual behavior, power and empowerment, conflict and victimization (stigma and vulnerability), obstetrical/physical/mental health, and HIV. The 20-item Center for Epidemiological Studies Depression Scale (CES-D) was used to determine the depressive symptom intensity experienced by these women [15, 16]. The CES-D also has been validated in Cape Town, South African women. Scores range from 0 to 60. A score of 16 in the United States and in South Africa indicates high risk for clinical depression [16, 17]. Pregnancy and self-reported drug use were confirmed with urine testing.

**2.5. Statistical Analysis.** Welch's *t* test assuming unequal population variances and Satterthwaite's approximation for degrees of freedom was employed to analyze the continuous outcome measures. Because the sample sizes in the cells was disproportionate, and sometimes small for the pregnant women, the cross-tabulation tables were therefore sparse, so exact test statistics were used to conduct the goodness-of-fit tests for the categorical outcomes.

## 3. Results

**3.1. Participant Characteristics.** The total sample (Table 1) was predominantly Coloured (63.6%), in their early 20s, single, and having completed, on average, less than the 12 years required for graduation from high school. While few of the women were employed (9.7%), more than three-quarters indicated that they have skills for employment. They had, on average, two children living with them. More than 1/3 had spent time in prison. Finally, the elevated mean score on the CES-D would strongly suggest that a substantial percentage of these women were currently experiencing significant depressive symptoms.

**3.1.1. Alcohol and Drug Use.** Table 1 shows that past-month drug use differed by pregnancy status only for methamphetamine ("tik") use, with a larger proportion of pregnant than nonpregnant women reporting methamphetamine use (92.3% versus 66.9%;  $P = .01$ ). Use of alcohol (91.7%) and marijuana, or "dagga," (73.6%) was reported by an overwhelming majority of both groups. In contrast, both

TABLE 1: Demographic and Background Characteristics of Pregnant and Nonpregnant Women (N = 382).

Measure	Total sample (N = 382)	Pregnant women (n = 26)	Nonpregnant women (n = 356)	Test statistic (t(df) or $\chi^2(df)$ )	P
Mean (SD) or n (%) or n/N (%)					
<i>Demographics and Social characteristics</i>					
Age	23.1 (4.2)	22.7 (3.6)	24.3 (4.3)	t(30) = -2.22	.03
Race					
Black	139 (36.4%)	5 (19.2%)	134 (37.6%)	$\chi^2(1) = 3.55$	.09
Coloured	243 (63.6%)	21 (80.8%)	222 (62.4%)		
Mean years of education completed	9.3 (1.9)	9.0 (2.2)	9.3 (1.9)	t(28) = -0.69	.49
Marital status					
Single	353 (92.4%)	24 (92.3%)	329 (92.4%)	$\chi^2(1) = 0.00$	1.0
Married	29 (7.6%)	2 (7.7%)	27 (7.6%)		
Have a main sexual partner	359 (94.0%)	24 (92.3%)	335 (94.1%)	$\chi^2(1) = 0.14$	.66
<i>Economic status</i>					
Employed	37 (9.7%)	0 (0.0%)	37 (10.4%)	$\chi^2(1) = 3.00$	.16
Have skills for employment	290 (75.9%)	20 (76.9%)	270 (75.8%)	$\chi^2(1) = 0.02$	1.0
Mean number of children living with participant	2.0 (1.7) (n = 351)	2.1 (1.1) (n = 17)	2.0 (1.7) (n = 325)	t(20) = 0.05	.96
<i>Legal history</i>					
Ever spent time in prison	142 (37.2%)	9 (34.6%)	133 (37.4%)	$\chi^2(1) = 0.08$	.84
<i>Violence exposure</i>					
Ever been physically hurt	171 (44.8%)	8 (30.8%)	163 (45.8%)	$\chi^2(1) = 2.21$	.16
Ever forced to perform sexual acts	89 (23.3%)	6 (23.1%)	83 (23.3%)	$\chi^2(1) = 0.001$	1.0
<i>Risk factors for substance abuse</i>					
Depressive symptom severity: mean CES-D score in past week	28.4 (12.2)	29.7 (9.9)	29.4 (12.2)	t(31) = 0.16	.87
Family members use drugs and/or alcohol too much	289 (75.7%)	22 (84.6%)	267 (75.0%)	$\chi^2(1) = 1.22$	.35
Maternal history of alcohol use	183 (47.9%)	12 (46.2%)	171 (48.0%)	$\chi^2(1) = 0.03$	1.0
During the past 30 days, did your main partner get drunk	211/359 (58.8%)	13/24 (54.2%)	198/335 (59.1%)	$\chi^2(1) = 0.23$	.67
During the past 30 days, did your main partner use drugs	232/359 (64.6%)	13/24 (54.2%)	219/335 (65.4%)	$\chi^2(1) = 1.23$	.28
<i>Alcohol and drug use and drug injecting</i>					
Methamphetamine (tik) use	262 (68.6%)	24 (92.3%)	238 (66.9%)	$\chi^2(1) = 7.29$	.01
Drink alcohol	341/372 (91.7%)	23/26 (88.5%)	318/346 (91.9%)	$\chi^2(1) = 0.38$	.47
How often do you drink alcohol	(n = 372)	(n = 26)	(n = 346)		
Never	31 (8.3%)	3 (11.5%)	28 (8.1%)		
Monthly or less	90 (24.2%)	4 (15.4%)	86 (24.9%)		
2-4 times per month	101 (27.2%)	12 (46.2%)	89 (25.7%)	$\chi^2(4) = 6.26$	.14
2-3 times per week	114 (30.7%)	5 (19.2%)	109 (31.5%)		
4 or more times per week	36 (9.7%)	2 (7.7%)	34 (9.8%)		
Marijuana (dagga) use	281 (73.6)	17 (65.4%)	264 (74.2%)	$\chi^2(1) = 0.96$	.36
Rock use	12 (3.1%)	1 (3.8%)	11 (3.1%)	$\chi^2(1) = 0.05$	.58
Cocaine use	2 (0.5%)	0 (0%)	2 (0.6%)	$\chi^2(1) = 0.15$	1.0

