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Gestational Damage caused by THC Use: Public Health Actions and Prenatal Prevention

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ABSTRACT

OBJECTIVE

This study aims to display the importance of raising awareness about the harmful effects of marijuana (*Cannabis*) use by pregnant women on fetal development. It also seeks to review possible pre-existing questionnaires to be administered during prenatal care in this group.

METHODS

This is a literature review based on research from Cochrane, Pubmed, Scielo, and Science Direct databases, using the keywords "Uso de Maconha", "THC" and "Gestação" in portuguese; and "Marijuana Use", "THC" and "Pregnancy" in english.

RESULTS

There is no safe amount of marijuana (*Cannabis*) to be used during pregnancy. We have identified that its use, even in small quantities, results in detrimental effects on the conceptus from the intrauterine period to childhood, adolescence, and adulthood. Healthcare professionals responsible for prenatal care need to be able to identify, prevent, and, if necessary, treat pregnant women who use *Cannabis*. This can be facilitated with questionnaires such as the Marijuana Craving Questionnaire (MCQ-SF) and the *Cannabis* Use Disorder Identification Test - Revised (CUDIT-R).

CONCLUSION

Screening by healthcare professionals is essential for tracking and diagnosis of pregnant drug users. This way, it will be possible to reduce the public health impacts of *Cannabis* use during pregnancy and potentially decrease its abuse after the baby is born.

DESCRIPTORS

Marijuana, THC, Pregnancy.

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INTRODUCTION

Marijuana (*Cannabis*) use during pregnancy leads to numerous undesirable effects on the mother-fetus pair. Marijuana is composed of two main substances, namely: cannabidiol and delta 9-tetrahydrocannabinol (THC), with the latter being the focus of our upcoming study[1, 2].

During our research, we were able to ascertain that "*Cannabis* is the most commonly used illicit drug by pregnant women" nowadays. Especially when combined with electronic cigarattes ("vaping"), a method currently considered "safer" by women, as mentioned in the article *Combined Vapor Exposure To THC And Alcohol In Pregnant Rats: Maternal Outcomes And Pharmacokinetic Effects*. Furthermore, pregnant users of this substance also tend to abuse alcohol and nicotine, primarily [1, 3, 4, 5, 6].

Self-administration of marijuana (*Cannabis*) through vaping has proven to be more harmful than through regular cigarettes, with higher concentrations of THC in its essence and in the bloodstream[4, 5, 6, 7].

Cannabis exposure during the gestational period has been justified by users due to the feelings of relaxation and well-being induced by the drug, as well as the reduction of nausea, a common symptom caused by increased progesterone during pregnancy, associated with other pains. Its pattern of use is changing as the number of user increases, and its consequences for the mother and fetus vary depending on the gestational period in which the drug was used [1, 5].

THC is an active Chemical with the potential to cross the placenta and bind to cannabinoid receptors in the fetal brain, promoting an increased risk of intrauterine growth restriction (IUGR) and consequences of neurodevelopment. Furthermore, there is evidence of an increased rate of stillbirths and early miscarriages, with a risk up to twelve times higher compared to pregnant non-users of the drug, as mentioned in the 2018 study *Marijuana Use in Pregnancy: a Review*. Other consequences are still not well-established[1, 4, 8].

It is of extreme importance emphasizing that THC concentrations in recreational marijuana have doubled in the last 10 years, a fact found in a 2018 study by Freeman. While the amount of cannabidiol, the *Cannabis* component that can be used therapeutically, has become virtually nonexistent in this new format. Consequently, the use of this drug nowadays has much more potent side effects than before. The clinical consequences of this abuse will only be truly quantified after several years of studies[4, 6, 9].

This article's purpose was demonstrating the importance of raising awareness about the harmful effects of marijuana (*Cannabis*) use by pregnant women on fetal development. In addition to reviewing possible pre-existing questionnaires to be applied during prenatal care in this group, as pregnancy is the time when patients are more inclined to make health-related changes. Therefore, it is essential, besides the questionnaires, to seek awareness and prevention measures in prenatal care, starting from the first appointment. This should be associated with close monitoring and a strong doctor-patient relationship, which we aspire to highlight in this article.

