

Methamphetamine Use in Pregnant Women in Hawai'i: A Case Series

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Abstract

Methamphetamine use is widespread among pregnant and reproductive-aged women in Hawai'i. Women who use methamphetamine require comprehensive care that is gender specific and tailored to their needs. In Hawai'i, more services are needed to solve this serious public health problem. The authors present three cases of methamphetamine use with negative maternal and fetal outcomes. The first case describes a pregnant woman with daily methamphetamine use who experienced cardiac arrest with subsequent preterm delivery and maternal death due to global anoxic brain injury. The second case describes a pregnant woman with daily methamphetamine use which exacerbated her chronic hypertension and led to intrauterine fetal demise. The third case describes a pregnant woman with current methamphetamine use who experienced preeclampsia and a cerebrovascular accident necessitating preterm delivery. Methamphetamine remains a serious public health concern for the United States and especially in the state of Hawai'i.

Keywords

Hawai'i, Methamphetamine, Pregnancy

Abbreviations

ACE = Adverse childhood experiences
HACA = Hypothermia after cardiac arrest protocol
MRI = Magnetic resonance imaging
SGA = Small for gestational age

Introduction

Methamphetamine is a stimulant that causes the release of dopamine, norepinephrine, and serotonin. It is usually smoked or snorted and causes increased energy, euphoria, weight loss, tooth decay, irritability, anxiety, paranoia, memory impairment, and can exacerbate pre-existing psychiatric conditions.¹ In general, amphetamine stimulants, including methamphetamine, are the most rapidly increasing class of illicit drugs used worldwide. Approximately 4.7 million people in the United States have tried methamphetamine.¹ Methamphetamine is one of the most addictive substances even after first time use and has been proven to change signaling pathways in the brain in rat models.² Mortality from methamphetamine use is high with approximately 10,333 drug overdose deaths in 2017, a rate which has tripled since 2011.³

Amphetamine use including methamphetamine has been increasing in reproductive-aged women, including pregnant women. A recent study looking at drug abuse hospitalization from 1998 to 2004 noted that, among hospitalized pregnant patients, co-

caine use had decreased by 44% whereas amphetamine use had doubled.⁴ Another study examined trends from 1994 to 2006 and found that the incidence of hospitalized pregnant women using methamphetamine increased from 8% in 1994 to 24% in 2006.⁵ The majority of these occurred in the western United States.

Amphetamines and their byproducts cross the placenta to the fetus. Amphetamine use is associated with a two to fourfold increase in intrauterine growth restriction, hypertensive diseases of pregnancy, placental abruption, preterm delivery, intrauterine fetal demise, and neonatal and infant death.⁶ Studies have consistently shown an increased rate of small for gestational age (SGA) babies among users. A prospective study identified a 3.5 times higher risk of SGA neonates with prenatal methamphetamine exposure.⁷ Neonates exposed to methamphetamine have lower Apgar scores and increased neonatal mortality.⁸ Long term effects in prenatally exposed children include increased stress, lower attention, verbal memory, and spatial memory.⁹

Three cases of methamphetamine use during pregnancy are presented. These cases demonstrate the immediate and long-term negative effects for both mother and neonate. Case 1 shows an example of maternal and neonatal mortality related to methamphetamine use. Case 2 shows an example of fetal demise related to methamphetamine use. Case 3 shows an example of long-term maternal morbidity related to methamphetamine use.