TABLE 1: Continued.

Measure	Total sample (N = 382)	Pregnant women (n = 26)	Nonpregnant women (n = 356)	Test statistic (t(df) or $\chi^2(df)$ )	P
Heroin use	13 (3.4%)	0 (0%)	13 (3.7%)	$\chi^2(1) = 0.98$	1.0
Mandrax (white pipe) use	98 (25.7%)	8 (30.8%)	90 (25.3%)	$\chi^2(1) = 0.38$	.50
Ever injected	3 (0.8%)	0 (0%)	3 (0.84%)	$\chi^2(1) = 0.22$	1.0
Participant thinks she has an alcohol problem	52 (13.6%)	2 (7.7%)	50 (14.0%)	$\chi^2(1) = 0.83$	.55
Participant thinks she has a drug problem	244 (63.9%)	16 (61.5%)	228 (64.0%)	$\chi^2(1) = 0.07$	.83
<i>Drug treatment history</i>					
Ever been to drug treatment	34 (8.9%)	3 (11.5%)	31 (8.7%)	$\chi^2(1) = 0.24$	.72
<i>Reasons for not entering drug Treatment</i>					
Drug treatment does not work	100/348 (28.7%)	7/23 (30.4%)	93/325 (28.6%)	$\chi^2(1) = 0.03$	.82
Participant does not know where to go for treatment	95/349 (27.2%)	2/23 (8.7%)	93/326 (28.5%)	$\chi^2(1) = 4.27$	.05
Lack the money to pay for treatment	69/349 (19.8%)	2/23 (8.7%)	67/326 (20.6%)	$\chi^2(1) = 1.9$	.28
<i>Nutrition</i>					
Frequency of going without food					
Never	127 (33.3%)	6 (23.1%)	121 (34.0%)	$\chi^2(3) = 1.36$	.64
Less than once a month	87 (22.8%)	7 (26.9%)	80 (22.5%)		
Less than once a week	73 (19.1%)	6 (23.1%)	67 (18.8%)		
Every week	95 (24.9%)	7 (26.9%)	88 (24.7%)		
<i>Obstetrical status</i>					
Now pregnant	26 (6.8%)				
Seek prenatal care		19 (73.1%)			
Received prenatal care		9 (34.6%)			
Use of methamphetamine (tik) while pregnant					
Never used		2 (7.7%)			
Stopped		0 (0%)			
Reduced		16 (61.5%)			
Same		7 (26.9%)			
Increased		1 (3.9%)			
Use of alcohol while pregnant					
Never used		2 (7.7%)			
Stopped		9 (34.6%)			
Reduced		10 (38.5%)			
Same		5 (19.2%)			
Use of marijuana (dagga) while pregnant					
Never used		5 (19.2%)			
Stopped		3 (11.5%)			
Reduced		13 (50.0%)			
Same		4 (15.4%)			
Increased		1 (3.9%)			

Notes. Probability values for  $\chi^2$  tests of significance are based on exact methods. Percentages are within their respective sample.

TABLE 2: Sexual behavior of pregnant and nonpregnant women ( $N = 382$ ).

Measure	Total sample ( $N = 382$ )	Pregnant women ( $n = 26$ )	Nonpregnant women ( $n = 356$ )	Test statistic ( $t(df)$ or $\chi^2(df)$ )	$P$
Last sex was with a man	374 (97.9%)	26 (100%)	348 (97.8%)	$\chi^2(1) = 0.60$	1.0
At last sex act, participant used drugs or alcohol use before or during sex	202 (52.9%)	11 (42.3%)	191 (53.7%)	$\chi^2(1) = 1.25$	.31
Mean age at first vaginal sex	16.2 (2.73)	16.2 (1.63)	16.3 (2.95)	$t(38) = -0.19$	.85
First vaginal sex was willing	307 (80.4%)	22 (84.6%)	285 (80.1%)	$\chi^2(1) = 0.32$	.80
Condom used first time	117 (30.6%)	12 (46.2%)	105 (29.5%)	$\chi^2(1) = 3.17$	.08
Past 30 day sex with main partner	349/359 (97.2%)	24/24 (100%)	325/335 (97.0%)	$\chi^2(1) = 0.74$	1.0
Mean of sex partners in past 30 days	1.29 (2.0)	1.11 (0.4)	1.36 (2.4)	$t(199) = -1.57$	.12
Mean times of sex with main partner in past 30 days	8.09 (6.90)	6.04 (7.96)	8.24 (6.81)	$t(25) = -1.29$	.25
Mean times of condom use with sex with main partner in past 30 days	1.93 (4.29)	0.26 (0.92)	2.04 (4.40)	$t(129) = -5.75$	<.0001
Drugs and alcohol leads to sex risk	84 (22.0%)	7 (26.9%)	77 (21.6%)	$\chi^2(1) = 0.40$	.62
Trading sex for money in past 6 months	31/58 (53.5%)	3/5 (60%)	28/53 (52.8%)	$\chi^2(1) = 0.09$	1.0
Trading sex for drugs in past 6 months	23/58 (39.7%)	1/5 (20.0%)	22/53 (41.5%)	$\chi^2(1) = 0.88$	.64
Last time had sex:					
48 hrs	123 (32.2%)	10 (38.5%)	113 (31.7%)		
3–7 days	157 (41.1%)	11 (42.3%)	146 (41.0%)	$\chi^2(2) = 0.93$	.89
In last 8–30 days	102 (26.7%)	5 (19.2%)	97 (27.3%)		
At last sexual encounter the woman participant was willing	368 (96.3%)	26 (100%)	342 (96.0%)	$\chi^2(1) = 1.06$	.61

