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Routes of Cannabis Administration Among Females in the Year Before and During Pregnancy: Results from a Pilot Project

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Abstract

Use of cannabis during pregnancy is on the rise, yet little is known about how women administer cannabis during the perinatal period. This study examined self-reported modes of cannabis administration among women in the year before and during pregnancy, and their association with self-reported cannabis use frequency using data from 585 women screened in 2018-2019 for cannabis use during standard prenatal care in two medical centers in Northern California. The prevalence of cannabis use was 12% before pregnancy and 3% during pregnancy. Among the 71 women who reported cannabis use before pregnancy and the 19 women who reported cannabis use during pregnancy, smoking was the most common mode of administration (58% and 42%), followed by edibles (27% and 16%), vaping (23% and 16%), lotions (11% and 5%), and other (10% and 0%). In the year before pregnancy and during pregnancy, monthly or less use was most common (56% and 58%), followed by weekly use (24% and 26%) and daily use (20% and 16%). Among cannabis users, 43% used more than one mode before pregnancy compared to 15% during pregnancy. Daily cannabis use was most common among women who reported smoking only or smoking in combination with other modes. These novel results indicate that while smoking is the most common mode of cannabis administration during the perinatal period, there is variation in use and co-use of alternative modes. Future studies are needed to understand the relative health effects associated with individual and combined modes of cannabis administration during pregnancy.

1. Introduction

Maternal use of cannabis during pregnancy is rising (Brown et al., 2017; Young-Wolff et al., 2017) alongside increases in cannabis acceptability and accessibility (Roditis, Delucchi, Chang, & Halpern-Felsher, 2016) and messages from online media and cannabis dispensaries endorsing the safety of cannabis use in pregnancy (Dickson et al., 2018; Jarlenski et al., 2018). While much remains unknown, some evidence exists that cannabis use during pregnancy negatively affects fetal growth and neurodevelopment (Committee on Obstetric Practice, 2017; National Academies of Sciences Engineering and Medicine & Health and Medicine Division, 2017).

Research on the health effects of prenatal cannabis use has not adequately accounted for how women administer cannabis. This is important, as the timing and duration of peak effects, psychoactive effects, and health effects can vary with administration mode (Borodovsky, Crosier, Lee, Sargent, & Budney, 2016; Newmeyer, Swortwood, Abulseoud, & Huestis, 2017), and the prenatal risks may depend on how cannabis is consumed. Differentiation of smoking cannabis from other modes of administration in pregnancy is particularly important, given the potential risks to the fetus associated with the vascular effects of smoking (Goler, Conway, & Young-Wolff, 2018).

Smoking is the most common mode of cannabis administration among US adult women (Steigerwald et al., 2018). In 2017, 12.8% reported past-year use of cannabis in any form; 10.8% smoked cannabis, 5.7% used edibles, 4.0% vaporized cannabis, 1.7% used concentrates, 0.9% used topicals, and 5.9% reported >1 mode. These data may not accurately reflect how women use cannabis during pregnancy, as pregnant women may change or reduce the number of methods they use to administer cannabis.

As a first step toward addressing this gap in the literature, this study capitalizes on the pilot implementation of a substance use questionnaire that includes questions about modes of cannabis administration in the year before pregnancy and during pregnancy in two Kaiser Permanente Northern California (KPNC) medical centers as part of standard prenatal care. We examined: 1) the prevalence and number of modes of cannabis administration in the year before pregnancy and during pregnancy, and 2) whether mode of administration was associated with self-reported frequency of use.

2. Methods

2.1. Study setting and Participants

KPNC is a nonprofit healthcare delivery system. As part of standard prenatal care in KPNC, pregnant women are screened for cannabis use in the year before pregnancy and during pregnancy via self-report at their first prenatal visit (at ~8 weeks gestation). We use data from 585 women who received an expanded version of the self-administered questionnaire systematically piloted to all pregnant women at two medical centers (Medical Center A, June 11, 2018 to August 29, 2018, n=198 and Medical Center B, June 5, 2018 to April 30, 2019, n=387). The pilot study was conducted to evaluate the feasibility of asking pregnant

women questions about mode of cannabis administration. The KPNC institutional review board approved this study with a waiver of consent.

2.3. Measures

Women were asked to indicate whether they used cannabis, alcohol, tobacco, and e-cigarettes/vaped in the year before and during pregnancy (no use, monthly or less use, weekly use, daily use). For cannabis, patients were asked to indicate their mode of administration (smoked, vaped, edible/oral, lotion/ointment, and other). Women could select more than one mode of administration for cannabis, but they could not specify frequency of use for each mode.