METHODS

The current manuscript is a literature review. It was written through research in major databases such as Cochrane, PubMed, Scielo and Science Direct, using the keywords "Uso de Maconha", "THC" and "Gestação" in Portuguese, and "Marijuana Use", "THC" e "Pregnancy" in English. All of them were cross-referenced with Decs. Inclusion criteria comprised articles published between 2018 and 2023 in both English and Portuguese, while exclusion criteria consisted of articles that did not relate drug addiction to pregnancy or fell outside of the specified time frame.

A systematic analysis of the selected articles was conducted, which presented results and statistically already established data from medical-academic literature.

RESULTS

Seveteen articles and one book were selected for this research, while nine were excluded.. Among the selected ones, there were literature reviews, cross-sectional cohort studies, retrospective observational studies, amidst others.

The self-reported prenatal *Cannabis* use prevalence ranges from 2% to 5% in most studies, but reaches 15% to 28% among young, urban, and socioeconomically disadvantaged women. Maternal use was higher in the category of women aged 20 to 24 years (13%) compared to those between 25 to 34 years-old (4%) and 35 years or older (3%). Furthermore, women are also more likely to use if they do not have a high school diploma (16%) when correlated to women with some college education (4%). Race and ethnicity do not appear to affect the prevalence of maternal use[1].

Marijuana (*Cannabis*) is a drug classified as a Central Nervous System (CNS) disturber, thus presenting side effects such as relaxation, increased appetite and sensory capacity, tachycardia, hallucinations, impaired reasoning, and reflexes. Its chronic use leads to the development of tolerance, psychological dependence, loss of concentration, and an increased risk of lung cancer (50% more than tar and cigarettes), chronic bronchitis, and other lung diseases. The most found varieties of the plant are active Indica *Cannabis*, which has a higher concentration of cannabidiol (used therapeutically with CNS action), and American *Cannabis*, which has high THC levels. In short term, higher doses, or lower doses in sensitive, inexperienced individuals, or those with psychopathologies, can lead to Acute Toxic Psychosis – an acute panic reaction associated with hallucinations and depersonalization[10, 11, 12].

Even with the retrospective and observational studies prevalence, and the limited number of samples, exposure to *Cannabis* during pregnancy disrupts fetal development, including an increased risk of Intrauterine Growth Restriction (IUGR)[1, 8].

When analyzing the effects of THC on neonates, we observe that when exposed, newborns exhibit altered responses to visual stimuli, increased tremors, and high-pitched crying, which can indicate issues with the Central Nervous System (CNS). As they progress through their development, school-age children are more prone to advancing with cognitive and motor deficits, along with an increased presence of depressive and anxious symptoms. In the teenage years, a stronger connection has been observed with delinquency and early *Cannabis* use (starting from the age 15), high rates of impulsivity, hyperactivity, poorer sleep quality, inattention, and memory deficits. There is also a greater risk for the development of psychiatric disorders in these individuals [1, 2, 4, 5, 6].

A significant discovery was made when researchers observed that the consequences mentioned before are more prevalent in male individuals, as shown in the study *Long-Term Hippocampal Interneuronopathy Drives Sex-Dimorphic Spatial Memory Impairment Induced by Prenatal THC Exposure*[2].

The THC's mechanism of action in trophoblastic tissues during pregnancy modifies the cytotrophoblast and cellular remodeling of the syncytiotrophoblast during embryonic implantation. In placental development, the antioxidant effects of THC can inhibit normal placental growth and development. In other words, this substance alters neuroplasticity, affecting the development of pyramidal neurons and GABAergic interneurons via cannabinoid receptors CB1 (CB1R). However, it is not yet clear how this leads to cognitive and motor deficits in adulthood[1, 2, 13, 14].

