

Newborns with Withdrawal Symptoms Caused by Maternal Exposure to Select Substances

OKLAHOMA MEDICAID AND BIRTH CERTIFICATE LINKED DATA 2016



Oklahoma State
Department of
Health, Maternal and
Child Health Service

Oklahoma Health
Care Authority

Background

Drug abuse remains a concerning public health problem in the United States. Approximately 90% of women who abuse drugs are of reproductive age, and use of illicit drugs during pregnancy can lead to increased risks for adverse pregnancy outcomes.^{1,2,3} More concerning is the deleterious consequences for newborns exposed to illicit drugs prenatally. When newborns are exposed to drugs or other substances in a mother's womb, withdrawal symptoms can occur within hours of birth. In addition to withdrawal, infants born to women who use illicit drugs may be born with other adverse birth outcomes, including low birth weight, preterm birth and abnormal development of nervous systems.^{4,5}

Opioid abuse during pregnancy has steadily increased in recent years.^{6,7} Between 2000 and 2009, there was a five-fold increase in opioid use during pregnancy, reflecting an epidemic of opioid prescription misuse in the United States.^{8,9} Studies show the use of prescription or illegal opioids, such as oxycodone, codeine or heroin, during pregnancy can cause withdrawal in over half of newborns exposed prenatally, and is considered the primary cause of neonatal drug withdrawal.^{4,5} However, neonatal withdrawal symptoms have been attributed to the exposure of a variety of drugs and substances during pregnancy.^{4,5,10,11} Alcohol is one of the most prevalent substances of concern consumed by pregnant women.^{12,14,15} Newborns born to women who abuse alcohol during pregnancy can experience severe withdrawal symptoms, such as tremors and seizures.^{1,15,16} Fetal alcohol syndrome due to exposure to alcohol during gestation is associated with similar outcomes, such as withdrawal and cognitive and functional disabilities.^{1,4,13,15} Maternal exposure to narcotics can cause neonatal withdrawal symptoms, such as neurologic excitability and gastrointestinal dysfunction.^{5,17} Withdrawal symptoms caused by maternal exposure to cocaine have not been clearly defined; however, cocaine can cause certain neonatal withdrawal symptoms such as feeding difficulties, irritability, spasms and tremors.^{18,19,20}

The drug withdrawal symptoms may start as early as 24 to 48 hours after birth, or as late as 5 to 10 days after birth.^{5,11} The withdrawal symptoms range from benign clinical characteristics, such as high-pitched crying and feeding difficulties, to severe clinical signs, such as tremors and seizures.^{5,6} The onset of withdrawal symptoms varies depending on the half-life of the drug, the type and dose of substances, the duration of substances consumed by the mother and the timing of the mother's last dose intake.⁵ No standard protocol exists in Oklahoma for providers to implement universal screening, diagnosis and uniform coding of withdrawal symptoms in newborns. Newborns affected by maternal exposure to substances may be discharged from a hospital before the onset of withdrawal symptoms. The inability to recognize withdrawal symptoms can lead to underreporting the incidence of affected newborns due to missing diagnosis codes in hospital billing and clinical records.

Studies show newborns with withdrawal symptoms require specialized care that typically results in substantial costs to the health care system, particularly Medicaid.^{10,21} Although the burden of substance abuse in Oklahoma is high, limited research exists in enumerating the incidence of infants with withdrawal symptoms caused by maternal exposure to substances. No comprehensive study has been conducted due to the absence of uniform data sources to track newborns with withdrawal. Provider groups and hospitals in Oklahoma are taking steps to develop guidelines for providing universal screening and standard practices in diagnosing and documenting medical diagnoses using standard code sets. The issue of neonatal withdrawal symptoms is complex, requiring collaborated efforts from state, regional and local partners to establish a standard protocol for the diagnosis and care of newborns with withdrawal symptoms, and provide consistent data sources for researchers to conduct comprehensive studies.

Report Objectives

The objectives of this report are:

- To provide a rationale for using certain International Classification of Diseases, also known as ICD, diagnosis codes to define withdrawal symptoms among newborns impacted by maternal exposure to select substances.
- To enumerate the incidence of newborns impacted by the exposure among Oklahoma's Medicaid population.
- To present a snapshot of demographic distribution, select maternal characteristics and birth outcomes among newborns with withdrawal symptoms.
- To list the major clinical symptoms and conditions present among the affected newborns.