Note. Probability values for  $\chi^2$  tests of significance are based on exact methods.

groups reported infrequent use of most other drugs, including heroin and cocaine. Almost two-thirds of the sample indicated they believed they had a drug problem; only a small percentage of the sample reported they had an alcohol problem. These statements appear equally true for both the pregnant as well as the nonpregnant sample.

**3.1.2. Sexual Behavior.** Almost all participants had a main sex partner (Table 1). Table 2 reveals that more than half the sample had used drugs or alcohol before or during sex, and that more than half had traded sex for money, and more than one-third had traded sex for drugs in the past 30 days. The mean number of sex partners in the past 30 days was quite low (1.29 (SD = 2.0)), although more than two-thirds indicated they had engaged in sex with a casual partner. While over 90% of both groups reported having sex with their main partner in the past month, pregnant women reported fewer times of condom use in the past month than did nonpregnant women (.26 versus 2.04,  $P < .0001$ ).

In the pregnant sample, only 34.6% of women received prenatal care, although 73.1% sought such care (Table 1). However, it should be noted that a self-report of receipt

of prenatal care could include as little as setting up a delivery date. More than 50% of the women indicated that they had reduced or stopped their alcohol, dagga, and methamphetamine use; however, clinically concerning percentages of women were still using these substances during pregnancy (Table 1). This statement is particularly true for methamphetamine, for which more than 30% of the pregnant sample reported that their use of methamphetamine was the same frequency or more frequent than before they became pregnant.

**3.1.3. Needs Assessment.** Table 3 indicates that the most requested services included services in the areas of employment (86.7%), financial assistance (82.5%), and housing (68.3%); medical (53.4%), transportation (48.4%), alcohol/drug services (47.6%), school (45.8%), and HIV/STD testing (42.9%) all hover around 50%. Approximately one-quarter of the sample expressed a need for sexual abuse and/or legal assistance services. Mental health assistance was least requested (19.1%). Finally, it should be noted that a greater proportion of pregnant than nonpregnant women wanted educational assistance (65.4% versus 44.4%;  $P = .04$ ).

TABLE 3: Areas in which participants expressed a need for a social service ( $N = 382$ ).

Measure	Total sample ( $N = 382$ )	Pregnant women ( $n = 26$ )	Nonpregnant women ( $n = 356$ )	$\chi^2$	$P$
<i>Service area</i>		<i>n (%)</i>			
Employment	331 (86.7%)	21 (80.8%)	310 (87.1%)	0.83	.37
Financial assistance	315 (82.5%)	19 (73.1%)	296 (83.2%)	1.70	.19
Housing	261 (68.3%)	17 (65.4%)	244 (68.5%)	0.11	.83
Medical	204 (53.4%)	15 (57.7%)	189 (53.1%)	0.21	.69
Transportation	185 (48.4%)	12 (46.2%)	173 (48.6%)	0.06	.84
Alcohol/drug services	182 (47.6%)	10 (38.5%)	172 (48.3%)	0.94	.42
School	175 (45.8%)	17 (65.4%)	158 (44.4%)	4.31	.04
HIV/STD testing	164 (42.9%)	8 (30.8%)	156 (43.8%)	1.68	.22
Child care	113 (29.6%)	7 (26.9%)	106 (29.8%)	0.09	.83
Sexual abuse	99 (25.9%)	4 (15.4%)	95 (26.7%)	1.61	.25
Legal assistance	93 (24.4%)	5 (19.2%)	88 (24.7%)	0.40	.64
Mental health	73 (19.1%)	2 (7.7%)	71 (19.9%)	2.35	.19

Notes.  $df = 1$  for all  $\chi^2$  tests of significance. Probability values are based on exact methods.

