

## **Marijuana Use in Pregnancy**

1) "Birth outcomes associated with cannabis use before and during pregnancy," Mohammad R. Hayatbakhsh, Vicki J. Flenady, Kristen S. Gibbons, Ann M. Kingsbury, Elizabeth Hurrion, Abdullah A. Mamun and Jake M. Najman, K.; *Pediatric Research*, Vol. 71, (2) Feb. 2012

This study aimed to examine the association between cannabis use before and during pregnancy and birth outcomes. The results of this study show that the use of cannabis in pregnancy is associated with increased risk of adverse birth outcomes. Prevention programs that address cannabis use during pregnancy are needed.

2) "Cannabis and the developing brain: Insights from behavior" Viviana Trezza, Vincenzo Cuomo, Louk J.M.J. Vanderschuren; *European Journal of Pharmacology* 585 (2008) 441-452

The studies reviewed here suggest that changes in the activity of the endocannabinoid system during stages of high neuronal plasticity, such as the perinatal and adolescent period, can have long-lasting behavioral consequences.

3) "Demographic, emotional and social determinants of cannabis use in early pregnancy: The Generation R study," Hanan el Marroun, Henning Tiemeier, Vincent W.V. Jaddoe, Albert Hofman, Johan P. Mackenbach, Eric A.P. Steegers f, Frank C. Verhulst, Wim van den Brink g,h, Anja C. Huizink, *Drug and Alcohol Dependence* 98 (2008) 218–226

Results showed that multiple demographic, emotional and social characteristics were associated with maternal cannabis use. These characteristics should be considered when investigating offspring exposed to cannabis in utero, as they may play an important role in mother–child interaction and child development.

4) "Exposure to Marijuana During Pregnancy Alters Neurobehavior in the Early Neonatal Period," Marina Carvalho De Moraes Barros, MD, PHD, Ruth Guinsburg, MD, PhD, Clovis De Araujo Peres, PhD, et al. (*J Pediatr* 2006;149:781-7)

Marijuana exposure during pregnancy alters the neurobehavioral performance of term newborn infants of adolescent mothers.

5) "Marijuana, Spice 'Herbal High', and Early Neural Development: implications for rescheduling and legalization", Delphine Psychoyos and K. Yaragudri Vinod, *Drug Test Analysis* 2013, 5, 27 - 45,

In humans, gestational marijuana exposure is associated with a plethora of neurobehavioral deficiencies including visual behavioral alterations in neonates, mental, motor and neurobehavioral deficiencies, as well as aggressive behavior and attention problems. Little is known on the potentially detrimental effects of gestational exposure to the psychoactive constituents of Spice blends and to cannabinoid research chemicals.

**6)** "Prenatal Marijuana Exposure and Neonatal Outcomes in Jamaica: An Ethnographic Study," Melanie C. Dreher, Kevin Nugent and Rebekah Hudgins, *Pediatrics* 1994;93;254

The absence of any differences between the exposed and nonexposed groups in the early neonatal period suggest that the better scores of exposed neonates at 1 month are traceable to the cultural positioning and social and economic characteristics of mothers using marijuana that select for the use of marijuana but also promote neonate development.

**7)** "Marijuana Impairs Growth in Mid-Gestation Fetuses," Y.L. Hurda, X. Wanga, V. Andersonb, O. Beckc, H. Minkoff d,e, D. Dow-Edwards, *Neurotoxicology and Teratology* 27 (2005) 221–229

The present study evaluated the influence of early maternal marijuana use on fetal growth. Women electing voluntary saline-induced abortions were recruited at a mid-gestational stage of pregnancy (weeks 17–22), and detailed drug use and medical histories were obtained. These findings provide evidence of a negative impact of prenatal marijuana exposure on the mid-gestational fetal growth even when adjusting for maternal use of other substances well known to impair fetal development.

**8)** "Prenatal Marijuana Exposure Contributes to the Prediction of Marijuana Use at Age 14, Nancy L. Day, Lidush Goldschmidt & Carrie A. Thomas, *Addiction*, 101, 1313–1322, 2006,

The authors found a significant association between exposure to marijuana during gestation and the frequency of marijuana use of at age 14 and a marginally significant association between prenatal marijuana exposure (PME) and age of onset of marijuana use. Adolescents with PME have an earlier onset of marijuana use and use marijuana more frequently compared to adolescents who were not exposed.