Data and Methods

The data used in this report were based on the Oklahoma Medicaid and birth certificate data linkage project for calendar year 2016. SoonerCare, Oklahoma's Medicaid program, data were extracted from the Oklahoma Medicaid Management Information Systems of the Oklahoma Health Care Authority. Birth certificate data were obtained from Center for Health Statistics division of the Oklahoma State Department of Health. SoonerCare-paid newborn claims were used to identify newborns with withdrawal symptoms caused by maternal exposure to select substances. This included inpatient, outpatient and provider claims. Figure 1 is a brief description of the process used to identify newborns with withdrawal symptoms from the linked SoonerCare and birth certificate data. For this report, birth certificate variables including county of residence, race and Hispanic origin, education level, age, timing of prenatal care initiation, pre-pregnancy body mass index, gestational age, birth weight, and neonatal intensive care unit admission were assessed. Major clinical symptoms and conditions among the affected newborns were assessed from the primary, secondary and tertiary diagnoses in the SoonerCare claims.

Newborns with Withdrawal Symptoms

SoonerCare-paid live births were identified from matching the SoonerCare-eligibility data to the birth certificate data. Newborns with withdrawal symptoms were subsequently identified based on a series of ICD-10 diagnosis codes included in SoonerCare-paid newborn claims. Table 1 shows the list of ICD-10 diagnosis codes used for identifying newborns with withdrawal symptoms caused by maternal exposure to select substances.²²

Figure 1. Process of Identifying Newborns with Withdrawal Symptoms

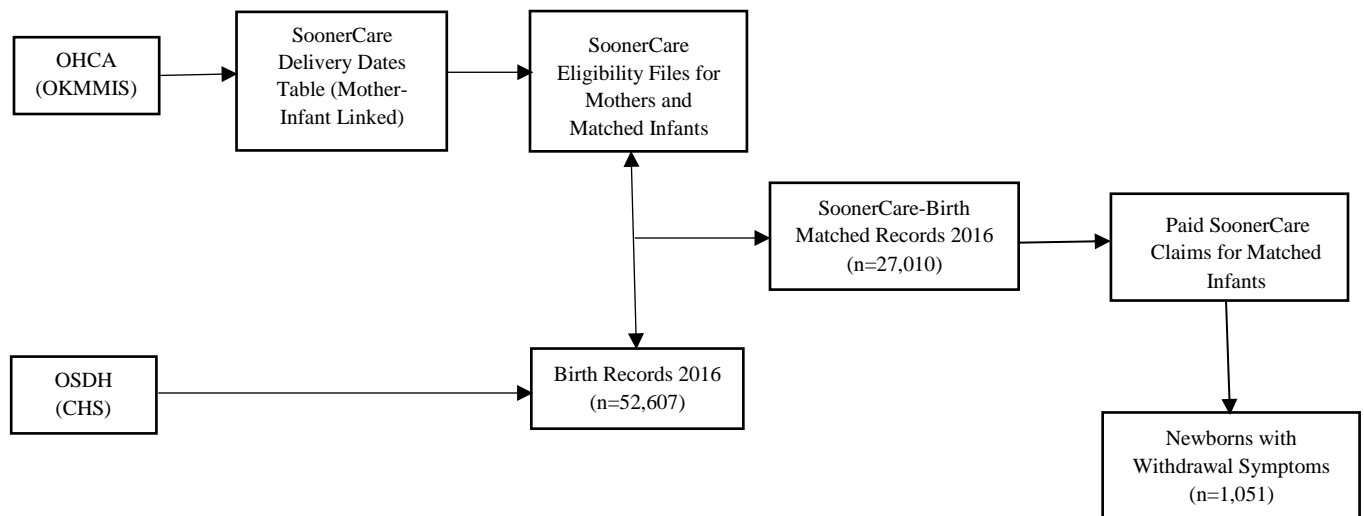


Table 1. ICD-10 Diagnosis Codes for Identifying Newborns with Withdrawal Symptoms

ICD-10 CM code	Code Description
P04.3	Newborn affected by maternal use of alcohol
P04.41	Newborn affected by maternal use of cocaine
P04.49	Newborn affected by maternal use of other drugs of addiction
P96.1	Neonatal withdrawal symptoms from maternal use of drugs of addiction
Q86.0	Fetal alcohol syndrome