#### 4. Discussion

The study has several major findings. First, there is the concerning rate of methamphetamine use among pregnant women compared with nonpregnant women. The fact that over 90% of the pregnant women reported recently using methamphetamine is consistent with another recent study in Cape Town, which showed that among a group of pregnant women who smoked tobacco, up to 78% reported methamphetamine use [18]. These results are also consistent with other reports of high rates of methamphetamine use observed in Cape Town among the general population, its women, and its out-of-school young women between 13 to 20 years old [4, 8]. Taken together, the past and current data highlight the urgent need to develop and implement effective women-focused interventions to reduce this epidemic. The high rate of methamphetamine use among pregnant women may also be a reflection of the relationship between methamphetamine use and sexual risk behavior, which can result in pregnancy. On a positive note, the majority of the pregnant women made attempts to reduce their drug use after learning that they were pregnant, which is an encouraging sign. However, more than 30% of the pregnant sample either used at the same level or increased use of methamphetamine. Given the potentially adverse impact of stimulants on fetal brain development, particularly in the context of multiple environmental risk factors, there is a clear need for prevention initiatives in the Western Cape of South Africa, similar in scope and focus to efforts for informing the public about fetal alcohol spectrum disorders.

The second major finding of this secondary analysis is the pervasive need for comprehensive treatment for pregnant Black and Coloured women in Cape Town, South Africa. Although these women have myriad needs, the pregnant women in this sample necessarily required medical and obstetrical care. The literature from South Africa suggests that over the 16 years since National Health System has

provided free antenatal and intrapartial care to all uninsured women, many women have not been accessing or have been underutilizing care before delivery [19]. The reasons underlying this underutilization are complex and include structural barriers (e.g., inconvenient hours of clinic operation, inability to take time off from work, too long a wait to be seen, lack of child care, and/or transportation); relationship issues (e.g., unstable relationship with the father of the baby); psychological factors (e.g., unwanted pregnancy, pregnancy denial); lack of education as to the need for prenatal health care; negative interactions with the medical professionals [20–24]. The current findings, in context with the prior literature, suggest that women want medical care as well as drug and alcohol treatment, yet interventions must be implemented where they can be reached and at multiple levels to concurrently address the structural barriers to care, improve the actual care these women receive, and reduce the perceived and actual stigma and discrimination the women feel and encounter.

The third finding of note is that the pregnant women had a lower rate of condom use than did the nonpregnant women. This result suggests that a significant proportion of methamphetamine-using Black and Coloured women consider condoms to serve the primary role of birth control rather than of disease prevention. If this conclusion is supported by future research, community outreach efforts need to be made to educate this high-risk population regarding the crucial role that condoms can play in HIV/sexually transmitted infection prevention.

Finally, it is notable that these women made a clear distinction between mental health services and alcohol/drug services. Fewer than 1 in 5 women expressed a need for mental health services, despite the CES-D mean score being almost twice that of the clinical cutoff used previously in low-income US and South African women. Although increased depressive symptoms are associated with being of color, lower educational attainment, and low income; having

substandard living conditions; living in stressful neighborhoods; possibly, lacking support of a partner [17], this finding underscores the need for intervention to ameliorate the symptoms of depression while concurrently treating drug addiction.

In contrast to the low self-reported need for mental health services, almost 1 in 2 women expressed a need for alcohol/drug services. Moreover, the most pressing needs expressed were for economic support, with more than three-quarters of the women wanting employment and financial aid; housing only slightly trailed the former two needs. These conclusions appear to be equally valid for the pregnant women as for the nonpregnant women.

## 5. Study Limitations

As with all studies, the present study has its limitations. First, it involved a preliminary and secondary analysis to the aims from ongoing larger Western Cape Women's Health CoOp project, which has a focus on HIV prevention that is different from the present project. Thus, the inclusion and exclusion criteria of the parent project may have adversely impacted the ability to recruit a representative sample of Black and Coloured South African women. Second, the extent to which these results generalize to the larger population of Black and Coloured South African women is unknown. Third, because the primary focus of the parent project was not pregnancy and substance use, the number of respondents who were pregnant was relatively low in comparison to the size of the nonpregnant sample. Fourth, the RRBA was focused on collecting a wide variety of information, not all of which was maximally relevant to pregnant women. Despite the limitations, the findings provide considerable initial information on the similarities and unique issues for pregnant and nonpregnant Black and Coloured South African women.

## 6. Conclusions

Study findings strongly support two conclusions. First, the widespread use of methamphetamine in pregnant Black and Coloured South African women indicate an urgent need for the development and implementation of comprehensive treatment programs to address methamphetamine use (as well as other co-occurring substance use) in these women. Second, findings suggest that both common and unique issues between pregnant and nonpregnant women must be addressed when developing and adapting comprehensive treatments for substance-using Black and Coloured South African women of childbearing age. Notably, the dismal circumstances that impact the health and well-being of many of these women (and their children) are unlikely to change until they are provided with women-centered medical and obstetrical care and drug treatment. Moreover, programs should include employment or job-skills training so that these women can break the cycle of trading sex for money and drugs.

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## Research Article

# Initial Feasibility of a Woman-Focused Intervention for Pregnant African-American Women

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African-American women who use crack are vulnerable to HIV because of the complex social circumstances in which they live. Drug-abuse treatment for these women during pregnancy may provide time for changing risk behaviors. This paper examines the initial 6-month feasibility of a women-focused HIV intervention, the Women's CoOp, adapted for pregnant women, relative to treatment-as-usual among 59 pregnant African-American women enrolled in drug-abuse treatment. At treatment entry, the women were largely homeless, unemployed, practicing unsafe sex, and involved in violence. Results indicated marked reductions in homelessness, use of cocaine and illegal drugs, involvement in physical violence, and an increase in knowledge of HIV from baseline to 6-month followup for both conditions. Findings suggest that the Women's CoOp intervention could be successfully adapted to treat this hard-to-reach population. Future studies should examine the efficacy of the pregnancy-adapted Women's CoOp for women not enrolled in drug-abuse treatment.

