Managing Maternal Substance Use in the Perinatal Period: Current Concerns and Treatment Approaches in the United States and Australia

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Supplementary Issue: Substance Use in Pregnancy

ABSTRACT: Substance use in pregnancy can have adverse effects on mother and fetus alike. Australia and the US are countries with high levels of substance use and policies advising abstinence, although the Australian approach occurs within a broader framework of harm minimization. Less attention has been paid to treatment of the mothers' substance use and what is considered gold standard. This is despite evidence that prior substance use in pregnancy is the most important factor in predicting future substance use in pregnancy. This paper draws together information from both the peer-reviewed and gray literature to provide a contemporary overview of patterns and outcomes of the three main drugs, alcohol, tobacco, and cannabis, used in Australia and the US during pregnancy and discusses what are considered gold standard screening and treatment approaches for these substances. This paper does not set out to be a comprehensive review of the area but rather aims to provide a concise summary of current guidelines for policy makers and practitioners who provide treatment for women who use substances in pregnancy.

KEYWORDS: alcohol, tobacco, cannabis, treatment, pregnancy

SUPPLEMENT: Substance Use in Pregnancy

CITATION: Burns et al. Managing Maternal Substance Use in the Perinatal Period: Current Concerns and Treatment Approaches in the United States and Australia. *Substance Abuse: Research and Treatment* 2016:10(S1) 55–61
doi: 10.4137/SART.S34558.

TYPE: Review

RECEIVED: May 18, 2016. **RESUBMITTED:** September 07, 2016. **ACCEPTED FOR PUBLICATION:** October 04, 2016.

ACADEMIC EDITOR: Gregory Stuart, Editor in Chief

PEER REVIEW: Five peer reviewers contributed to the peer review report. Reviewers' reports totaled 1991 words, excluding any confidential comments to the academic editor.

FUNDING: Authors disclose no external funding sources.

COMPETING INTERESTS: Authors disclose no potential conflicts of interest.

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Introduction

The negative effects of substance use on fetal development are well known.[1–3] Despite this, policies on substance use in pregnancy remain contentious. This is because, as pointed out by other researchers, the area brings together evidence and views from a wide range of stakeholders such as pediatrics, law, genetics, mental health, medicine, child protection, substance use, and women's rights.[4–7]

In addition to this, Lester et al.[6] have identified a number of significant public health events that occurred in the 1960s and 1970s and raised public concern about women who had, unknowingly, ingested teratogenic substances during pregnancy. The first of these was the use of thalidomide in 1958 as treatment for nausea in early pregnancy. By the early 1960s, evidence showed deformities, and in particular limb malformations were caused by the drug. Thousands of children had been unwittingly affected. The second was the use of a synthetic hormone, diethylstilbestrol (DES), in the 1940s and 1950s to prevent miscarriage. By the 1970s, it was noted that the daughters of women who had taken DES during pregnancy developed a rare adenocarcinoma of the vagina.[8]

Public and medical concern around the use of drugs in pregnancy intensified, and recreational drugs (both licit and illicit) were queried as potential teratogens.[6] Concern increased in the 1970s when researchers in France observed children born with fetal alcohol syndrome (FAS) from women who drank a large amount of alcohol during pregnancy.[9] Later in the 1980s, the widespread use of crack cocaine in the US further fueled public concern and *outrage* that a generation of *crack babies* would follow, although later research has shown this did not come to pass.[10,11]

While public concern continues for women in all sectors of the population, problematic substance use in pregnancy and associated harms are not uniformly distributed throughout the community. Problematic use is most commonly found among women who are also marginalized and/or disadvantaged and often have comorbid physical and mental health problems.[12–15] Recent Australian research has confirmed these findings. In a sample of 171 mothers in opioid pharmacological treatment, a significant proportion had a criminal history, had been subjected to domestic violence, and also had mental health problems.[16,17] Two-thirds of the sample had been sexually abused in childhood. Taplin and Mattick[17] also found that approximately two-thirds of the sample had previously or were currently involved with the child protection

system and approximately one-third had at least one child in out-of-home care.

