

THE EFFECTS OF ALCOHOL AND DRUG CONSUMPTION ON A FETUS

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ABSTRACT

Substance abuse during pregnancy continues to become a rising threat as per increasing statistics and requires global attention to the matter for it to be solved for future proficiency. Alcohol and drug exposure to a fetus within the gestation period, especially the first trimester of pregnancy, can cause severe birth defects and an increased risk of sudden infant death syndrome (SIDS), stillbirth, as well as miscarriage. Through extensive secondary research, the major issues can be seen through abnormalities in the brain structure and components of a child with prenatal alcohol or drug exposure, such as white matter integrity, volume reductions in several parts of the brain, and changes to gray matter, which then affect the child's neuropsychology. It also further leads to differences in a fetus' brain networking functional proficiency, oxidative stress, and the increase of apoptosis in neurological cells. Furthermore, substance abuse puts the mother's and baby's lives at risk during pregnancy delivery due to the mortality rates that prenatal substance exposure brings. Due to social stigma and the many gaps that are still left in this field of research, it is critical that attention be brought to this global issue to ensure safety for our future generations.

KEYWORDS: Pregnancy, Sensorimotor, Substance Abuse, Stimulants, Neuropsychological, Birth Defects

INTRODUCTION

Fetal alcohol spectrum disorders (FASD) are defined as a range of syndromes that are related to alcohol exposure during the gestation period. With the constant rise of FASD continuing to escalate, physical and mental health are seen in a negative state for future generations. The reason alcohol in a baby's circulatory system is a large issue is due to differences in how a child's body and an adult's body are able to break down the substance. The baby's body thus has an increased blood alcohol level than its mothers (MedlinePlus, 2022). Alcohol is not the only psychoactive substance that is causing potential harm to pregnant women and their fetus, but also several drugs, such as stimulants, marijuana, nicotine, and prescriptions. Severe prenatal drug exposure (PDE) typically results in neonatal abstinence syndrome (NAS), in which babies go through drug withdrawal when they are born (NIDA, 2020). Various aspects of life are affected by prenatal alcohol exposure (PAE) and PDE before birth, which can include a child's motor skills, self-regulation, and capabilities to become inferior to an average human being. This further complicates a functional way of living for the child in their lifespan. FASD and drug consumption related problems often remain under-diagnosed due to the difficulties related to social stigma and the similarities it carries with similar syndromes (e.g., Attention Deficit

Hyperactivity Disorder) (Wozniak et al., 2019). The effects of PAE and PDE are clearly harmful to a child and mother through brain complications, sensory and neuropsychological abnormalities, and increased risks during delivery.

Based on various regional factors, the rates of PDE related disorders and FASD vary globally. As an example, disorders are largely prevalent in the majority of the African continent due to historical social norms (e.g., being rewarded with alcohol for doing farm work). Meanwhile, countries that religiously prohibit drinking and drugs carry much lower percentages of PDE and PAE syndromes (Wozniak et al., 2019). It is confirmed through research that the rate of FASD exclusively has tripled since estimated studies 16 years ago. Over the past 4 decades, it has been shown that global PAE levels have still not been lowered enough to a point where it is correct to assume that they are safe. Furthermore, cannabis usage in the last month rose among pregnant women overall from 3.4% to 7.0% between 2002-2003 and 2016-2017, and during their first trimester from 5.7% to 12.1%, which is more than double the previous statistics (NIDA, 2020). Cocaine is also on a significant rise for PDE, as it is estimated that every year there are roughly 750,000 cocaine exposed pregnancies globally.

¹Research Scholars Program, Harvard Student Agencies, In collaboration with Learn with Leaders

HOW TO CITE THIS ARTICLE:

Saanvi Sharma (2024). The Effects of Alcohol And Drug Consumption on A Fetus, International Educational Journal of Science and Engineering (IEJSE), Vol: 7, Issue: 3, 11-13

MATERIALS & METHODS

The data and findings that are used in this paper were gathered through extensive secondary research, including at the National Library of Medicine, National Institute on Drug Abuse, etc. The results of studies comparing neurological brain activity between children diagnosed with FASD/PAE and youth without these conditions were thoroughly analyzed to portray the adverse effects of alcohol and drug consumption during pregnancy.

RESULTS & DISCUSSION

Brain Complications

A recent study done with neuroimaging and MRI revealed that babies with reported FASD and PAE have irregular brain structures, cortical development, increased apoptosis in neurological cells, and abnormalities in white matter (Wozniak et al., 2019). These symptoms then continue to have an effect on the neuropsychological aspects of the child, leading to sensory, cognitive, motor, and behavioral issues. Group comparison in these studies has allowed scientists to point out major differences in the brain's structure. For example, even after controlling for overall brain volume, there were regional changes in total gray matter density and volume reductions in the frontal, temporal, and parietal lobes, basal ganglia, thalamus, cerebellum, and amygdala parts of the human brain. Longitudinal MRI studies of infants with FASD indicate different trajectories of cortical volume change, showing the long-term influence of PAE on the course of postnatal development (Wozniak et al., 2019). Children with FASD are overall seen to have many connectivity issues, which thus correlates with the white matter abnormalities that PAE causes. Overall, PAE significantly alters the human brain in harmful ways for growth and living.