## 1. Introduction

The risk of contracting HIV is one of the most devastating health threats African-American women who use crack cocaine face. HIV prevalence rates among African-American women range from a low rate of 1.7% among noninjecting drug users who do not trade sex to a high rate of 54% among homeless African-American women, many of whom trade sex for drugs and survival items [1–5]. Crack cocaine use also has been repeatedly associated with increased sexual activity; if the sex is unprotected, unplanned pregnancies and HIV can result [6, 7].

African-American women who use crack are vulnerable to HIV because of the complex social circumstances in which they live. These social circumstances may produce situations where these women engage in multiple high-risk HIV behaviors [8]. Furthermore, the combination of crack, alcohol use, and sexual-risk behaviors (e.g., trading sex for drugs or survival items, inconsistent condom use, multiple

partners) place African-American women at greater risk for HIV infection than other drug-using groups [9].

Many of these crack-using African-American women lack self-sufficiency, rely on public assistance for long durations, are often unstably housed, experience repeated episodes of homelessness, have no or scanty employment records, lack education and job skills, and live in poverty [9–15]. The lives of substance-using African-American women also are often characterized by inflicting or being a victim of violence, crime, childhood and current sexual, physical, and emotional victimization, as well as symptoms of anxiety, depression, and posttraumatic stress disorder [9, 16–18].

Many of these African-American women's struggles against social, cultural, and economic subordination include survival strategies that have the burden of drug use, sexual risk, HIV risk, homelessness, and violence [19]. In the context of this inequality, many impoverished African-American women also face unplanned pregnancies [20] and poor pregnancy outcomes [21]. In all but the rarest cases, licit

and illicit substance-use starts well before pregnancy [22]. Drug use during pregnancy is associated with a multitude of adverse maternal, fetal, and neonatal outcomes, which occur in the context of poverty and psychosocial and environmental concerns. Substance-using pregnant African-American women tend to have completed approximately 11 years of education, be unmarried, have a history of substance-use in their families, have a history of physical and sexual victimization, have significant health and/or mental health problems (e.g., depression and/or anxiety), have current problems with criminal justice, have current and/or past involvement with Child Protective Services, lack stable housing, and be unemployed with poor vocational training [23–26]. As such, pregnant African-American women with substance use disorders are a very vulnerable population with meager support networks and few, if any, resources [27]. Yet they are often the targets of prejudicial and judgmental treatment by health care providers and coercive policies implemented by child welfare systems, juvenile/family courts, and the criminal justice system [28, 29].

These barriers frequently deter African-American women with substance-use disorders from seeking concurrent prenatal care and substance use disorder treatment. The social, cultural, and economic subordination that African-American women face set the stage for a lack of prenatal care and an array of medical and obstetrical complications, reducing the chances of a healthy pregnancy outcome regardless of the effects of the drug(s) they are abusing. These adverse effects can be even further compounded if the pregnant woman has HIV. Thus, African-American women who are using crack cocaine are in critical need of an effective HIV risk-reduction intervention that acknowledges the multiple adverse influences in their lives, addresses their specific barriers to success, and empowers them to make positive choices in their lives for themselves and their children.

The most effective HIV risk-reduction interventions for women are based on social psychological theory and are women-focused, culturally sensitive, and incorporate women-only sessions led by peers [30]. The Women's CoOp is an intervention that has resulted in HIV-risk behavior reduction in African-American women, and it has shown consistent reductions in homelessness and increases in employment as well as in condom use [30]. Given these improvements in risk behavior among nonpregnant African-American women, it was important to see if this intervention could be adapted for pregnant African-American women who, once pregnant, are at increased vulnerability for the consequences of HIV risk behavior, violence, homelessness, and unemployment [31].

**1.1. Purpose of the Present Study.** The purpose of the study is twofold. First, we will describe the multifaceted HIV risk behaviors and the psychosocial service needs of a sample of African-American pregnant women enrolled in drug-abuse treatment. Second, we will examine the initial feasibility of an adapted women-focused HIV intervention, Women's CoOp for Pregnant African-American Women,

relative to treatment-as-usual for drug-abusing, pregnant African-American women in treatment. The intervention and the process to adapt it are described elsewhere [31]. This paper summarizes the results of the 6-month outcomes, the final time point of evaluation.

## 2. Methods

**2.1. Study Design.** A small-scale randomized clinical trial with pregnant African-American women in drug-abuse treatment was begun in May 2007 to measure the feasibility of the Women's CoOp for Pregnant African-American Women intervention relative to treatment-as-usual in multiple areas (e.g., substance abuse, HIV risk, homelessness, employment, intimate partner violence, and birth outcomes). This study was approved by the IRB of RTI International. Because the procedures of this study have been reported elsewhere [31]; a full summary of procedures is not provided here.

**2.2. Outreach.** Participants were recruited through targeted outreach, regional drug treatment centers, radio advertisements, and referrals from health department officials in North Carolina. Any out-of-treatment women were first referred to drug-abuse treatment. After drug-abuse treatment entry, these women could be enrolled in the study.