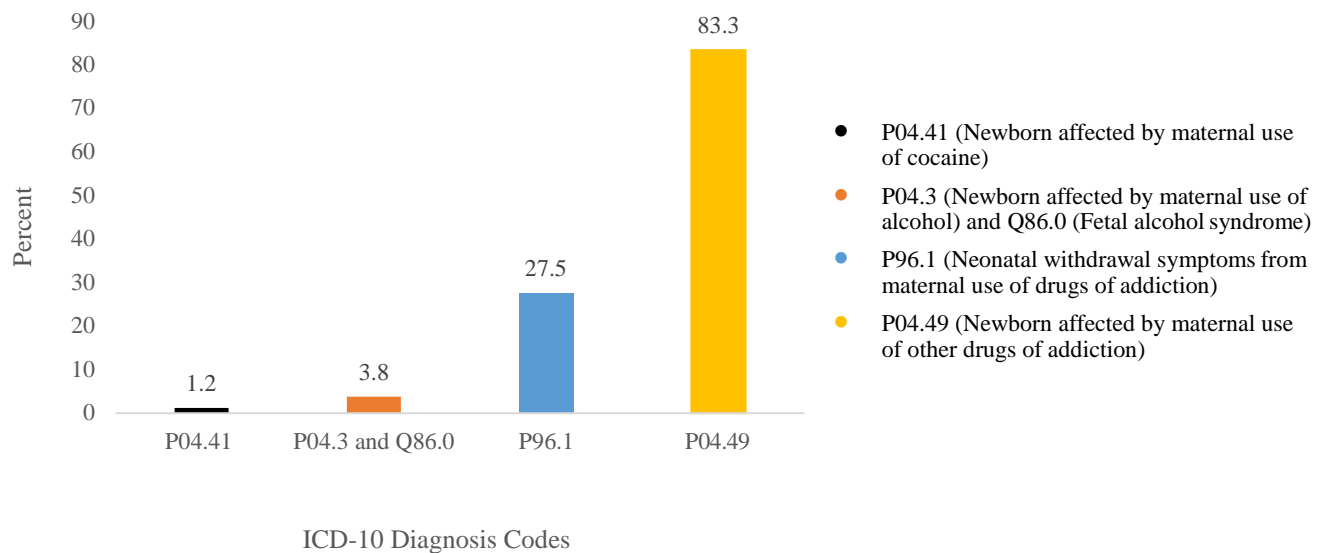
Findings

Among 27,010 SoonerCare-paid live births in 2016, 1,051 (4%) newborns had withdrawal symptoms caused by maternal exposure to select substances. More than 81% of the affected newborns had withdrawal symptoms diagnosed at birth. Overall, 99% of the affected newborns had withdrawal symptoms diagnosed within the first 28 days of birth.

Distribution of Newborns with Withdrawal Symptoms by ICD-10 Diagnosis Code

More than 83% of newborns with withdrawal symptoms were detected as newborns affected by maternal use of other drugs of addiction (P04.49). Approximately 28% of these newborns had neonatal withdrawal symptoms from maternal use of drugs of addiction (P96.1). Nearly 4% of these newborns were affected by maternal exposure to alcohol (P04.3 and Q86.0). Approximately 1% of these newborns were affected by maternal use of cocaine (P04.41) (Figure 2).