Socio-demographic factors (age, race/ethnicity, and median neighborhood household income) and trimester of screening were extracted from the EHR. Data on pregnancy intentions were based on self-reported answers via questionnaire.

2.4. Statistical analysis

We used descriptive statistics to characterize the sample's demographic characteristics and the prevalence of any self-reported cannabis use in the year before pregnancy and during pregnancy. Next, we tested whether the prevalence of cannabis use differed by demographic characteristics using chi-square and Fisher's exact test. We also examined the distribution of different modes of cannabis administration and the number of modes of administration reported. Finally, we examined the frequency of cannabis use for all users and by mode of administration.

3. Results

The sample (n=585) was 30.6% non-Hispanic White, 50.3% Hispanic, 9.7% Asian, 4.3% Black, and 5.1% Other/Unknown; 21.4% were aged 16-24, 60.9% 25-34, and 17.8% 34-45, and the mean age was 29.6 (standard deviation=5.5) (Table 1). Average median neighborhood household income was $68,537 (IQR:$46,189-$85,625). The median gestational age at the time of screening for prenatal cannabis use was 8 weeks.

Prevalence of any self-reported cannabis use was 12.3% in the year before pregnancy and 3.3% during pregnancy. None of the women self-reported starting cannabis use during pregnancy. Use was more common among patients aged 16-24 (25.6% year before; 6.5% during) than those aged 25-34 (9.7% year before; 2.9% during) and those aged 35-45 (5.0% year before, 1.0% during; p<.001 before, p=.07 during), and more common among those who reported not wanting to get pregnant (18.9% year before, 10.5% during) or wanting to get pregnant but not at this time (20.1% year before, 5.3% during) than those reporting wanting to get pregnant (9.5% year before, 1.9% during; p=.005 before; p=.02 during). Women who used alcohol before pregnancy were more likely to use cannabis before pregnancy (15.3%) compared to women who did not use alcohol (5.5%; p=.001). Women who used versus did not use tobacco before pregnancy were more likely to use cannabis both before pregnancy (29.4% vs. 11.3%, p=.005) and during pregnancy (12.9% vs. 2.8%, p=.02). Women who used e-cigarettes/vaped before pregnancy were more likely to also use cannabis before pregnancy (50.0%) compared to women who did not use e-cigarettes (11.0%,

p<.001). Cannabis use did not differ by race/ethnicity, median household income quartile, or trimester of screening (Table 1).

Among the 71 women who reported cannabis use in the year before pregnancy, smoking was the most common mode of administration (57.7%), followed by edibles (26.8%), vaping (22.5%), use of lotions (11.3%), and other (9.9%); 18.3% did not report their mode of administration. Among the 58 women who reported on their modes of use, 56.9% reported using only one, 32.8% reported using two, 8.6% reported three, and 1.7% reported all five modes. The 56.9% who used one mode reported smoking (32.8%), vaping (6.9%), edibles (8.6%), lotions (3.4%), and other (5.2%). The 32.8% who used two reported: smoking and edibles (12.1%), smoking and vaping (10.3%), smoking and lotion (3.4%), smoking and other (1.7%), and edibles and lotion (5.2%). The 8.6% who used three modes reported: smoking, vaping, and edibles (5.2%) and smoking, vaping, and other (3.4%).

Among the 19 women who reported cannabis use during pregnancy, smoking was the most common mode of administration during pregnancy (42.1%), followed by vaping (15.8%), edibles (15.8%), and use of lotions (5.3%); 31.6% did not report on their mode of administration. Among the 13 women who reported their modes of use, 84.6% reported using only one and 15.4% reported using two modes. The 84.6% who used one mode reported smoking (46.2%), vaping (15.4%), edibles (15.4%), and lotions (7.7%). The 15.4% who used two modes reported: smoking and vaping (7.7%) and smoking and edibles (7.7%).

Among women who reported cannabis use in the year before pregnancy (n=71), 19.7% reported daily, 23.9% weekly, and 56.3% monthly or less use. Among those who reported use during pregnancy (n=19), 15.8% reported daily, 26.3% weekly, and 57.9% monthly or less use. Of the 71 who used cannabis before pregnancy, 73.2% quit using during pregnancy, 7.0% reduced use frequency, and 19.7% maintained the same frequency; none of the women increased frequency. Frequency of cannabis use before pregnancy and during pregnancy varied by the mode or combinations of modes of administration (Table 2), with daily use being most common among those who reported smoking cannabis.

