

## Complications and Hospital Admissions Among Pregnant Women with Substance Abuse

Jamila Iqbal Ranavaya, MD<sup>1</sup>, Sydney Smith-Graham, MD<sup>1</sup>, Micah Ray<sup>1</sup>, Aryana Misaghi<sup>1</sup>, Jenni Yoost, MD, MSc<sup>1</sup>, Kelly Cummings, MD<sup>2</sup>

### ABSTRACT

In recent times, there has been an increase in drug abuse in the general population and in women of reproductive age. Our objectives were to identify, classify, and describe the spectrum of complications, the average number of admissions, and the length of hospital stay among pregnant women with substance abuse. The aim was to understand complication prevalence better to improve management in this ever-growing population. A retrospective chart review was conducted of pregnant women ages 18-45 with a history of substance abuse from 2013-2018 in the tri-state area of West Virginia, Ohio, and Kentucky. We collected the following data: demographics, medical history, specific substances abused, inpatient admission dates and diagnoses, and delivery information. A total of 411 patients met the inclusion criteria, comprising 525 pregnancies. Out of 525 pregnancies, 71.6 % used buprenorphine (i.e., Subutex), 43.4% used opiates (excluding heroin), and 35% of patients used heroin. Out of the 525 pregnancies, there were 714 inpatient antepartum admissions. Of these, 376 were admissions due to withdrawal symptoms (52.7%). A total of 263 pregnancies had at least one admission for withdrawal, drug abuse, overdose, or buprenorphine/methadone conversion (50%). The average hospital stay for withdrawal admissions was 3.4 days (SD). There were 62 admissions for infectious causes, 24 due to pyelonephritis (38.7%). The findings highlight multiple areas for future studies and areas for quality improvement in managing this population.

### KEYWORDS

Pregnancy, substance use disorder, substance abuse, complications, inpatient, admission

### INTRODUCTION

In recent times, there has been an increase in drug abuse in the general population and in women of reproductive age. According to data compiled by the Yale School of Medicine, women are most likely to develop a problem with substance abuse between the ages of 18 and 29, with 5.9% of the total female population of the United States using illicit substances in 2012. Between 2000 and 2009, the US saw an increase of 5 times for women abusing opioids during pregnancy.<sup>1</sup>

According to the CDC, West Virginia leads the United States in overdose deaths with a rate of 52.0 per 100,000.<sup>2</sup> There has been a rapid increase in health

care costs and burden to the existing healthcare system in treating and caring for these patients. Of note, the rate of babies born with neonatal abstinence syndrome rose from 25.2 per 1,000 births in WV to 51.2 per 1,000 births between 2011 and 2014, as reported by the NIH, and has likely trended higher since then.<sup>3</sup> These children and their mothers, whom both face withdrawal from illicit substances, have become an increasing proportion of the patient population.

Twenty-four percent of pregnant women can achieve future abstinence due to their pregnancy. The remainder relapse during the postnatal period and, as noted above, often are of an age that they may again become pregnant while suffering from

*Author affiliations are listed at the end of this article.*

### Correspondence to:

Melissa Nehls, MD  
Marshall University  
Joan C. Edwards  
School of Medicine  
[nehls@marshall.edu](mailto:nehls@marshall.edu)





deliveries, the two most common comorbidities were hepatitis C and depression, 59.2% and 38.7%, respectively (Table 1).

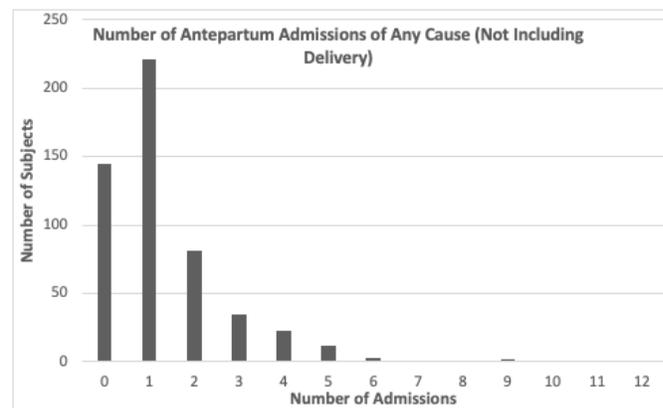
Out of 525 pregnancies, there were 714 inpatient antepartum admissions, i.e., admissions not including the labor and delivery inpatient admission. Overwhelmingly, the common reason for admission was withdrawal. Of the 714 antepartum admissions, 376 (52.7%) were due to withdrawal, drug abuse, overdose, or buprenorphine/methadone conversion. 263 (50%) of the 525 pregnancies had at least one admission for withdrawal, drug abuse, overdose, or buprenorphine/methadone conversion. The remainder of the antepartum admissions were as follows: 62 (8.75%) for infectious causes, 19 (2.7%) for psych/social circumstances, 28 (3.9%) for non-reassuring antenatal testing (abnormal biophysical profile, fetal deceleration, nonreactive strip, etc.), and the remaining 229 (31.95%) admissions were for maternal/fetal indications, such as preterm pre-labor rupture of membranes, preterm labor, placental abruption, etc.

