

2022 *Literature Review Summary:*  
**Perinatal Cannabis Exposure**



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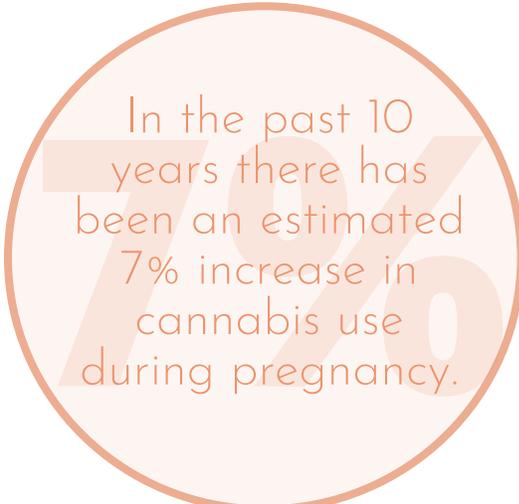
# Introduction

The following literature review was conducted to examine the impacts of perinatal cannabis (Cannabis Sativa) exposure and its effects on maternal, fetal, and neonatal health. The scope of literature consists of peer reviewed clinical or epidemiological studies, literature reviews, and opinion summaries published within the past five years (2017-2022). Fourteen sources were selected through advanced search engine settings on the PubMed library using combined key words such as cannabis, pregnant people, fetal health, and infant development. There appears to be differential conclusions regarding the relationship between cannabis exposure and adverse maternal and fetal health outcomes. Some studies found an association between perinatal cannabis use and adverse maternal and fetal or infant health outcomes (e.g. miscarriage or still birth, low birth weight, being small for gestational age, preterm delivery, small head circumference). While other studies did not report a relationship between cannabis exposure and small head circumference. There are mixed conclusions on the relationships between cannabis exposure and varying markers of fetal, infant, and child neurodevelopment. Further research is needed to fill in these knowledge gaps and establish guidelines to control for confounding factors, such as polysubstance use, substance dosage, and duration of exposure.

*Note: The Center for Excellence on Addiction recognizes diverse gender identities. When describing the study populations included in research, this review refers to pregnant people with the sex they were identified with at birth (female or she/her pronouns) to reflect the gender language chosen by the authors of the published clinical or epidemiological studies.*

## Cannabis 101

Cannabinoids are compounds produced by cannabis, including delta9-tetrahydrocannabinol (THC) and Cannabidiol (CBD). CBD, a mixture of THC and a base oil, is often derived from hemp plants and contains <3% THC, meaning it has no psychoactive effects. While THC compounds are derived from marijuana plants. Both hemp and marijuana plants are classified as 'cannabis'. In more recent years, the cannabis industry has developed concentrated THC delivery forms, including vape pens and edible varieties, which impacts the Central Nervous System more strongly and for longer periods of time (Martin, 2020). Cannabis use during pregnancy and lactation periods has become a rising concern because THC concentrations are over two times higher than they were 15 to 20 years ago (Navarrete, García-Gutiérrez, Gasparyan, Austrich-Olivares, Femenía, & Manzanares, J., 2020).



In the past 10 years there has been an estimated 7% increase in cannabis use during pregnancy.

(Di Giacomo, Pessina, Colmegna, Placenti, Pescatore, Aspesi, & Clerici, 2021; Volkow, Han, Compton, & McCance-Katz, 2019; Young-Wolff, Ray, Alexeeff, Adams, Does, Ansley, & Avalos, 2021).

## Perinatal Cannabis Use in the U.S.

- A. On average, the prevalence of marijuana use during pregnancy ranges from 2% to 5% in most studies (The American College of Obstetrics and Gynecology [ACOG], 2017; Henschke, 2019; Navarrete et al., 2020).
- B. 2-5% of pregnant women self-report to using cannabis; however, this may be an underestimate due to hesitancy towards drug use disclosure (Badowski & Smith, 2020).

- C. It is estimated that cannabis use during pregnancy has increased to 8.14% due to combined pandemic and pregnancy related stressors (Young-Wolff et al., 2021).
- D. Risk factors for continued use during pregnancy include: single/unmarried status, lower income households, lower level of education, history of polysubstance use, and living in a household with someone who uses cannabis (Badowski & Smith, 2020).
- E. Three major longitudinal studies have provided leading insight on the short and long term effects of in-utero cannabis exposure by observing pregnant women and their offspring from birth through young adulthood. These studies are:
  1. Ottawa Prenatal Prospective Study (OPPS, started 1978)
  2. Maternal Health Practices and Child Development Study (MHPCD, started 1982)
  3. Generation R Study (Gen R, started 2001)

## Nausea & Anxiety Relief

- A. In some instances, Cannabis is used to reduce nausea during pregnancy (Badowski & Smith, 2020; Navarrete et al., 2020; Young-Wolff et al., 2021).
- B. It is advised that alternative antibiotics are used during pregnancy. Chronic cannabis use also places the mother at risk for Cannabinoid Hyperemesis Syndrome (CHS), which is a condition characterized by episodes of abdominal pain, nausea, and vomiting (Badowski & Smith, 2020).