Figure 2. Percent Distribution of the Affected Newborns by ICD-10

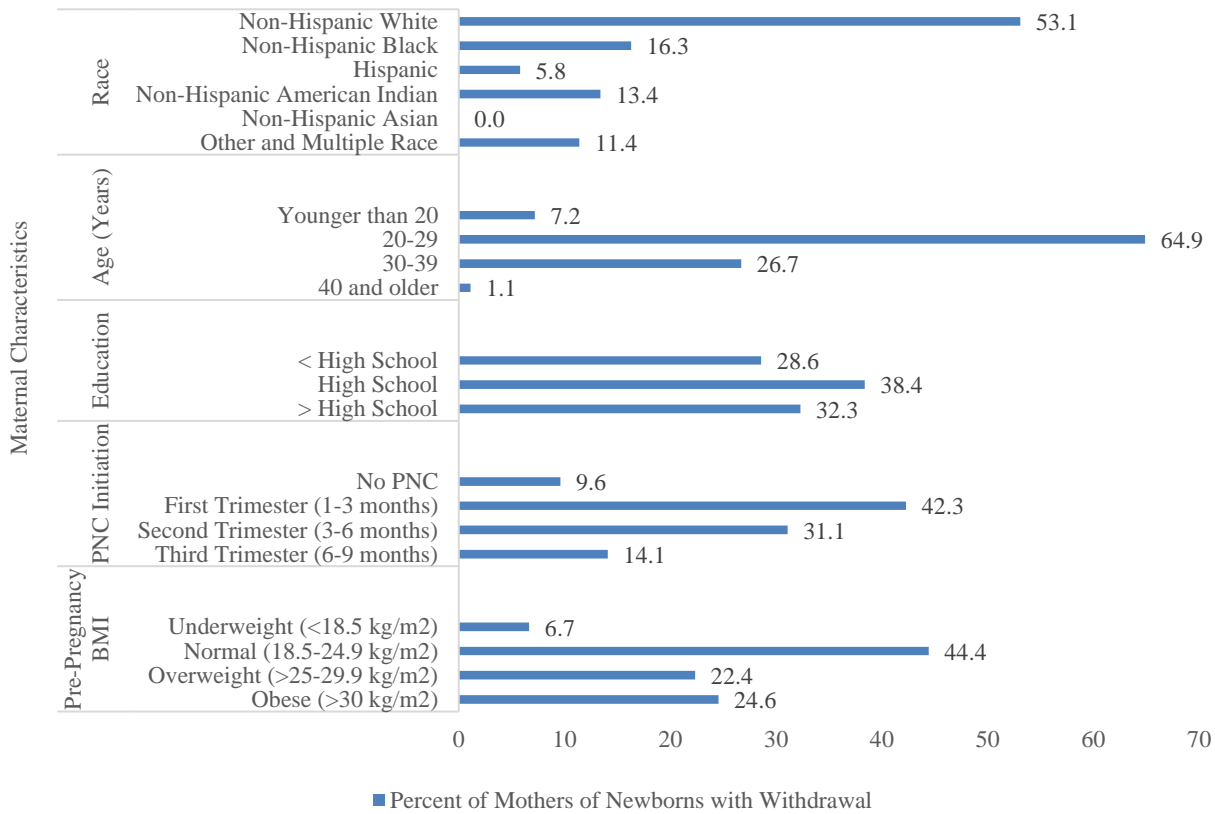


* Newborns may be diagnosed with multiple withdrawal symptoms and counted multiple times in multiple diagnosis codes.

Select Maternal Characteristics of Newborns with Withdrawal Symptoms

About 53% of mothers of newborns with withdrawal symptoms were non-Hispanic white, 65% of the mothers were in the age group 20-29 years and 71% of the mothers had at least a high school education. Nearly 10% of mothers of newborns with withdrawal symptoms did not access prenatal care. Around 7% of the mothers were underweight, and 47% of the mothers were either overweight or obese (Figure 3).

Figure 3. Select Maternal Characteristics of the Affected Newborns

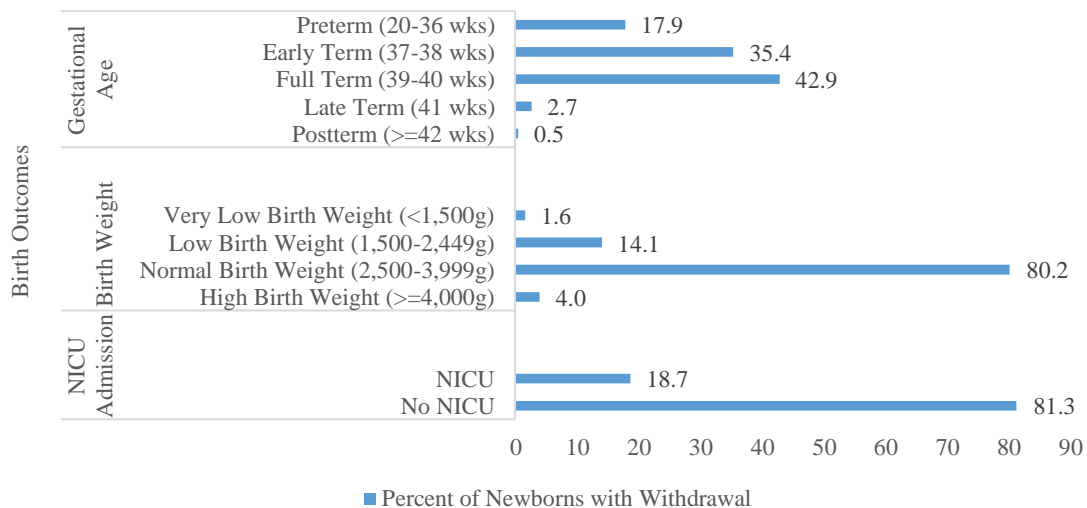


* BMI = weight in kilograms / (height in meters x height in meters)
 * Percentage may not sum to 100% due to rounding or missing values

Select Birth Outcomes of Newborns with Withdrawal Symptoms

Nearly 18% of newborns with withdrawal symptoms were premature, 16% were low or very low birth weight and 19% of these newborns were admitted to NICU (Figure 4).