While substance use in pregnancy raises general concern, in Australia substance use alone, without additional risks, is not an indicator for a child protection notification, although child welfare is a consideration in all treatments for women who are substance dependent and notifications are made accordingly.[18] In the United States, policies are more diverse: 18 states consider substance abuse during pregnancy to be child abuse under civil child welfare statutes, and three states consider it grounds for civil commitment (eg, forced admission to inpatient treatment).[19]

While debate around the question of how society should deal with substance use in pregnancy continues, knowledge of effective treatment approaches for maternal substance use disorders remains poor. Recently, the World Health Organization published guidelines and noted considerable gaps in knowledge, including the need to increase the evidence base in many areas including knowledge about local clinical practices and the promotion of best practice in maternal and neonatal care.[20] To date, most of the extant literature pertains to treatments aimed at maternal abstinence while research into the effectiveness of approaches focused on other outcomes is limited. Yet given that substance dependence is a chronic relapsing disorder, and approximately half of all pregnancies are reported to be unplanned,[21,22] it remains a public health imperative to develop and implement effective prevention and treatment approaches. Given that cessation of substance use will not be immediately possible for some women who are dependent on substances or for those who do not wish to cease use, substitution treatment or harm minimization approaches need to be included in the overall framework.[18] To ensure that services are accessed, they will need to be acceptable to the women they target and be built on the premise that substance use in pregnancy requires care in the long term, including approaches such as assertive outreach and relapse prevention.[23]

The three most commonly used substances during pregnancy in both Australia and the US are tobacco, alcohol, and cannabis.[24,25] While there is now a significant evidence base regarding fetal and child harm from alcohol and tobacco, the effects of cannabis use during pregnancy are less well defined. A recent comprehensive review of the area deeming our understanding seems to be "very poor".[26]

The aim of the current paper is to draw together and synthesize key literature on patterns of alcohol, tobacco, and cannabis use in pregnancy and to present an overview of what is considered to be gold standard with respect to screening and subsequent provision of maternal treatment for problematic use of tobacco, alcohol, and cannabis. A comprehensive literature search of material published before June 2013 was conducted in PubMed using MeSH terms "pregnancy," "substance use disorders," "substance abuse," and "substance dependence," as well as terms relevant to alcohol, tobacco, and cannabis. Key review articles were focused on, and significant documents from the gray literature were included. The first section of the paper discusses the prevalence, predictors, and outcomes of alcohol, tobacco, and cannabis in pregnancy, the second section discusses screening options, and the third outlines contemporary gold standard treatment approaches. The final section puts forward some broad recommendations. It should be noted at this point that the surveys referenced generally measure substance as self-report and not with the use of biochemical markers. Underreporting may therefore be a feature of the estimates presented.

Prevalence and Predictors

Alcohol. In Australia, alcohol is the most commonly used substance in pregnancy.[25] In a population-based cohort of 1570 pregnant Australian women, it was reported that 41% of women did not drink during pregnancy, and 27% drank in first trimester only, most of whom stopped drinking once they realized they were pregnant.[27] More than a quarter of the women (27%) continued to drink alcohol at some level throughout pregnancy, with approximately half drinking at low or moderate levels. When compared to women who abstained throughout the pregnancy, those who drank in the first trimester were more likely to have not planned their pregnancy. Those who drank throughout pregnancy were in their early to mid-thirties, reported smoking, and had a higher income and educational attainment.[27]

In the United States, the Centers for Disease Control and Prevention (CDC)[28] assesses alcohol use among pregnant women with the Behavioral Risk Factor Surveillance System (BRFSS).[29] To examine alcohol use in pregnancy, data from the 2011–2013 surveys for women aged 18–44 years were aggregated. From this analysis, the authors reported alcohol use in pregnancy to be most common among older women, those who were college educated and who were unmarried. They reported a slight increase in the number of pregnant women who reported drinking compared to 2006–2010 estimates and suggested that this may have been due to changes in methodology rather than in actual drinking practices.[30]