**2.3. Eligibility Criteria.** Eligibility criteria included being female, at least 18 years of age, self identified as Black/African-American, at least 14 weeks and not more than 32 weeks pregnant (pregnancy determined by urine testing and self reported gestational age based upon last menstrual period), and currently enrolled in a drug-abuse treatment program. Participants also needed to self-report use of an illicit drug within the past year. Additional eligibility criteria included being willing and with the cognitive capacity to provide written informed consent and being willing to provide verifiable locator information for followup assessments [31].

**2.4. Recruitment.** Women were recruited between May 2007 and February 2009. In total, 96 women were screened for the study, of whom 37 were found to be ineligible, including treatment refusals ( $n = 23$ ), lack of self-reported use of any illicit drug in the past year ( $n = 21$ ), outside the gestation window ( $n = 12$ ), and not being pregnant ( $n = 6$ ). Thus, 59 women from 11 different drug-abuse treatment programs were randomized into one of two study conditions, either the Women's CoOp for Pregnant African-American Women ( $n = 30$ ) or treatment-as-usual ( $n = 29$ ) after their baseline assessment [31].

**2.5. Data Collection.** At both baseline and followup assessments, participants were asked to complete a urine drug screen for methamphetamine, amphetamine, cocaine, heroin, marijuana, and ecstasy and an audio computer-assisted self-interview (ACASI) that included demographic (baseline only) and health-related questions regarding substance use, sexual-risk behaviors, experiences with violence,

and prenatal care [31]. Followup interviews were then collected at 3 months (data not analyzed or shown due to amount of missing data) and 6 months following baseline assessment, at which time 85% of the sample was assessed.

## 2.6. Intervention Conditions

**2.6.1. The Women's CoOp for Pregnant African-American Women.** The Women's CoOp for Pregnant African-American Women in drug-abuse treatment was developed from the original Women's CoOp that focuses on preventing HIV through drug use and sexual-risk reduction, improving relationships with men and social support, and receiving HIV testing [30]. Behavioral skills training (e.g., male and female condom demonstration and practice), roleplay to improve negotiation and communication skills, and personalized risk-reduction plans are key elements of the intervention [30]. Women's CoOp for Pregnant African-American Women retained the core elements of the Women's CoOp, and also included material on the risks of using drugs while pregnant, parenting, violence and victimization, and use of antiretroviral therapy (ART). The program also used short video vignettes of African-American women to emphasize key points [31].

**2.6.2. Treatment-As-Usual Control Group.** The control group received no intervention beyond what they received as a part of the treatment program in which they were enrolled.

## 2.7. Measures

**2.7.1. The Revised Risk Behavior Assessment (RRBA).** The RRBA has 10 sections, which contain questions about demographics and social characteristics; health knowledge; alcohol use; drug use; drug injecting; sexual practices; power and empowerment; conflict and victimization (stigma and vulnerability); physical and mental health and HIV.

Although the RRBA has excellent psychometric properties for African-American women [9], an adaptation was necessary to measure particular concerns related to pregnant women. Based on a review of the literature and consultation with experts, several new questions were added. Specifically, experiences with personal violence were assessed by asking the participant how many times in the past 90 days she behaved in a violent manner toward others, including insulting or swearing at someone, beating up someone, and using a knife or gun on someone (Cronbach's Alpha = 0.91). These items were condensed into an indication of violent behavior in the past 90 days. Moreover, a 22-item scale adapted from the RRBA assessed participants' knowledge about HIV and STD transmission, drug and alcohol use, and substance-use influence on fetal development (Cronbach's Alpha = 0.71). These items were combined into a total HIV and drug risk knowledge score with a range of scores from 0 to 22.

An ACASI version was administered to insure privacy for respondents, given the inclusion of more intimate violence measures.

**2.7.2. Urine Drug Testing.** Urine drug testing for methamphetamine, amphetamine, cocaine, heroin, marijuana, and ecstasy was conducted at baseline and followup using a rapid 6-panel urine dip test.

## 3. Analysis

Analytic methods began with descriptive statistics on demographic variables of interest (e.g., age, employment status, marital status, homeless status), followed by inferential analyses on the outcome variables of interest using *t*-tests on continuous data to compare the Women's CoOp for Pregnant African-American Women and treatment-as-usual conditions within time and chi-squared analyses for dichotomous and ordinal data. Subscale items combined into an additive or averaged scale score were assessed through Cronbach's Alpha reliability to check internal consistency. Only those scales with an acceptable statistic ( $\alpha = 0.70$  or greater) were included in the analyses. In addition to the descriptive and reliability analyses, change-over-time assessments were conducted for the substance-use, sexual-risk, and violence outcomes of interest using the paired *t*-test for continuous data, the McNemar test for dichotomous data, and the Wilcoxon signed-ranks test for ordinal data. All analyses were conducted using the SAS 9.2 statistical software. Because both the Women's CoOp for Pregnant African-American Women and treatment-as-usual addressed the importance of substance-use reduction, an overall reduction in drug and alcohol use over time in both intervention conditions was expected.