As noted, there were 62 admissions for infectious causes. Of these, 24 (38.7%) were due to pyelonephritis, and 9 (14.5%) were due to pneumonia. There were 8 (12.9%) from sepsis, including endocarditis, septic emboli, or joints, and 9 (14.5%) from soft tissue abscesses. The remaining were from less common sources of infection, such as cellulitis or dental abscesses.

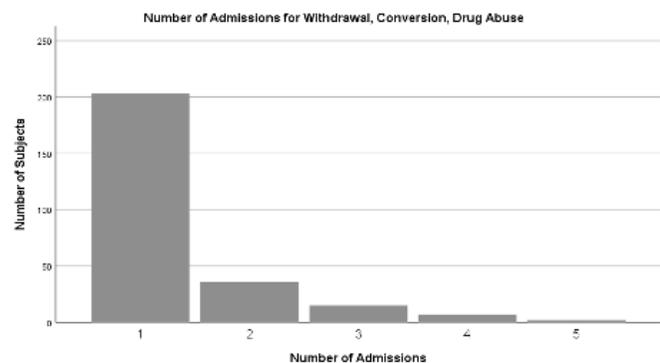
Out of the 525 patients, 145 (27.6%) had no antepartum admissions, 221 (42.1%) had one admission, and the remaining patients were admitted more than once, with a small number of patients having between 4-12 antepartum admissions (Figure 1). The number of admissions relating specifically to withdrawal, conversion, or drug abuse ranged from 1 to 5 (Figure 2). There was a high variation in the length of stay for any antepartum admission. Admission length ranged from less than 1 day to 82 days. Patients with extreme length of stay were primarily complicated by infectious causes requiring extensive intravenous antibiotic use. When specifically looking at admissions for drug abuse or withdrawal, the average length of inpatient stay was 3.4 days.

Two hundred and twenty-one out of the 525

pregnancies were patients in the MARC program. There were 279 not in the MARC program and 25 undocumented. A total of 127 (57.5%) patients in the MARC program were admitted for withdrawal, compared to a total of 121 (43.5%) non-MARC patients admitted for withdrawal ( $p=0.001$ ). There



**FIGURE 1.** Number of antepartum admissions of any cause (not including delivery) among 525 pregnancies with substance use. Three hundred and eighty patients out of the 525 pregnancies had at least 1 antepartum admission. Two hundred and twenty-one patients had 1 antepartum admission. Eighty patients had 2 admissions. Thirty-five patients had 3 admissions. Twenty-three patients had 4 admissions. Twelve patients had 5 admissions. Three patients had 6 admissions. One patient had 7 admissions. Two patients had 9 admissions. Three separate individual patients each had 10, 11, and 12 admissions.



**FIGURE 2.** Number of admissions for withdrawal, conversion, or drug abuse among 525 pregnancies with substance use. Of the 263 admissions related to withdrawal, conversion, or drug abuse among the 525 pregnancies with substance use, 203 patients were admitted 1 time, 36 patients were admitted 2 times, 15 patients were admitted 3 times, 7 patients were admitted 4 times, and 2 patients were admitted 5 times.



was no difference between groups in the mean number of antepartum admissions for withdrawal or average length of stay (Table 2).

Out of the 525 pregnancies, delivery data was obtained on 433 patients (Table 3). A total of 118 (27.2%) infants were admitted to the neonatal intensive care unit (NICU). A total of 85 (19.6%)

MARC Patient	MARC Patients	Non-MARC Patients	P value
Patients Requiring Admission for Withdrawal	127 (57.5%)	121 (43.5%)	0.0001
Mean Number of Antepartum admissions	1.46 (SD.89)	1.29 (.65)	0.08
Mean Length of Hospital Stay for Antepartum Admissions (days)	3.17 (SD 5.4)	3.63 (SD 4.5)	0.29

**TABLE 2.** Comparison of patients within the Maternal Addiction Recovery Center (MARC) and not regarding admission for withdrawal, mean number of admissions, and length of stay.

Route of Delivery	N=525
Spontaneous vaginal delivery	267 (50.8%)
Cesarean section	150 (28.6%)
Vacuum assisted vaginal delivery	5 (0.95%)
Forceps assisted vaginal delivery	3 (0.57%)
Cesarean hysterectomy	2 (0.38%)
Vaginal birth after cesarean section	4 (0.76%)
Delivery data unknown	94 (17.9%)

**TABLE 3.** Delivery data on 525 pregnancies with substance use

infants were admitted to the neonatal therapeutic unit (NTU). There was significant missing data on NICU and NTU admissions.