With respect to outcomes, it is now well accepted that alcohol is a teratogen and that heavy maternal alcohol consumption during pregnancy places the baby at risk of a wide range of negative outcomes including birth defects, growth impairment, developmental disabilities, and neurodevelopmental dysfunction.[31–33] These outcomes extend across a continuum that ranges from mild to severe impairment[33] and can result in ongoing disability.[34] The continuum is termed fetal alcohol spectrum disorder (FASD), with FAS being the most severe end of the FASD spectrum. In comparison to women who report more moderate consumption in pregnancy, mothers of children with FASD have been reported as being older, unemployed, and to have poorer mental health.[35]

Given the complex interplay between the dose, timing, and frequency of alcohol consumption together with both individual and societal variation, it is unlikely that a clear cutoff

for safe/unsafe consumption of alcohol will ever be established. It is in this light that the Australian National Health and Medical Research Council, the body that determines national health guidelines, most recently stated that "For women who are pregnant or planning a pregnancy, not drinking is the safest option".[36] The American College of Obstetricians and Gynecologists (ACOG)[37] has also long-supported this stance.

Tobacco. Tobacco is widely used in Australia with 13% reporting daily smoking in 2013.[25] Daily smoking has declined over time and almost halved since 1991 (from 24%). While a significant proportion of women will cease smoking once they know of their pregnancy, a subgroup will continue to smoke. Of women who gave birth in Australia in 2012, 12% reported smoking during the first 20 weeks of pregnancy and this reduced to 9% after 20 weeks of pregnancy.[38] As with alcohol use, the prevalence of smoking remains higher in some subgroups. Indigenous Australians are 2.5 times more likely to smoke daily than non-Indigenous Australians (32% versus 12%), and the proportion of Indigenous Australians smoking daily has not declined significantly since 2010.[25]

The CDC assesses trends in smoking since 2000 through a surveillance monitoring system, the Pregnancy Risk Assessment Monitoring System (PRAMS).[8] In this system, self-reported data are linked to birth certificate data and subsequently weighted to be representative of each participating state. A 10-year trend analysis of the data has shown that there has been little change in smoking prevalence before, during, and after pregnancy from 2000 to 2011. Data from 2010 show that the annual average rate of smoking in the three months prior to pregnancy was 24% and smoking during pregnancy was 10.7%. However, a significant number of women return to smoking following birth (an average of 16% reported smoking).

Smoking during pregnancy is more common among younger women, single women, women who are socioeconomically disadvantaged, women with lower rates of education, Indigenous women, and women in rural areas. While these women are only a small proportion of the total number of women who smoke during pregnancy,[39] inequities among women who smoke during pregnancy appear to be increasing over time.[40,41] As newer tobacco products emerge (eg, electronic cigarettes), it will become increasingly important to know how they are used by pregnant women and what they contain.[42] One recent US study suggests that e-cigarettes are perceived by pregnant women as being less harmful than traditional cigarettes, and this perception may lead to increased use without accompanying research to refute or support this idea.[43]

As with alcohol, the harm caused by tobacco smoking during pregnancy is well established and tobacco use during pregnancy is now the leading preventable cause of poor pregnancy outcomes and infant morbidity and mortality in the United States.[44] In addition, cigarette smoke contains many other toxins that are conveyed to the fetus via the bloodstream.[45] Research has shown that women who smoke in pregnancy are more likely to have a baby who is small for gestational age putting them at risk of illness, death in infancy, and health consequences in later life.[46,47] An Australian study has also shown an increased risk of sudden unexplained death in infancy (SUDI) among offspring of women who smoke during pregnancy.[48]