## 4. Results

**4.1. Participant Demographics and Characteristics.** Table 1 shows that on average, randomized participants were in their late twenties, and a majority had less than a high school education, had never married, and reported that this pregnancy was unplanned. The average gestational age at study entry was 24 weeks (SD = 7.0). Women reported being an average of 10 weeks pregnant (SD = 7.0) at the time of pregnancy awareness, 88% reported having received at least some prenatal care, and 97% reported planning to keep the baby after delivery (some data are not shown in Table 1). Of note, the Women's CoOp for Pregnant African-American Women and treatment-as-usual conditions did not significantly differ at baseline on any of the measures found in Table 1 or reported in the text.

An examination of baseline characteristics of women who completed 6-month followup surveys indicates the severe social circumstances that the sample experienced when they entered this study (Table 2). More than 40% were homeless, and more than 75% were unemployed; 18% reported that they had an alcohol problem, and 58% reported that they had a drug problem. On a positive note, the participants had good knowledge of the risks of HIV and the effects of prenatal exposure to drugs of abuse, correctly answering, on average, 18 of the 22 questions. However, in the past 90 days, 33% of women who had sex indicated

TABLE 1: Baseline demographic and background characteristics for the total sample and the Women's CoOp for Pregnant African-American Women and treatment-as-usual conditions.

	Total sample ( <i>N</i> = 59)	Women's CoOp ( <i>n</i> = 30)	Treatment-as-usual ( <i>n</i> = 29)	<i>P</i>
Demographic Characteristics				
	<i>M</i> ( <i>SD</i> )			
Maternal age in years	28.7 (6.6)	28.2 (5.7)	29.2 (7.5)	.76
Race: Black/African American	59 (100%)	30 (100%)	29 (100%)	—
Education				
Completed high school	21 (36%)	10 (33%)	11 (38%)	.79
Relationship status				
Never married	48 (81%)	23 (77%)	25 (86%)	.51
Pregnancy				
Unplanned	53 (90%)	27 (90%)	26 (90%)	1.00
Had you gone for prenatal care for this pregnancy?	52 (88%)	28 (93%)	24 (83%)	.25
Used any drugs since you found out pregnant?	41 (70%)	22 (73%)	19 (66%)	.58
Interpersonal violence				
Ever been physically abused:				
Never	44%	40%	48%	.60
More than 12 months ago	31%	33%	28%	.78
One year ago or less	25%	27%	10%	.18
Ever been sexually abused:				
Never	58%	50%	66%	.29
More than 12 months ago	31%	37%	24%	.40
One year ago or less	12%	13%	10%	1.00

The test statistic for maternal age was the independent-samples *t*-test. The remaining variables were tested with the  $\chi^2$  goodness-of-fit test, with *df* = 1. Probability values for the  $\chi^2$  tests are exact. Percentages are within the respective group.

that they had never used a condom, and 62% indicated that they had been in violent situations in which they were violent toward someone else. Nonetheless, in both cases, more than 75% of the sample reported that they want to stop/reduce using drugs for themselves, and 80% wanted to stop/reduce drug use to have a healthy baby, indicating substantial motivation on the part of the participants as they participated in drug-abuse treatment. Motivation for reducing or stopping drug use also was found in over half of the women in the sample, who were fearful that Child Protective Services would take their child away if they did not change their drug use behavior.

Finally, it should be noted that the Women's CoOp for Pregnant African-American Women and treatment-as-usual conditions did not significantly differ at baseline on any of the outcome measures found in Table 2 (all *P*s > .17).

**4.2. Intervention Evaluation.** There were marked reductions in homelessness in both groups at 6-month followup (see Table 2), suggesting that the women were finding stable housing. Use of cocaine and illegal drugs dropped markedly, as did threats of physical violence toward others. Further, on average, the participant's knowledge about HIV and the risks of prenatal drug exposure increased, showing improvement

from baseline assessment to 6-month followup. There were no significant differences between the Women's CoOp condition and the treatment-as-usual condition in the outcomes presented in Table 2. Although a stronger design would have included a no-treatment control condition to fully assess treatment efficacy, the present study focused primarily on feasibility of the Women's Coop for pregnant African-American women.

In contrast to the prior examination of the Women's CoOp in non-pregnant African-American women [30], this sample of pregnant women showed no improvement in unemployment.

However, it is important to note that each of the significant changes from baseline to followup for the entire sample was significant among just women included in the Women's CoOp condition.

**4.3. Birth Outcomes.** Two study participants had miscarriages during the study, one Women's CoOp for Pregnant African-American Women participant and one treatment-as-usual participant, at the gestational ages of 28 and 30 weeks, respectively. The Women's CoOp for Pregnant African-American Women and control conditions both resulted in, on average, term births, 38.2 weeks (*SD* = 1.9)

TABLE 2: Outcomes for the six-month reduced sample.

