H154 An Analysis of the Causal Relationship Between Maternal/Prenatal Cocaine Use and Stillbirth: Results of a National Hospital Database Study

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The goal of this presentation is to describe the contribution of maternal/prenatal cocaine exposure to stillbirth risk using national hospital data. After attending this presentation, attendees will better understand an issue increasingly encountered by medical examiner offices: whether maternal/prenatal cocaine exposure is a cause of stillbirth and, when such exposure is found in the instance of a stillbirth, whether the exposure can be ruled the sole cause of the stillbirth.

This presentation will impact the forensic science community, as well as those who represent disadvantaged populations, by elucidating the causal association between maternal/prenatal cocaine exposure and stillbirths.

Prenatal illicit substance use, including the use of crack cocaine, has become the focus of recent legislative attention in a number of states in recent years. In some states, the occurrence of a stillbirth coinciding with maternal and thus fetal exposure to cocaine, is considered evidence of homicide. Because stillbirth occurs both with and without maternal/prenatal cocaine exposure, it is fallacious to consider such exposure the entirety of the cause of a subsequent stillbirth without first considering the magnitude of competing causal factors. Without accurate information on cause, there is no way to determine the manner of death in a case of stillbirth following maternal/prenatal cocaine exposure (absent toxicology findings indicating a fatal dose).

Stillbirth, defined as a fetal death occurring at 20 or more weeks of gestation, is a relatively common adverse pregnancy outcome in the United States.[1] In 2005, a stillbirth rate 6.22 fetal deaths per 1,000 live births was reported in the United States, totaling 25,894 deaths.[2] Stillbirth occurs disproportionately among the disadvantaged and women of color.[1] Although the etiology of stillbirth in individual cases is often unclear, a number of associated factors, including poverty, single motherhood, inadequate prenatal care, maternal age, infection, obesity, diabetes, thrombophilia, fetal genetic or structural abnormalities, and umbilical cord abnormalities have been identified. Maternal syphilis infection is strongly associated with stillbirth, but it is a rare case; in 2008, there were 431 cases of congenital syphilis reported in the United States, of which only 25 (6%) were stillborn.[3]

The relationship between maternal cocaine exposure and stillbirth risk is incompletely explored at the present time. Using a case-control design Miller and colleagues examined stillbirths occurring at an urban hospital in Louisiana in 1994.[4] That study reported the odds of stillbirth among the cocaine-exposed group as a non-significant 1.18 (95% CI 0.45, 5.07). In a later study linking birth and death certificates, Wolfe et al. reported a non-significant odds ratio of 1.2 (95% CI 0.99, 1.42) for fetal death and fetal cocaine exposure in the univariate analysis.[5] A multivariate analysis that accounted for confounding variables demonstrated a counterintuitive protective effect (OR 0.2, 95% CI 0.19, 0.30). Flenady and colleagues reported a significant association between illicit drug use and stillbirth, but did not provide an analysis of cocaine use individually.[6]

Despite the fact that cocaine use during pregnancy is associated with adverse outcomes such as low birth weight, preterm birth, and small-for-gestational-age status, there are several issues that obscure the relationship between cocaine use and stillbirth.[7] Polydrug use and socioeconomic factors make it challenging to distinguish the effects between cocaine and other socioeconomic, ethnic, and health factors commonly associated with cocaine use. Additionally, the presence and degree of maternal cocaine use is difficult to measure.

To further explore this relationship, an analysis of hospital inpatient birth data was performed. Data from the Nationwide Inpatient Sample Database (NIS) of the Healthcare Utilization Project of the Agency for Healthcare Research and Quality of the United States Department of Health was accessed. The NIS is a publicly held database containing data from approximately eight million United States hospital stays each year in 45 states, or approximately a 20% sample of all hospital discharges. The NIS data allow for a national estimate of the incidence, risk factors, outcomes, and other variables pertaining to all conditions seen in US hospitals. A univariate analysis of the contribution of maternal cocaine presence to stillbirth risk, along with other known risk factors, was conducted. These findings were used to construct an adjusted model of cocaine exposure as a cause of stillbirth, using binomial logistic regression.

The preliminary results of this analysis resulted in an odds ratio of 1.58 (95% CI 1.02, 2.45), equivalent to an attributable risk or probability of causation of 37%. Thus, the result of this preliminary analysis indicates that the presence of maternal/prenatal cocaine use in a case of stillbirth does not even account for more than 50% of the cause of the stillbirth. Further analysis is needed to examine the interaction of a wider variety of predictive factors.

References:

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Cocaine, Stillbirth, Forensic Epidemiology