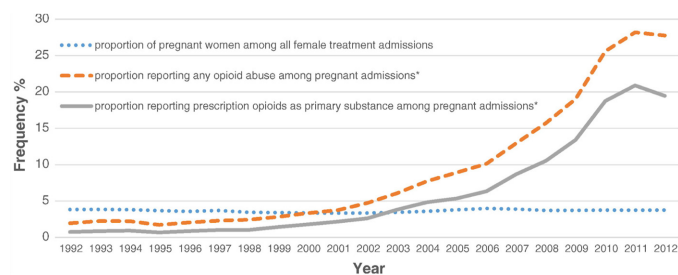
Neuropsychological Abnormalities

Firstly, the human brain is mainly composed of two major networks; a physical network, and functional network. A physical network connects brain cells to send and receive information via chemical signals, while a functional network uses physical networks as a foundation to be able to link parts of the brain with one another (UCLA Health, 2023). A study by UCLA Health, by Dr. Katherine Narr, Ph.D., and Dr. Roger Woods, MD, revealed through functional MRI that functional networks in the brain of a baby with PAE had weak connectivity when compared to babies without PAE. Furthermore, there was a much stronger connection in sensorimotor parts of the brain with PAE, which explains behaviors visible in the future such as short temper and easy irritability due to sensitive sensory stimulation in their brains (UCLA Health, 2023). Neurological deficits have also been seen to reduce motor and cognitive skills needed on a day-to-day basis for a child. For example, having lower manual coordination, fine motor composite scores, and graphomotor skills (Wozniak et al., 2019). Social adaptability and communication in a child with FASD are seen to also develop at a poor rate, leading to issues within social settings and thus increasing criminal activity in the future. Research has shown that prenatally marijuana exposed children have poorer academic performance compared to the average child, with problems regarding problem solving, complex thinking, memory, etc. Furthermore, breast milk from a mother who regularly consumes marijuana carries traces of THC

(cannabinoid). When a child drinks such breast milk, which contains THC, it affects the brain's development, especially if they are younger than 1 year. Substance abuse, especially with heroin, also allows the baby to become prone to NAS, due to drugs traveling into the placenta and causing an unborn fetus to become dependent on opioids (NIDA, 2020).

Risks During Pregnancy and Delivery

Not only does substance abuse heavily impact the fetus and child development during postpartum, but also the safety of the delivery and pregnancy itself. Stimulants and opioids, such as cocaine, dextroamphetamine, heroin, and methamphetamine, have been shown through research to put a woman at a higher risk of birth complications, including premature membrane rupture, maternal seizures and migraines, and a disconnection of the uterus and placental lining (NIDA, 2020). Although pregnancy comes with a vast amount of normal cardiovascular changes, the use of stimulants aggravates these changes to a much higher risk. This can lead to hypertensive crises, preterm labor, premature birth, and spontaneous miscarriage. Unfortunately, opioid use among pregnant women has been on a drastic incline throughout the years, as seen in the graph below.



Source: ScienceDirect (2015)

Figure 1: Comparative graph, which demonstrates the relationship between pregnant women and opioid substance abuse.

Between 1992 and 2012, young (21–29 years) non-Hispanic White women (62–85%), single (69–85%), and non-Hispanic women (41–68%) with at least a high school diploma (61–68%) but no employment (81–88%) made up the majority of pregnant substance abuse treatment admissions reporting any prescription opioid use. Apart from substance addiction, one-third (14–43%) of people had a mental disease (Martin et al., 2014).

CONCLUSION

With the lack of awareness that often surrounds the topic of addiction and substance disorders, it is critical that we as a society acknowledge the repercussions that they may have on our future generation through the consequences of PDE and PAE. We can see the harms of the exposure through complications in a child's brain, neuropsychological abnormalities, and the imposed risk of mortalities during delivery and gestation. Society should evolve in order to reduce stigma around mental health disorders and poor living conditions, which are interlinked with the issue of substance abuse. Thus, future research should have a focus on how poverty and capitalist issues are closely related to

alcohol and drug exposure to fetuses.

REFERENCE

1. Ethen, M., Ramadhani, T., Scheuerle, A., Canfield, M., Wyszynski, D., Druschel, C., & Romitti, P. (2008, March 4). Alcohol Consumption by Women Before and During Pregnancy. National Library of Medicine. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6090563/>
2. Martin, C., Longinaker, M., & Terplan, M. (2014, July 23). Recent trends in treatment admissions for prescription opioid abuse during pregnancy. ScienceDirect. Available at: <https://www.sciencedirect.com/science/article/pii/S0740547214001445>
3. MedlinePlus. (2022, 10 January). Alcohol and pregnancy. National Library of Medicine, Available at: <https://medlineplus.gov/ency/article/007454.htm>
4. National Institute on Drug Abuse. (2020, April). Substance Use While Pregnant and Breastfeeding. National Institute on Drug Abuse, Available at: <https://nida.nih.gov/publications/research-reports/substance-use-in-women/substance-use-while-pregnant-breastfeeding>
5. National Library of Medicine. (2022, January). Heroin. National Library of Medicine. Available at: <https://www.ncbi.nlm.nih.gov/books/NBK582745/>
6. UCLA Health. (2023). Alcohol exposure in the womb disrupts communication between brain regions. UCLA Health, Available at: <https://www.uclahealth.org/departments/neurology/about-us/brains-neurology/alcohol-exposure-womb-disrupts-communication-between-brain>
7. Wozniak, J., Riley, E., & Charness, M. (2019, May 31). Diagnosis, epidemiology, assessment, pathophysiology, and management of fetal alcohol spectrum disorders. National Library of Medicine. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6995665/>