Cannabis. Cannabis is the most commonly used illicit drug during pregnancy. In the US, 5.5% of pregnant women reported past month use in 2014.[29] In this study, pregnant women who smoked cannabis were more likely to be younger, single, African-American, and primigravida as compared to nonsmokers. Those who smoked most heavily were more likely to be single, unemployed, and have a lower income than the nonusers.[49] In a large population-based prospective cohort study, maternal cannabis use during pregnancy was found to be associated with growth restriction in pregnancy, with effects on low birth weight being most marked if cannabis use continued all through the pregnancy. These findings remained significant even after adjustment for potential confounding variables, including exposure to tobacco.[50] Prenatal cannabis has also been associated with poorer cognitive performance in adolescence.[51–53] Deficits in neurobehavioral and cognitive outcomes have been noted in the children as they grow including deficits in learning, memory, and executive function.[54,55] For the mother, the use of cannabis is associated with poor physical and mental health including increased risk of breathing problems.[51] Several recent reviews of the adverse health consequences of cannabis point to a dire need for additional research on the topic.[26,56]

There is also the potential for additive or even multiplicative harms with co-use of cannabis and tobacco.[57] Co-use of marijuana and tobacco has been increasing in the general population over the past decade,[58–60] and there is evidence that there are distinct mechanisms that link cannabis and tobacco use.[58]

Screening for Substance Use

Only a minor proportion of pregnant women with substance use problems are identified and treated.[61] A recent report from the US Substance Abuse and Mental Health Services Administration (SAMHSA) noted that approximately 5% of entries to treatment services were by pregnant women, with particularly low number of presentations for alcohol problems and somewhat higher numbers for treatment for other drug use.[62] Major reasons cited for nonpresentation is the guilt and remorse these women are reported to feel and their fear of the loss of their children to out-of-home care.[63–65] However, evidence suggests that early antenatal care improves both maternal and fetal outcomes, and hence engagement with services is critical.[66,67]

The first step in the provision of appropriate treatment is to determine the amount and frequency of any substances used and whether substance dependence is present.[18] Questions on the topic should be posed in a nonjudgmental manner, to

increase the trust needed to obtain an accurate history and to retain women in ongoing care.[18] It is recommended that substance use questions be included in the standard antenatal history at initial assessment and subsequently repeated at each perinatal assessment.

Simple questions about quantity and frequency of drug use are appropriate for screening, and these can then be followed by more in-depth questions for women who are found to be using substances. This would include questions on the pattern and frequency of use to determine if use reflects substance dependence and if there is co-use of other substances. Common substances to be asked about include prescribed medications (such as opioid replacement therapies, antidepressants, mood stabilizers, and benzodiazepines), over-the-counter medications (such as paracetamol), alcohol, tobacco, cannabis, psychostimulants (methamphetamine, 3,4-Methylenedioxymethamphetamine (MDMA), cocaine), opioids, inhalants, and misuse of prescribed medications. This assessment will then indicate when referral to specialist services is warranted. Urine drug testing is another option utilized by some clinics in Australia and the United States, although controversy exists around the legality of obtaining urinalysis for treatment versus law enforcement.[68] There are a range of substance-specific screening tools available, and those commonly used in both the US and Australia are described below.

Alcohol. There are a number of screening instruments that have been recommended to assess alcohol use in pregnancy. In Australia, the Alcohol Use Disorders Identification Test (AUDIT-C) is used to ask about the quantity, frequency, and impact of drinking.[69] The AUDIT-C is a three-item alcohol screener that can help identify persons who are hazardous drinkers or who have active alcohol use disorders. The AUDIT-C is a modified version of the 10-question AUDIT instrument developed through the World Health Organization and is freely available for public use, but not for sale or for use for commercial purposes. It is scored on a scale of 0–12.

With respect to women who are pregnant, the Foundation for Alcohol Research and Education recommends a score of 0–3 to be low risk of harm, 4–7 to be of medium risk, and 8+ to be of high risk.[70] An alternative questionnaire recommended by the National Institute on Alcohol Abuse and Alcoholism is the T-ACE.[71] The T-ACE has been noted to accurately identify a range of alcohol use levels in varied obstetric populations.[71] The questions can be asked by an obstetrician or nurse in one minute. Women waiting for their prenatal appointments, for example, could be asked to complete the T-ACE as part of a routine patient questionnaire to be reviewed during the visit.[72]

Tobacco. With respect to tobacco use, the revised Fagerstrom Test for Nicotine Dependence (FTND) is a six-item tool used for assessing level of nicotine dependence and may be useful as an indication of whether pharmacotherapy is required to support a quit attempt.[73] Scoring is from 8 to 10 and the following cutoffs have been established to indicate level of dependence: 0–2, very low dependence; 3–4, low dependence; 5, medium dependence; 6–7, high dependence; and 8–10, very high dependence.