4. Discussion

This pilot project of women screened for cannabis use during standard prenatal care has three main findings. First, smoking was the most commonly endorsed mode of cannabis administration both before and during pregnancy, followed by use of edibles and vaping. Second, use of more than one mode of administration was more common among those who used cannabis in the year before pregnancy (43%) than among those who used during pregnancy (15%), and the majority of women who endorsed more than one mode of administration reported smoking (88% in the year before pregnancy, 100% during pregnancy). Third, daily use of cannabis was most common among women who reported smoking only or smoking in combination with other modes of administration.

Our finding that smoking was the most common mode of cannabis administration before and during pregnancy is consistent with findings from national studies of adult women (Steigerwald et al., 2018). Further, among women reporting cannabis use in the year before

pregnancy, those who endorsed more than one mode of administration (43%) was similar to national findings (Steigerwald et al., 2018). However, the percentage of cannabis users with multiple modes of cannabis administration was lower during pregnancy (15%), and all women who reported multiple modes of cannabis administration during pregnancy indicated that they smoked. These results suggest that patterns of cannabis use in the year before pregnancy may not accurately reflect how pregnant women use cannabis, and support the need for future studies that examine the epidemiology of cannabis administration among pregnant women and has implications for education and interventions during pregnancy.

In the current study, which took place following legalization of cannabis for recreational use in California in January 2018, edibles and vaping were commonly reported among women who endorsed use in the year before pregnancy (27% and 23%, respectively) and during pregnancy (16% and 16%, respectively). Initial data suggest that legalization of cannabis for medical use, greater duration of medical cannabis laws, and greater density of cannabis dispensaries are associated with an increased prevalence of vaping and use of edibles, and use of these alternative modes of cannabis administration may increase with spreading cannabis legalization. Alternative modes of cannabis administration, such as vaping, are popular as they enable use in locations that require discretion (e.g., in a car) (Jones, Meier, & Pardini, 2018) and users perceive them to be healthier, with a better taste, and more subtle, cost-effective and efficient method of administration relative to smoking cannabis (Budney, Sargent, & Lee, 2015; Etter, 2015; Lee, Crosier, Borodovsky, Sargent, & Budney, 2016; Malouff, Rooke, & Copeland, 2014).

The timing and duration of onset and peak effects, psychoactive effects, and health effects varies by mode of cannabis administration (Borodovsky et al., 2016; Newmeyer et al., 2017), with greater potential health consequences associated with smoking than other methods due to the inhalation of combustible smoke (Borodovsky et al., 2016; Earleywine & Barnwell, 2007; Pomahacova, Van der Kooy, & Verpoorte, 2009). Of particular concern, among women who reported on their mode of cannabis administration during pregnancy, daily use was only reported among those who smoked cannabis. This suggests that pregnant women who smoke may be heavier cannabis users in addition to using a potentially more harmful mode of administration. However, data also suggest that vaping cannabis may lead to greater subjective drug effects, cognitive and psychomotor impairments, and higher THC blood concentrations than the same dose of smoked cannabis (Spindle et al., 2018), and studies suggest that adolescents who vape cannabis use high potency products (Morean, Kong, Camenga, Cavallo, & Krishnan-Sarin, 2015). Further, edibles have delayed onset of effects, inconsistent THC labeling, and are metabolized differently from inhaled products (Cao, Srisuma, Bronstein, & Hoyte, 2016; MacCoun & Mello, 2015). It is unclear how these factors might moderate the health risks of exposure to cannabis in utero.

Future research with larger samples is necessary to understand the epidemiology of modes of cannabis administration during pregnancy, to examine whether certain modes of combinations of modes of cannabis administration are associated with a lower likelihood of quitting during pregnancy, and to determine the relative health effects associated with individual and combined modes of cannabis administration in general and during pregnancy. National guidelines strongly recommend that clinicians advise against use during pregnancy

(Committee on Obstetric Practice, 2017), however, many women perceive cannabis use in pregnancy to be safe and prenatal use continues to rise (Brown et al., 2017; Young-Wolff et al., 2017). If certain modes of cannabis use in pregnancy are more harmful than others, results can be disseminated to patients and providers to help women who choose not to stop during pregnancy to make informed decisions about potentially less risky methods of administration.

This pilot study is limited in that results may not be generalizable to all pregnant women in KPNC, to those outside of California or those without access to healthcare, or where cannabis is not legal. The number of prenatal cannabis users was small and not all women who self-reported cannabis use reported mode of administration. Women were typically screened for prenatal cannabis use at approximately 8 weeks gestation and results do not reflect continued use throughout pregnancy. Moreover, we are unable to determine whether use in pregnancy occurred only before women realized they were pregnant or whether use continued after women found out about their pregnancy. Finally, some women who use cannabis during pregnancy may choose not to disclose this information when screened during prenatal care (Young-Wolff et al., 2017), and results may underestimate cannabis use. However, it provides initial information identifying the changing patterns of use and information to inform future studies.