It is also crucial to highlight that studies in rats comparing the combined use of alcohol and THC have shown that these

substances mutually alter their metabolism and modify maternal weight gain. Prenatal exposure to *Cannabis* generally does not appear to produce physical congenital defects, although it may reduce birth weight. Other clinical evidence suggests that children exposed to it during pregnancy exhibit changes in emotional, behavioral, and cognitive development.[4]

DISCUSSION

From the publications and studies analyzed, it is evident that there is a higher prevalence of *Cannabis* use among young, socially disadvantaged women with lower levels of education. This demonstrates that the patient's level of knowledge regarding the harmful effects of the substance directly impacts its use[1].

Additionally, it is evident from the studies that there is no safe amount of this substance to be used during the gestational period. We identified that its exposure, even in small quantities, results in damage to the concept from the intrauterine period to childhood, adolescence, and its development to adulthood.[1, 2, 4, 5, 6].

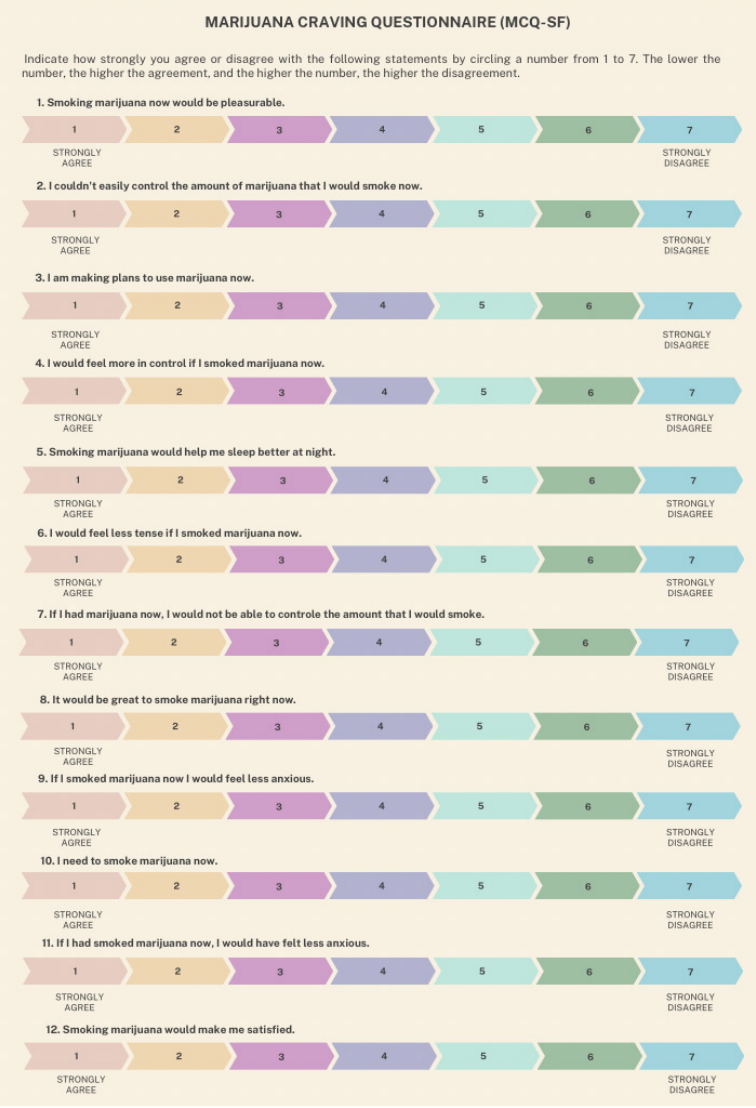
Therefore, it is essential to have effective health education and prenatal care using harm reduction policies to better serve and support the mother-fetus pair. All the health complications that surround them can be prevented by restricting or even reducing the habitual use of *Cannabis* by pregnant women.