Case One

A 35-year-old Gravida 4 Para 2 Aborta 1 woman at 34 weeks and 4 days gestation was brought to the emergency department via ambulance due to cardiac arrest at home. Her prenatal course was significant for longstanding history of methamphetamine-induced cardiomyopathy, history of cardiac arrest, previous suicide attempt, and one prenatal visit. Her boyfriend awoke to find her gasping for air and soon after unresponsive. He immediately called 911. Intubation and CPR were performed in the field. Return of spontaneous circulation was achieved 14 minutes later. Upon arrival to the emergency department, she was hypoxemic, placed on hypothermia after cardiac arrest protocol (HACA), and developed pulmonary edema. The fetal heart rate tracing demonstrated a deceleration that lasted for 17 minutes down to a nadir of 50 beats per minute. An emergent cesarean delivery was performed. A live preterm female neonate was stabilized and transferred to another facility where neonatal intensive care services were available. She was transferred to the medical intensive care unit and completed the HACA proto-

col. Neurologic posturing was noted consistent with an anoxic brain injury. An echocardiogram revealed poor cardiac function with an ejection fraction of 10-15% and diffuse hypokinesia. An electroencephalogram showed delta-theta slowing with no reaction to painful stimulus. Computed tomography (CT) of the head demonstrated diffuse sulcal effacement with loss of gray-white differentiation, consistent with severe global anoxic/ischemic injury. On postoperative Day 5, she developed seizures. On postoperative day 12, her family withdrew life support. Shortly after, her death was pronounced. The neonate suffered from severe hypoxic ischemic encephalopathy. At 4 weeks of age, the family withdrew life support and the neonate also died.

Case Two

A 30-year-old Gravida 3 Para 2 woman at 28 weeks and 4 days gestation presented to a prenatal visit. She complained of blurry vision and headaches for the past two days. She last felt fetal movement three days prior. Her prenatal course was significant for late onset of prenatal care, uncontrolled hypertension for over 10 years, and daily methamphetamine use. Her blood pressure was 179/121. Severe superimposed preeclampsia was diagnosed based on persistent central nervous system symptoms, new onset 4+ proteinuria, and persistent severe blood pressure readings. An obstetric ultrasound revealed an intrauterine fetal demise measuring 23 weeks and 3 days. The woman was treated with intravenous magnesium for seizure prophylaxis, intravenous and oral labetalol, labor was induced, and she vaginally delivered a macerated stillborn male that appeared grossly normal.

The woman reported that her other children had been removed from her custody and were living separately from each other with extended family on the mainland. She stated that her current boyfriend also used methamphetamine regularly. She was amenable to treatment and elected to stay at a residential treatment center. Her blood pressure required multiple medications to achieve control. She was then discharged on postpartum day two with prescriptions for four antihypertensive medications. Four years later, she was seen in the maternal fetal medicine office for another pregnancy. She was incarcerated. She hoped to re-enroll in a residential treatment program after release.

Case Three

A 27-year-old Gravida 3 Para 2 woman at 31 weeks and 6 days gestation with chronic hypertension with superimposed preeclampsia was transferred by air ambulance from a neighbor island to Honolulu. Her prenatal course was significant for current methamphetamine use, scant prenatal care, history of two prior preterm deliveries due to severe preeclampsia, and history of a classical cesarean delivery. She reported that her younger child born at 24 weeks had been removed from her care and was adopted by a foster family. Her blood pressure was controlled with an oral antihypertensive medication and the fetal status was reassuring. She experienced rapidly progressing

lower extremity weakness and urinary and fecal incontinence over several hours. There were no other neurological findings. She had normal capacity, but behaved impulsively and belligerently. Lumbar magnetic resonance imaging (MRI) showed disc protrusion at the L1-2 level and diffuse disc bulging at L3-4 and excluded cauda equina syndrome. She was transferred to another hospital where on site neurology and neurosurgery were available. An MRI of her brain, cervical, thoracic, and lumbar spine were ordered and ultimately performed three days later due to patient refusal. The MRI revealed multiple tiny infarcts in the bilateral frontal lobe, right parietal lobe, left occipital lobe, and right cerebellar hemisphere. An embolic cause was excluded. She received a negative transthoracic echocardiogram with bubble study, negative CT angiogram of the brain and neck, and negative CT venogram of the brain. A thrombophilia workup and lipid levels were normal. The final diagnosis was small acute infarcts caused by methamphetamine induced reversible cerebral vasoconstriction syndrome. Delivery by repeat cesarean delivery was performed at approximately 33 weeks gestation for the diagnosis of severe superimposed preeclampsia and brain ischemia. She requested and underwent tubal ligation which was performed immediately after delivery. The bowel and bladder incontinence did not reverse. On postoperative day four she was discharged from the hospital to follow-up in an outpatient stroke rehabilitation center, after she declined the recommended inpatient stroke rehabilitation. She has been lost to follow-up at the time of this writing. The neonate did well and was placed with the same adoptive family as her second child.