Acknowledgments:

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Highlights

- This study examined modes of cannabis administration before and during pregnancy.

- Results indicated that smoking was the most common mode of administration.

- Use of >1 mode was more common in the year before versus during pregnancy.

- Frequency of cannabis use varied with mode(s) of cannabis administration.

Table 1.

Socio-Demographic and Clinical Characteristics by Self-Reported Cannabis Use in Year Before Pregnancy and During Pregnancy

	Overall N = 585 (Column %)	Cannabis Use Before Pregnancy N=575 (Row %)	P-Value[*]	Cannabis Use During Pregnancy N=573 (Row %)	P-Value[*]
Overall		12.3		3.3	
Age category			<.001		.07
16-24	21.4	25.6		6.5	
25-34	60.9	9.7		2.9	
34-45	17.8	5.0		1.0	
Race/ethnicity			.13		.051
Non-Hispanic White	30.6	15.7		4.0	
Hispanic	50.3	11.1		2.4	
Black	4.3	8.3		8.3	
Asian	9.7	5.4		0.0	
Other/Unknown	5.1	20.7		10.0	
Median neighborhood household income			.42		.21
<45K	22.4	13.8		5.6	
45-<60K	22.7	10.8		1.6	
60K-<85K	28.9	10.4		1.8	
85K+	25.0	13.8		4.8	
Unknown	1.0	33.3		0.0	
Trimester of screening			.84		.10
First	90.6	12.3		2.9	
Second	6.2	11.1		8.3	
Third	3.2	15.8		5.6	
Pregnancy intentions			.005		.02
Wanting to get pregnant	64.1	9.5		1.9	
Wanting to get pregnant, but not at this time	23.2	20.1		5.3	
Not wanting to get pregnant	6.7	18.9		10.5	
Missing	6.0	5.7		2.9	
Other substance use in year before pregnancy					
Alcohol			.001		.33
Yes	68.3	15.3		3.8	
No	31.7	5.5		2.2	
Tobacco			.005		.02
Yes	5.8	29.4		12.9	
No	94.2	11.3		2.8	
E-cigarette/vaping			<.001		.13
Yes	3.6	50.0		10.5	
No	96.4	11.0		3.1	

*
 Chi-square and Fisher's exact tests

Table 2.

Frequency of Self-Reported Cannabis Use by Mode(s) of Cannabis Administration Among Users in Year Before Pregnancy and During Pregnancy

	Frequency of Use		
Before Pregnancy (N=71)	**Daily (Row %)**	**Weekly (Row %)**	**Monthly or Less (Row %)**
One Mode			
Smoking only (n=19)	36.8	21.1	42.1
Vaping only (n=4)	25.0	0.0	75.0
Edibles only (n=5)	0.0	0.0	100.0
Lotions only (n=2)	0.0	0.0	100.0
Other only (n=3)	0.0	66.7	33.3
Two Modes			
Smoking, Edibles (n=7)	14.3	28.6	57.1
Smoking, Vaping (n=6)	16.7	16.7	66.7
Smoking, Lotion (n=2)	0.0	100.0	0.0
Smoking, Other (n=1)	100.0	0.0	0.0
Edibles, Lotion (n=3)	0.0	0.0	100.0
Three Modes			
Smoking, Vaping, Edibles (n=3)	33.3	66.7	0.0
Smoking, Vaping, Other (n=2)	50.0	50.0	0.0
Five Modes			
Smoke, Vaping, Edibles, Lotion, Other (n=1)	100.0	0.0	0.0
Mode(s) not reported (n=13)	0.0	23.1	76.9

	Frequency of Use		
During Pregnancy (N=19)	**Daily (Row %)**	**Weekly (Row %)**	**Monthly or Less (Row %)**
One Mode			
Smoking only (n=6)	33.3	16.7	50.0
Vaping only (n=2)	0.0	0.0	100.0
Edibles only (n=2)	0.0	0.0	100.0
Lotions only (n=1)	0.0	0.0	100.0
Two Modes			
Smoking, Edibles (n=1)	0.0	100.0	0.0
Smoking, Vaping (n=1)	0.0	0.0	100.0
Mode(s) not reported (n=6)	16.7	33.3	50.0

Note: Row percentage reported. Women could endorse more than one mode of administration but could not specify a different frequency of use for each mode.