Cannabis. While there are no gold standard screening tools specifically for the assessment of cannabis use in pregnancy, it is recommended that quantity and frequency of use are assessed, followed by measurement of the presence of a substance use disorder,[18] the Severity of Dependence Scale (SDS). Originally developed for assessing heroin dependence, studies have indicated that the SDS is also applicable for assessing other illicit drugs including cannabis. Previous research has suggested cutoffs for cannabis as four in an adolescent population[74] and three in the adult population.[75]

Assessing Readiness and Confidence to Change

While screening can determine the amount of a substance used and the problems this may cause, research now also suggests that in order for treatment to be most successful, those seeking treatment must be ready to change their use.[76–78] Measures of readiness and confidence to change may be included into the overall history.[79] Readiness to change their substance use can be assessed by asking, do you want to change your use of (drug) right now? (no = 0, probably not = 1, unsure = 2, possibly = 3, and definitely = 4). Confidence to change can be measured by asking; do you think you could change your use of (drug) now if you wanted to? (definitely could not = 0, probably could not = 1, unsure = 2, probably could = 3, and definitely could = 4).

Gold Standard Treatment

Defining a substance disorder. *The Diagnostic and Statistical Manual of Mental Disorders* (Fifth Edition) (DSM-5) defines a substance use disorder as "when the recurrent use of alcohol and/or drugs causes clinically and functionally significant impairment, such as health problems, disability, and failure to meet major responsibilities at work, school, or home".[80] Further, a substance use disorder diagnosis is based on evidence of impaired control, social impairment, risky use, and pharmacological criteria. It is identified by the presence of symptoms such as tolerance, craving, and withdrawal, and periods of remission and relapse. The recently finalized DSM-5 combines the previous DSM-4 categories of substance abuse and substance dependence into a single disorder measured on a continuum from mild to severe. Each specific substance is addressed as a separate disorder, but nearly all substances are diagnosed based on the same overarching criteria. Severity of the disorder is based on the number of criteria endorsed by the respondent: two to three criteria indicates a mild disorder, four to five indicates a moderate disorder, and six or more indicates a severe disorder.[80]

Stepped care. Other than severity of disorder, appropriate treatment modality for a particular woman will be determined by intrinsic and extrinsic factors including the particular

personality and needs of the client, access to antenatal and other specialist services, physical and mental health, and available social and familial supports. Given this, an individualized approach is optimal and a cost-effective option is for a stepped approach.[81,82]

Stepped care involves commencing treatment at the least intensive level, for example, offering a brief intervention such as motivational interviewing, followed by more intensive, targeted treatments dependent on the response to the previous treatment.[83] That is, clients receive the simplest, least intensive treatment first, and then proceed to more intensive treatments if required.[82,83]

Motivational Interviewing

Brief interventions are often framed within the context of a motivational interview (MI). The main goals of MI are to engage clients, discuss making changes, and provide the environment to make these changes.[84] It is client centered and aims to help them explore and understand their feelings about changing their substance use. It combines elements of style (warmth and empathy) with technique (eg, reflective listening) and an understanding that the motivation to change is increased with negotiation that is supportive and nonthreatening, where the client and not the practitioner identifies the impetus for change.[85] A recent meta-analyses show that MI is effective in decreasing substance use in both adults and adolescents.[86,87] MI is a cost-effective method of treatment given that it can be undertaken by a range of practitioners such as primary care clinicians and specialists such as pediatricians and gynecologists.