Discussion

There are significant maternal and fetal risks with methamphetamine use during and after pregnancy. The first case demonstrated the increased risk of cardiomyopathy and myocardial infarction leading to death. The second case demonstrated the increased risk of hypertension and intrauterine fetal demise, as well as the consequences of incarceration and separation of families. The third case demonstrated the increased risk of stroke and permanent neurologic damage.

Methamphetamine use is linked to early mortality and with a significantly higher rate of suicide attempts regardless of age and socioeconomic status.¹⁰ The rate of methamphetamine-associated cardiomyopathy has increased from 1.8% in 2009 to 5.6% in 2014.¹¹ A recent study conducted in Hawai'i found that pregnant women who used illicit substances (the majority of whom used methamphetamine) have increased parity, more frequent use of tobacco and marijuana, are more likely to identify as Native Hawaiian or other Pacific Islander, and more often have diagnoses of schizophrenia, schizoaffective disorders, or post-traumatic stress disorder when compared to pregnant women who did not use illicit substances. Pregnant women who used methamphetamine were more likely to present later for care and to have fewer prenatal visits. Birth outcomes

were significant for preterm delivery and lower birth weight among continuous methamphetamine users and an increase in chronic hypertension and cesarean delivery among occasional methamphetamine users.¹²

Methamphetamine use also affects breastfeeding and may decrease maternal bonding. Breast milk concentrates amphetamines between 2.8-7.5 times higher than in maternal blood and thus women intermittently using methamphetamine are advised to wait or discard milk for 48-100 hours after use, a timeline which is unrealistic for those that use frequently.¹³ Infants who ingest breast milk with amphetamine demonstrate increased frequency of irritability, agitation, and crying.¹⁴ Women with chronic use resulting in brain dysregulation may find breastfeeding overwhelming or impossible. Maternal behavior may become disrupted where stress becomes heightened by neonate behavior instead of what would normally be rewarding to mothers without a substance use disorder.¹³

Methamphetamine remains a serious public health concern for the United States and the state of Hawai‘i. In the United States, costs associated with methamphetamine have risen from \$436 million in 2003 to \$2.2 billion in 2015.¹⁵ Methamphetamine has become the drug of choice in Hawai‘i. In 2004, there were approximately 30,000 methamphetamine users in Hawai‘i who spent a total of approximately 1.8 billion dollars annually due to their habits.¹⁶ The state of Hawai‘i spends approximately half a billion dollars per year on programs related to methamphetamine use and this cost has increased in the past few years.¹⁶ In comparison, Montana spends approximately \$300 million per year on methamphetamine related issues.¹⁷ In 2014, the drug overdose death rate in Hawai‘i was 10.6 per 100,000 residents, which far surpassed the motor vehicle death rate of 6.5 per 100,000. Between 2010 to 2014, 91% of all poisoning deaths were due to drug overdoses.¹⁸ According to the Hawai‘i Pregnancy Risk Assessment Monitoring System, 3% of pregnant women in Hawai‘i in 2014 reported use of any illicit drugs including methamphetamine during their most recent pregnancy.¹⁹ This is slightly lower than the national average of 5.4% averaged across 2012 and 2013.¹⁵ Hawai‘i was ranked number one in 2017 for drug-related hospital admissions concerning methamphetamine.²⁰ The Queen’s Medical Center, Hawai‘i’s only Level One Trauma Center, and its West O‘ahu Campus have noticed a sharp increase in patients affected by methamphetamine use. Of patients who present to the emergency department, 20-40% have methamphetamine related issues. Admissions related to methamphetamine use have quadrupled in the past 10 years.²⁰