## DISCUSSION

This study highlights the spectrum of complications and hospital admission data on a group of 411 patients with 525 pregnancies and deliveries with known substance abuse. There were 714 antepartum admissions, with over half of these attributed to withdrawal symptoms (52.7%). The average inpatient stay for these 376 withdrawal admissions was 3.4 days. With the average daily inpatient cost of a hospital stay in the United States in the thousands, these withdrawal-associated admissions are a huge cost burden to consumers and taxpayers alike. Per the American College of Obstetricians and Gynecologists (ACOG), MAT with methadone or buprenorphine in combination with counseling and behavioral therapy is the standard treatment of heroin addiction during pregnancy.<sup>6</sup> During these withdrawal admissions at our institution, patients were typically transitioned to buprenorphine as the first line agent for their MAT. One review of 18 studies involving 63 patients transitioning to buprenorphine using different microdosing techniques found that most patients transitioned to a stable dose of buprenorphine over a period of 4 to 8 days.<sup>7</sup> To combat rising health care costs and societal burden by decreasing the duration of hospital stay for induction of buprenorphine, our institution is currently trialing a rapid buprenorphine induction process vs. the previous delayed induction process, as was performed during this study period. With a newer approach, we anticipate a decrease in the average length of inpatient stay for withdrawal admission from 3.4 days reported in this study by at least 1 or more days; this decrease will potentially save patients and the health care system thousands of dollars.

A limitation of the study is that the timing of entrance into the MARC program was not recorded. There may be patients that were enrolled in the MARC program prior to or after their inpatient admissions for withdrawal symptoms. This is likely why admissions for withdrawal in the MARC group were statistically higher than those not in the MARC group.



The high rates of both depression and hepatitis C among our patients with substance use disorder are notable. Per ACOG, more than 30% of women enrolled in MAT programs screened positive for moderate to severe depression, and more than 40% screened positive for postpartum depression.<sup>6</sup> This study continues to confirm the importance of mental health screening, especially in these at-risk populations. Additionally, this study confirms the increasing rate of hepatitis C among pregnant patients. One previous study examining the prevalence of the hepatitis C virus in women of childbearing age and pregnant women in the United States found that from 2011 to 2016, hepatitis C virus rates increased by 39%, from 6.1% to 8.4% in this population. They found that hepatitis C virus rates among pregnant women increased by 135%, from 5.7% to 13.4%.<sup>8</sup> As of May 2021, ACOG is now recommending screening for hepatitis C for all pregnant individuals during each pregnancy.<sup>9</sup>

Of the 714 antepartum admissions, 62 (8.75%) were for infectious causes, with 38.7% of these admissions attributable to pyelonephritis. The incidence of pyelonephritis in pregnancy is estimated to be between 0.5 to 2%.<sup>10</sup> This warrants future investigation to potentially reduce this increased rate of kidney infections in this at-risk population. In this retrospective chart review, our goal was to identify, classify, and describe the spectrum of complications and the average number of admissions and length of hospital stay among pregnant women who suffer from substance abuse. We aimed to provide a better understanding of prevalence in order to improve management in this ever-growing subset of the population. This study has given background information on a population lacking much data and will hopefully contribute to many quality improvement measures in the future.

## AUTHOR AFFILIATIONS

1. Marshall University Joan C. Edwards School of Medicine, Huntington, West Virginia
2. West Virginia University School of Medicine, Morgantown, West Virginia

## REFERENCES

1. Forray, A., Substance Use During Pregnancy F1000 Res, 2016. 5.
2. Centers for Disease Control. Drug Overdose Deaths. February 21, 2022]; Available from: <https://www.cdc.gov/drugoverdose/deaths/index.html>.
3. National Institutes of Health. West Virginia: Opioid Involved Deaths and Related Harms Accessed February 22, 2022; Available from: <https://nida.nih.gov/drug-topics/opioids/opioid-summaries-by-state/west-virginia-opioid-involved-deaths-related-harms>.
4. Forray, A. and D. Foster, Substance Use in the Perinatal Period. *Curr Psychiatry Rep*, 2015. 17(11): p. 91.
5. McLafferty, L.P., et al., Guidelines for the Management of Pregnant Women With Substance Use Disorders. *Psychosomatics*, 2016. 57(2): p. 115-30.
6. Committee Opinion No. 711: Opioid Use and Opioid Use Disorder in Pregnancy. *Obstet Gynecol*, 2017. 130(2): p. e81-e94.
7. Ahmed, S., et al., Microinduction of Buprenorphine/Naloxone: A Review of the Literature. *Am J Addict*, 2021. 30(4): p. 305-315.
8. Schillie, S.F., et al., Hepatitis C Virus in Women of Childbearing Age, Pregnant Women, and Children. *Am J Prev Med*, 2018. 55(5): p. 633-641.
9. American College of Obstetricians and Gynecologists. Practice Advisory: Routine Hepatitis C Virus Screening 2021 February 22, 2022]; Available from: <https://www.acog.org/clinical/clinical-guidance/practice-advisory/articles/2021/05/routine-hepatitis-c-virus-screening-in-pregnant-individuals>.
10. Wing, D.A., M.J. Fassett, and D. Getahun, Acute pyelonephritis in pregnancy: an 18-year retrospective analysis. *Am J Obstet Gynecol*, 2014. 210(3): p. 219 e1-6.