## Fetal Health Risks

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- A. Infants whose mothers were only exposed to cannabis during pregnancy had 12 times greater odds of stillbirth or miscarriages compared to the no-use group (Coleman-Cowger, Oga, Peters & Mark, 2018) .
- B. Infants of mothers who were exposed to marijuana during pregnancy had an increased risk of a birth weight below 2500g (RR, 2.06), being small for gestational age (RR, 1.16), preterm delivery (RR, 1.28), and NICU admission (RR, 1.38); additionally, a decreased mean birth weight (mean diff., 112.30), apgar score at one minutes after birth (average mean difference, -0.26), and infant head circumference (average mean difference, -0.34) (Marchand, Masoud, Govindan, Ware, King, Ruther, Brazil, Ulibarri, Parise, Arroyo, Coriell, Goetz, Karrys & Sainz, 2022).

## Birthweight

- A. There are mixed findings regarding cannabis effects on fetal growth. Some studies have found statistically significantly lower mean difference in birth weight among women who used cannabis during pregnancy compared to those who have not when controlling for tobacco use (Badowski & Smith, 2020; Henschke, 2019; Marchand et al., 2022; Martin, 2020; Navarrete et al., 2020; Paul et al.m 2020).
- B. Cannabis consumption during pregnancy is not associated with an increased risk of overt birth defects, but that there are studies showing risks for negative birth outcomes, including: significantly lower mean birth weight, preterm birth, small for gestational age, and admission to neonatal intensive care even when adjusting for socioeconomic status and other drug consumption (Henschke, 2019).

## Head Circumference

- A. Infants of mothers who used both cannabis and tobacco cigarettes during pregnancy had a 5.7 times greater odds of having a smaller head circumference than the no-use groups (Coleman-Cowger et al., 2018).
- B. In contrast, others report that cannabis exposure does not have a statistically significant negative effect on length or head circumference (Martin, 2020; Navarrete et al., 2020).

## Neurodevelopment

- A. There is an association between in-utero exposure to cannabis and long term adverse neurodevelopmental outcomes through young adulthood (ACOG, 2017; Badowski & Smith, 2020; Henschke, 2019; Martin 2020; Navarrete et al., 2020)
- B. Cannabis use during pregnancy is associated with a greater risk of infant startles, tremors, and reduced habituation to light (Badowski & Smith, 2020; Henschke 2019; Huang, Zhang, & Xu, 2020). In contrast, another author notes that these findings are not statistically significant (Martin, 2020).
- C. At preschool age, studies have found that children who experienced in-utero cannabis exposure have difficulties with verbal and visual reasoning; six year olds showed increased hyperactivity, attention deficits, impulsivity; and 18-22 year olds showed depressive and anxious symptoms (Badowski & Smith, 2020; Henschke, 2019; Martin 2020; Navarrete et al., 2020).
- D. These findings are not consistent across all studies, which may be attributable to the complex interplay between cannabis and neurodevelopment (Badowski & Smith, 2020; Martin, 2020; Paul et al., 2020).
- E. Cannabis can disrupt brain development that is critical for dopamine and serotonin development, which may predispose infants to addiction and psychiatric disorders later on in life (Henschke, 2019). Additionally, animal study results suggest that in-utero THC exposure may have long term impacts on T Cell functions, which plays a large role in protecting the body from infection and help fight cancer (Henschke, 2019).

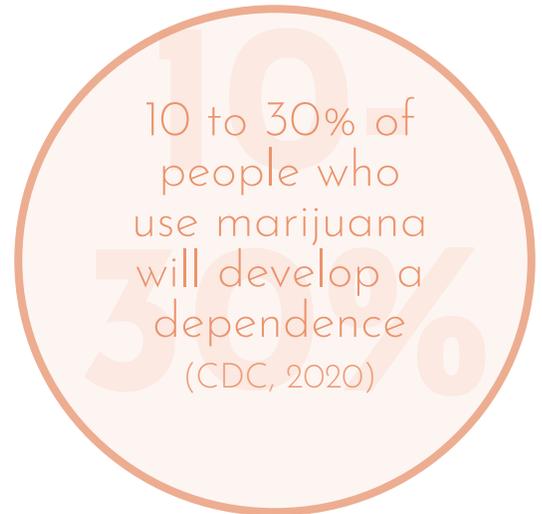
## Breastfeeding

- A. Data on cannabis effects via breastfeeding are limited, but cannabinoids are fat soluble, meaning THC can pass through the placental barrier and is traced in milk at high concentrations (Badowski & Smith, 2020; Henschke, 2019, Martin, 2020; Navarrete et al., 2020). Additionally, the highest THC concentration in milk occurs 1 hour after maternal consumption (Martin, 2020).
- B. There is no confirmed safe level of cannabis during pregnancy or breastfeeding, thus pregnant women should be counseled on the risks and advised to abstain from cannabis use during breastfeeding periods (Badowski & Smith, 2020; Henschke, 2019).
- C. Animal trials report that infant exposure to THC via breastfeeding has caused similar neurodevelopmental effects observed in human in-utero exposure (Badowski & Smith, 2020).
- D. Babies, on average, consume 2.5% of maternal THC dose through nursing (Martin, 2020). However, this is dependent on collection methods and if sampling occurred during foremilk or hindmilk.
- E. THC blood level concentrations are one-tenth to one-third of maternal concentrations one hour after maternal consumption (Navarrete et al., 2020).