Treatment: alcohol. When substance use is severe, more intensive treatment is required. With respect to alcohol, if the woman has an alcohol use disorder it may be necessary (where possible) to provide a supervised detoxification as a first-line approach, preferably as an inpatient. This is because rapid withdrawal may lead to fetal distress and possible death.[18] The majority of pharmacotherapies available for alcohol dependence in the general population are contraindicated in pregnancy, other than nutritional support.[18] The recommended treatment is therefore to focus on psychological and social approaches incorporating assertive outreach follow-up throughout and post pregnancy.

Treatment: tobacco. In both Australia and the United States, advice on stopping smoking and referral to related programs are now widely available through antenatal clinics. Recent Australian clinical guidelines[18] suggest a range of interventions for pregnant women who are smokers and are willing to quit (smoking cessation), not wanting to quit (motivational interviewing), and former smokers who have recently quit (relapse prevention). The United States Preventive Services Task Force (USPSTF) and ACOG currently recommend asking all pregnant women about their tobacco use and using the 5 A's (Ask, Advise, Assess, Assist, and Arrange) manualized behavioral framework to assist with cessation.[44] While the 5 A's of Intervention can be a useful framework for encouraging patients to quit smoking, more intensive interventions may also be required.

As with alcohol use, a stepped care approach to smoking cessation is advocated, including nicotine replacement therapy (NRT) when a pregnant woman is otherwise unable to quit, and when the "likelihood and benefits of cessation outweigh the risks of NRT and potential continued smoking".[88] It is recommended that pregnant women who smoke use intermittent (gum, lozenge, inhaler, tablet) rather than continuous (patches) NRT formulations at the lowest possible dose in discussion with a health professional.[18] In the US while obstetricians and other prenatal care clinicians are uniquely positioned to intervene during pregnancy, there is currently no formal recommendation in place for smoking cessation and relapse prevention postpartum. Future research is needed in this area given the high rates of relapse to smoking after giving birth among women who quit or cut down on smoking during pregnancy.[89]

Treatment: cannabis. With respect to cannabis, it is advised that all pregnant women should be offered support for cessation and relapse prevention at each antenatal visit throughout the pregnancy.[18] There is currently no gold standard treatment identified specifically for cannabis use during pregnancy; however, as with tobacco use, the 5 A's approach is an option. Regular users of cannabis may be offered a range of alternate interventions including information, brief intervention, counseling, and psychologically based treatment for cannabis dependency. Those who are heavily dependent on cannabis should be referred to their general practitioner or specialist alcohol and drug agency.

It is suggested that at the very least women should be offered a brief intervention including feedback on their cannabis use, education regarding the impact of cannabis use and their score on the SDS.[90] Asking the woman to comment on her perceived level of severity may allow for more open discussion of other important problem areas and high-risk situations, which will allow for the development of strategies for change, including coping with cravings, and goal setting.

Conclusion

Alcohol, cannabis, and tobacco are the most commonly used substances in pregnancy. There are now a range of recommended screening tools available to measure substance use and level of substance dependence. While alcohol and tobacco are well researched, the evidence base for screening and treatment for cannabis use in pregnancy is sparse. While the majority of women will cease or reduce substance use during pregnancy, a minority will continue to use and use heavily and this group requires targeted support and treatment. This is a consistent finding across the US and Australia. To date, however, approaches to both prevention and treatment have focused on the general population of pregnant women, rather than tailoring approaches to meet the needs of groups most at risk. The

reasons for continued heavy use in pregnancy are a complex interplay between the environment, physiology, and individual characteristics. Ongoing dependent use is most common in marginalized communities. It is, therefore, recommended that all preventive and treatment approaches take both cultural and environmental factors into account including outreach and assertive long-term follow-up by local practitioners.

Author Contributions

Wrote the first draft of the manuscript: LB. Contributed to the writing of the manuscript: VCC, CB. Agree with manuscript results and conclusions: LB, VCC, CB. Jointly developed the structure and arguments for the paper: LB. Made critical revisions and approved final version: LB, VCC, CB. All authors reviewed and approved of the final manuscript.

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