Treatment of methamphetamine intoxication includes intravenous fluids, sedation with benzodiazepines, diphenhydramine, antipsychotics, and blood pressure and heart rate control. There is a longstanding dogma that beta-blockers, including labetalol, should not be used to treat hypertension with concomitant methamphetamine exposure or toxicity. This recommendation is based on a small number of cocaine toxicity cases, which have

perpetuated a theoretical concern regarding “unopposed alpha stimulation” when beta blockers are used. This side effect has not been demonstrated in cases of methamphetamine toxicity. Labetalol is a nonselective beta-blocker with selective alpha one blocking effect with weak intrinsic sympathomimetic activity. It is also one of the first line antihypertensive medications for use during pregnancy. According to a systemic review in 2015, for concomitant tachycardia and hypertension that does not respond to sedation, labetalol is the preferred treatment due to its alpha blocking ability.²¹ It predictably reduces blood pressure and heart rate and has the added advantage of being lipophilic, thus penetrating the blood brain barrier and decreasing agitation.²²

It is extremely beneficial to keep the mother and baby dyad together for both maternal and child health. Gender specific treatment is necessary, recognizing that many patients are single mothers who need help with housing, childcare, and transportation to effectively participate in treatment. Women who use substances benefit from trauma informed care as they are frequently victims of adverse childhood experiences (ACE), including neglect, deprivation, sexual and physical abuse, and parental substance use. ACEs also increase the rate of chronic conditions, decrease the quality of life, and life expectancy. There are higher rates of resilience among children receiving care in family-centered medical homes.²³ Separation is reserved for severe cases where the mother is unwilling or unable to seek treatment or unable to safely care for the child. Benefits for the mother include bonding which may be a strong motivation to stop use. Benefits for baby include bonding with the mother and breastfeeding, if feasible.⁶ Families coping with substance use disorder would benefit greatly from the well-known health benefits of breastfeeding that include child spacing, decreased rates of infection, sudden infant death syndrome, and postpartum depression.¹³

There are not enough substance use treatment programs available in the state of Hawai‘i to meet the needs of women. This is especially true in the more rural neighbor islands, as demonstrated by the fact that in 2014, 28 of the 52 publicly funded treatment programs were located on O‘ahu.²⁴ The island of O‘ahu has capacity for less than 100 women, and only one residential treatment program allows women to live with or bring their children to the treatment center. As a result, waiting lists are months long. There are no residential treatment programs on the island of Kaua‘i. Other states suffer from similar problems and have tried a variety of approaches.¹⁵ Vermont has established telehealth programs to improve capacity. Ohio recommended increasing the number of addiction doctors who work in treatment programs. Montana attempted to use graphic advertising as a way to prevent first time use among teenagers; however, it was criticized as making the drug seem less risky and more acceptable to teenagers. California implemented a community-based drug treatment and probation program for offenders convicted of a nonviolent drug-related crime. They found a benefit cost ratio of four to one for participants who

completed the program, resulting in a net savings of \$173.3 million.²⁵ Kansas started a prevention project that supported local community efforts to prevent the manufacture and use of methamphetamine and saw a significant reduction in the use of methamphetamine in high school seniors.²⁶ Hawai'i has just started an addiction medicine fellowship that will help address the physician shortage of people specifically trained to deal with substance use disorders.

In conclusion, methamphetamine use remains a serious public health problem for Hawai'i's women, children, and families. Methamphetamine use causes significant maternal, fetal, and neonatal morbidity and mortality, all of which negatively affect the whole of society. Currently, there are insufficient services in Hawai'i to support and treat pregnant and reproductive-aged women who are using methamphetamine and other drugs. More social services that destigmatize the issue and provide gender specific care are needed.

Conflict of Interest

None of the authors identify any conflict of interest.

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