Moreover, it is important that healthcare professionals in charge of prenatal care know how to identify, prevent, and, if necessary, treat these *Cannabis* users. To achieve this, screening tools can be utilized, such as already validated questionnaires from medical literature that can be applied during this follow-up. Since 2009, the *Marijuana Craving Questionnaire (MCQ-SF)* was ratified in Portuguese by Pedroso, Castro and Araújo, consisting of 47 items. In 2020, a more concise version of this questionnaire, comprising 8 items, was introduced, called the *Cannabis Use Disorder Identification Test- Revised (CUDIT-R)*, where a score greater or equal to 8 indicates dangerous substance use. In high-risk patients, urine toxicology screening may be considered. Regarding pregnant women wishing to cease their use, psychological support should be provided, including substance abuse support groups. [1, 3, 15, 16, 17]

Through this monitoring and the use of these tools, the impacts of the drug on both the mother and the fetus's bodies can be reduced. Below, we present examples of questionnaires that can be used to enhance monitoring, screening, and public health outcomes.

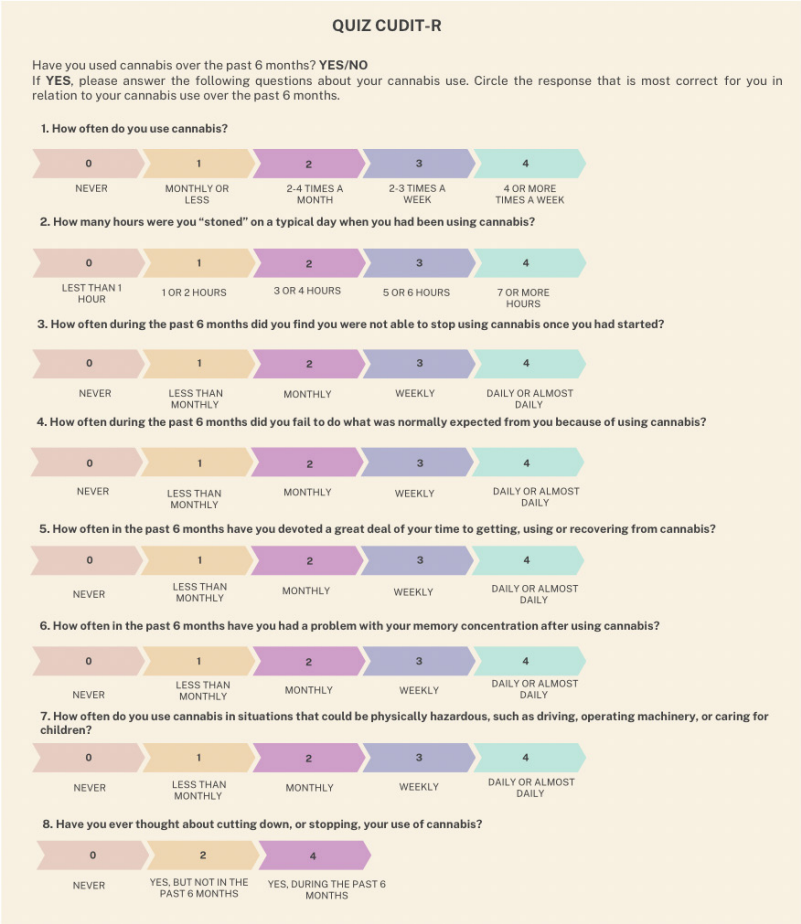
ADAPTED MCQ-SF QUESTIONNAIRE:

Figure 1. Redesigned Marijuana Craving Questionnaire (MCQ-SF). Previously published in a study: https://www.scielo.br/j/jbpsiq/a/bpJVSsfKynjspX3pfMCK6gh/?format=pdf&lang=pt. Patient Guidelines: i) The lower the number you circle, the more you agree with the statement; the higher the circled number, the more you disagree with the statement. If you neither agree nor disagree, circle number 4 (neutral). Ii) Please respond to all statements. We are interested in understanding how you are thinking and feeling at the moment you are filling out the questionnaire.