**9)** "Prenatal Marijuana Exposure and Intelligence Test Performance at Age 6," Lidush Goldschmidt, Ph.D., Gale A. Richardson, PhD, Jennifer Willford, Ph.D. and Nancy L. Day, Ph.D., *J. Am. Acad. Child Adolesc. Psychiatry*, 2008;47(3):254-263

There was a significant nonlinear relationship between marijuana exposure and child intelligence. Heavy marijuana use (one or more cigarettes per day) during the first trimester was associated with lower verbal reasoning scores on the Stanford-Binet Intelligence Scale. Heavy use during the second trimester predicted deficits in the composite, short-term memory, and quantitative scores. Third-trimester heavy use was negatively associated with the quantitative score. Other significant predictors of intelligence included maternal IQ, home environment, and social support. Conclusions: These findings indicate that prenatal marijuana exposure has a significant effect on school-age intellectual development.

**10)** "Intrauterine Cannabis Exposure Affects Fetal Growth Trajectories: The Generation R Study," Hanan El Marroun, M.Sc. Henning Tiemeier, PhD, Eric A.P. Steegers, Ph.D, M.D., et al; *J. Am. Acad. Child Adolesc. Psychiatry*, 48:12, December 2009 1173-1181

Maternal cannabis use during pregnancy was associated with growth restriction in mid- and late pregnancy and with lower birth weight. This growth reduction was most pronounced for fetuses exposed to continued maternal cannabis use during pregnancy. Maternal cannabis use during pregnancy resulted in more pronounced growth restriction than maternal tobacco use. Paternal cannabis use was not associated with fetal growth restriction. *Conclusion:* Maternal cannabis use, even for a short period, may be associated with several adverse fetal growth trajectories.

**11)** "The Effects of Prenatal Marijuana Exposure on Delinquent Behaviors are Mediated by Measures of Neurocognitive Functioning" Nancy L. Day, Sharon L. Leech, Lidush Goldschmidt; *Neurotoxicology and Teratology* 33 (2011) 129 - 136

PME significantly predicted child depressive symptoms and attention problems at age 10, after controlling for other significant covariates. Child depressive symptoms and attention problems at age 10 significantly predicted delinquency at 14 years. The association between PME and delinquent behavior at 14 years was mediated by depressive symptoms and attention problems in the offspring at 10 years.

**12)** "Effects of Prenatal Marijuana Exposure on Child Behavior Problems at Age 10," Lidush Goldschmidt, Nancy L. Day, Gale A. Richardson, *Neurotoxicology and Teratology* 22 (2000) 325–336

Prenatal marijuana use was significantly related to increased hyperactivity, impulsivity, and inattention symptoms as measured by the SNAP, increased delinquency as measured by the CBCL, and increased delinquency and externalizing problems as measured by the TRF. The pathway between prenatal marijuana exposure and delinquency was mediated by the effects of marijuana exposure on inattention symptoms. These findings indicate that prenatal marijuana exposure has an effect on child behavior problems at age 10.

**13)** "Association Between Stillbirth and Illicit Drug Use and Smoking During Pregnancy," Michael W. Varner, Robert M. Silver, Carol J Rowland Hogue, et al. *Obstetrics & Gynecology* 123 (2014) 113-125.

Based on historical and toxicology confirmation of marijuana use in pregnancy, a positive cord homogenate test for marijuana was associated with stillbirth at a 2.3 times increased rate. The effect was partially confounded by smoking. Cannabis use, smoking, illicit drug use, and apparent exposure to second-hand smoke separately or in combination during pregnancy were associated with an increased risk of stillbirth.

**14)** “Maternal Periconceptional Illicit Drug Use and the Risk of Congenital Malformations,” M.M. vanGelder, J. Reefhuis, A.R. Caton, et al. *Epidemiology* 20 (2008) 60-66.

A large scale epidemiologic study documented increased risk of anencephaly when marijuana is used during the first month of pregnancy.