## Maternal Risks

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- A. The Centers for Disease Control and Prevention (2020) reports that anywhere from 10% to 30% of people who use marijuana will develop a dependence. Cannabis Use Disorder (CUD) is characterized by impaired control, social difficulties, risky use, tolerance, and withdrawal. (Badowski & Smith, 2020)
- B. Long-term side effects, withdrawal symptoms, and CUD especially, could impact a caretaker's ability to care for the child (i.e. child safety, child development, etc.) (Huang. et al., 2020).
- C. There is a complex relationship between the endocannabinoid system (EDS) and reproductive sex hormones; thus, cannabinoids can impact implantation and fertilization in the female reproductive system and potentially future offspring (Martin, 2020; Navarrete et al., 2020; Paul et al., 2020).



## Harm Reduction and Treatment Methods

- A. The risks associated with cannabis use are related to route of administration, frequency of use, and presence of addiction. Harm reduction methods should be used when abstinence is not possible.  
These methods may include using vaporizers or edibles instead of smoking to reduce maternal carcinogen risk, avoiding smoking indoors or near children, tapering doses of cannabis, and changing clothes after smoking to avoid second-hand smoke exposure (Badowski & Smith, 2020; Henschke, 2019; Martin, 2020; Navarrete et al., 2020).
- B. Currently, no identified optimal treatment method or pharmacotherapy has been shown to be effective at mitigating withdrawal symptoms or maintaining abstinence for CUD (Badowski & Smith, 2020; Connor, Stjepanović, Le Foll, Hoch, Budney, & Hall, 2021; Henschke, 2019). Connor et. al (2021) maintain that treatment modalities are complicated by comorbid mental health needs and the presence of other substance use disorders.
- C. Cognitive Behavioral Therapy, Motivational Enhancement Therapy, and Contingency Management are the most commonly used therapies for cannabis Use Disorder (Connor, et al., 2021).

## Study Limitations

There are limited, quality studies on perinatal cannabis effects because:

1. It is unethical to conduct a human clinical trial
2. Observational study parameters are difficult to replicate
3. Polysubstance use is not controlled for as a confounding variable in many empirical studies
4. Confounding sociodemographic risk factors (e.g. adverse childhood experiences and SES) may lead to widely varying conclusions about cannabis effects
5. THC potency is frequently rising, therefore study findings can quickly become irrelevant or outdated
6. Challenges with misclassification of exposure (e.g. hesitancy to disclose due to fear of repercussions, THC can be detectable in urine even 6 months after last use)

(Badowski & Smith, 2020; Di Giacomo et. al, 2021; Martin, 2020; Navarrete et al., 2020; Paul et al., 2020).

## Recommendations Summary

Ultimately, the American College of Obstetrics and Gynecology (2017) recommends, in an overwhelming consensus across recent literature, that all women planning to get pregnant or are currently pregnant should be screened for drug use. Regardless of substance use status, all women should be informed on the effects and risk factors associated with perinatal cannabis use. “Women who are pregnant or contemplating pregnancy should be encouraged to discontinue marijuana use. Obstetrician-gynecologists should be discouraged from prescribing or suggesting the use of marijuana for medical purposes during preconception, pregnancy, and lactation” (p. 931).

If using cannabis for medical purposes, women should be advised to abstain from use, and instead, use alternative therapies that are proven to be safe during pregnancy. Since research on cannabis and breast milk is limited, both ACOG (2017) and the U.S. Surgeon General (Paul et al., 2020) advise that women abstain from cannabis use during breastfeeding.

The following withdrawal environmental interventions are recommended for infants exposed to cannabis in-utero (Martin, 2020):

1. Dimly lit room environment
2. Minimal sensory or environmental stimulation
3. Positional support
4. Swaddling & Gentle handling
5. Skin-to-skin contact
6. Gentle vertical rocking
7. Frequent small volumes of feedings
8. Nonnutritive sucking
9. Maintain temperature stability
10. Use of family-integrated neonatal care

Moreover, Navarrete et al. (2020) advises that detecting cannabis misuse as early as possible gives the patient and care provider more time to develop a comprehensive care plan, evaluate determinants of health (e.g. access to health services), address the needs of mother as much as the infant, and evaluate social support networks to ensure the wellbeing of both the child and parent.



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