	Differences over time		P
	Baseline	6-month	
Currently homeless	42%	6%	<.001
Currently unemployed	78%	70%	.41
Past 90 days, used			
Cocaine, any form	56%	36%	.03
Use of one or more of illegal drugs (methamphetamine, amphetamine, cocaine, heroin, marijuana, and/or ecstasy)	82%	52%	.001
Reason quit/cut back drugs			
Want to get clean for myself	78%	84%	.18
Wanted to have healthy baby	80%	76%	.16
Child Protective Services would take baby away	56%	50%	.44
What helped you stay clean and sober the most			
Treatment		36%	
Staying away from people (you) used to drink, get high with OR places (you) used to drink, get high OR old neighborhood		38%	
In the past 90 days, one or more times			
Meeting with specialist about relationship with spouse or family member	30%	18%	.16
Meeting with specialist on parenting	46%	38%	.43
Meeting with specialist regaining contact	32%	6%	.002
Meeting with specialist on getting along with children	44%	28%	.1
Meeting focused on regaining contact with children	34%	12%	.01
Any meeting or session	56%	76%	.03
Current alcohol and drug problem			
Have alcohol problem at this time	18%	28%	.23
Have drug problem at this time	58%	62%	.67
Sexual behavior and HIV and prenatal drug use knowledge			
How many days in the past 90 did you have any sex? (Mean (SD))	18 (25)	11 (21)	.13
HIV and prenatal drug risk knowledge: Total score (Mean (SD))	18 (3)	21 (2)	<.001
Condom use in past 90 days	N = 21		.51
Never	33%	38%	
Almost never	10%	14%	
Any use	57%	48%	
Can insist on condom use with main sex partner in past 90 days	50% (N = 18)	61%	.53
Past 90 days threatened any violence			
Threatened any violence	62%	34%	.003

N = 50 due to missing data at 6-month followup. The tests of the differences over time are based on the McNemar test for matched data, with the exception of the tests for condom use, which are based on the Wilcoxon signed-rank test, and the number of days in the past 90 days on which the respondent had any sex and the HIV knowledge: total score, which are based on the paired *t*-test.

and 37.2 weeks (SD = 5.8), respectively. The mean birth weight, length, and head circumference also were within normal limits for gestational age in both the Women's CoOp for Pregnant African-American Women and treatment-as-usual conditions.

## 5. Discussion

There are several notable findings from this initial examination of the feasibility of this evidence-based intervention

modified for pregnant women. First, this study confirms and emphasizes the ability of outpatient drug-abuse treatment to reduce cocaine and other illegal drug use among pregnant women in an extent similar to non-pregnant patients [32]. These results, coupled with promising birth outcomes, underscore the ability of pregnant women to make meaningful changes in their drug use behavior and serves as evidence that intervention tailored specifically to the needs of pregnant women can be successful. Second, this study suggests that, as with the original Women's CoOp, the Women's CoOp with pregnant African-American women

showed reductions in homelessness for its participants. While both the Women's CoOp for Pregnant African-American Women and the treatment-as-usual conditions showed marked improvements in helping women to secure housing only the Women's CoOp for Pregnant African-American Women reduced it to 0%. This reduction in homelessness is similar to that of the Women's CoOp for non-pregnant African-American women [30]. Third, the data from this initial feasibility study of the adaptation of the Women's CoOp for pregnant women suggests that this intervention could be successful in teaching women the needed skills to avoid violent situations and/or not use violence against others in situations. Fourth, this study provides valuable information regarding the extent to which these women had unplanned pregnancies that brought them into treatment. The fact that 9 out of 10 women reported an unplanned pregnancy speaks to the dire need for education regarding family planning options, access to these options, and the skills and support to implement their chosen family planning method. Data from this study also demonstrate that pregnant African-American women in drug-abuse treatment continue to have low rates of condom use and are unable to insist on condom use with partners all the time. These results support the need for drug-abuse treatment programs to infuse and integrate HIV sexual-risk reduction messages, education, and skills practice into their programs. Finally, our results, although not definitive, certainly speak to the importance of future research to more fully examine the efficacy of Women's CoOp with pregnant African-American women.

## 6. Study Limitations

The present study is not without its limitations. First, it is an initial feasibility study undertaken to examine the potential utility of the Women's CoOp with pregnant African-American women. Therefore, the impact of the intervention would not be expected to be maximal relative to the success of other Women's CoOp interventions. Second, because 23 of the 96 (24%) women screened for the study were ineligible due to refusal of drug-abuse treatment, the generalizability of the results to the larger pregnant drug-abusing population may be limited; however, this result speaks to the fear, stigma, and concern women have with drug-abuse treatment and the need for future studies to examine ways of changing treatment to be more attractive to these participants. Third, the sample was quite diverse in its use of licit and illicit substances. This diversity may have adversely impacted the efficacy of this adaptation of the Women's CoOp intervention, since the original version of the Women's CoOp targeted crack-abusing African-American women. Fourth, in contrast to other examinations of the Women's CoOp, this study tested the intervention in the context of intensive outpatient drug-abuse treatment. This intense service may have compromised the ability to see improvements specific to the Women's CoOp. Fifth, because of the small sample size, the study may have insufficient power to detect significant changes in some outcomes. Finally, despite that RRBA was

revised for the present study, further research establishing its reliability and validity in pregnant African-American women is certainly needed. Nonetheless, results from the current study suggest that future research should examine the Women's CoOp as a potentially efficacious intervention for an underserved population seriously in need of such an intervention.

## 7. Conclusions

These results demonstrate not only the success of drug-abuse treatment to help improve the risk behaviors and social circumstances of pregnant women but also the potential feasibility of the Women's CoOp to eliminate homelessness. This pregnancy-specific adaptation of the Women's CoOp argues for the extension of the reach of this intervention by also suggesting the possibility of reduced violence involvement for its participants. Moreover, these results demonstrate the myriad of stressors these women face in their daily lives and how these issues can compromise treatment seeking and engagement. Finally, these results also support the need for ongoing integration of family planning and HIV sexual-risk reduction into drug-abuse treatment for pregnant African-American women.

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