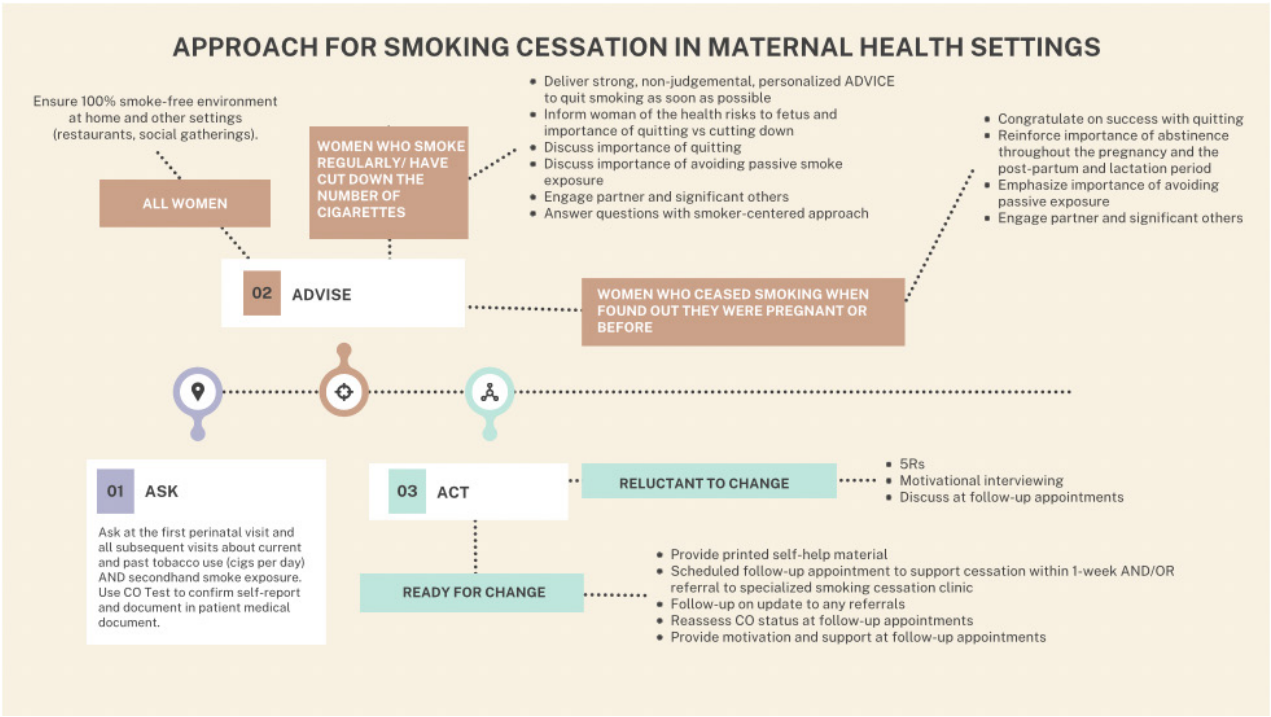
CUDIT-R QUESTIONNAIRE:

Figure 2. Redesigned *Cannabis* Use Disorder Identification Test – Revised (CUDIT-R), previously published in a study: https://pubmed.ncbi.nlm.nih.gov/34913644/



Another interesting intervention proposal, which could be integrated with the use of the previous questionnaires, was brought up in a 2019 study for smoking cessation. It could also be a possibility when considering *Cannabis* use. It is composed of three steps: ask, advise, act. [18]

Figure 3. Redesigned 3As Approach Flowchart – a possible intervention to cease tobacco use in the context of maternal health. Previously published in a study: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6770622/pdf/TID-17-57.pdf



CONCLUSION

A careful approach regarding the use of *Cannabis* in prenatal care is vital so that pregnant women have knowledge of its impacts. This data should be disseminated among all women in the country.

Amidst all the studies analyzed, it is evident that there is no safe amount of this substance to be used during pregnancy nor breastfeeding. With that in mind, it is imperative for health-care professionals to conduct screening for better tracking and diagnosis of pregnant women at an increased risk of Marijuana (*Cannabis*) abuse, for better guidance and intervention during the prenatal period. This way, it will be possible to reduce the impact in public health of its use during that time and possibly decrease its abuse after the birth of the baby.

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