Figure 4. Select Birth Outcomes of the Affected Newborns

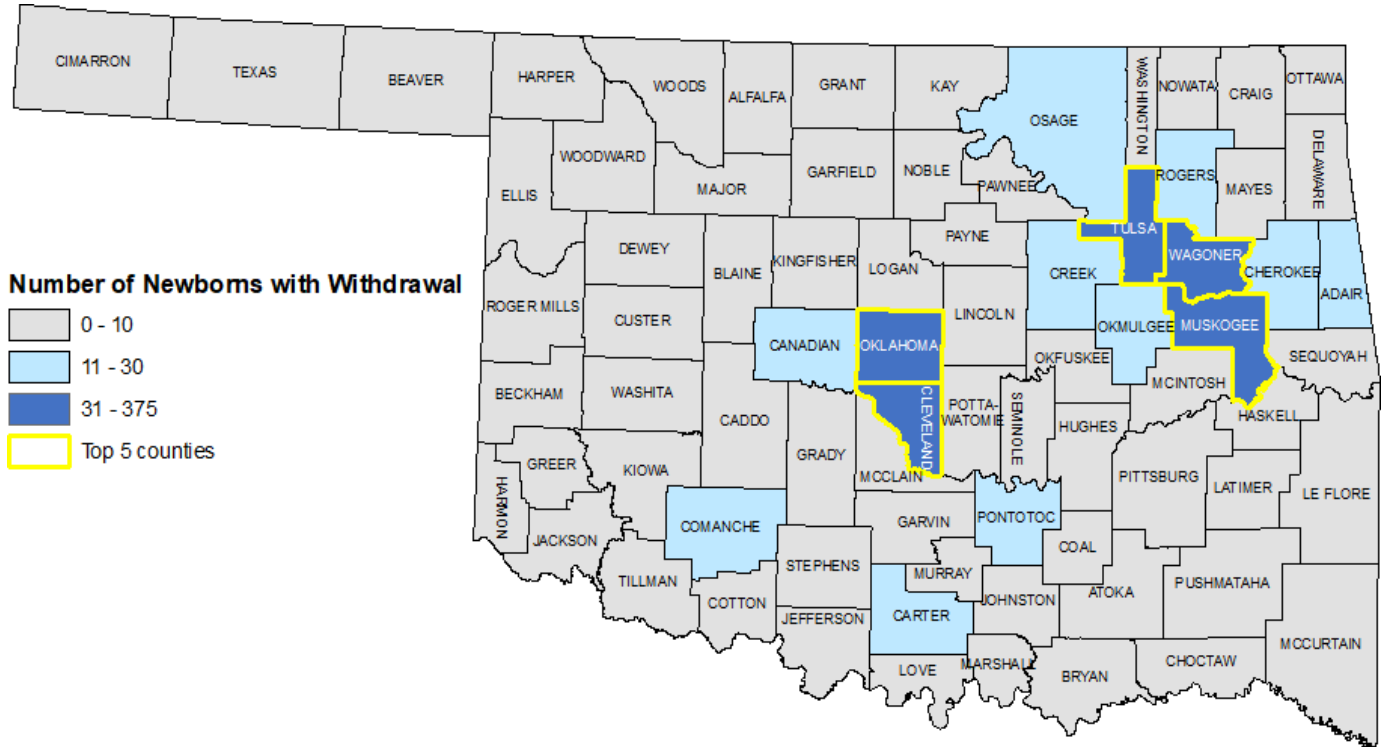


* Percentage may not sum to 100% due to rounding or missing values

Distribution of Newborns with Withdrawal Symptoms by County of Residence

Five counties, including Tulsa, Oklahoma, Cleveland, Muskogee and Wagoner, accounted for 60% of newborns with withdrawal symptoms caused by maternal exposure to select substances (Map 1).

Map 1. Distribution of the Affected Newborns by County of Residence



Counties with the highest proportion of newborns that experienced withdrawal symptoms among SoonerCare were Muskogee and Wagoner counties, followed by Tulsa, Pontotoc and Adair counties (Table 2).

Table 2. Counties with the Highest Proportion of Newborns that Experienced Withdrawal Symptoms Among SoonerCare

Maternal County of Residence	Number of Newborns with Withdrawal	Number of SoonerCare-Paid Live Births	Percent of Newborns with Withdrawal among SoonerCare-Paid Live Births
Muskogee	44	510	8.6%
Wagoner	33	383	8.6%
Tulsa	375	4,991	7.5%
Pontotoc	23	309	7.4%
Adair	11	151	7.3%

* Percent = (number of newborns with withdrawal in each county / number of SoonerCare-paid live births in each county) × 100%

Clinical Symptoms and Conditions Among Affected Newborns

Clinical signs of drug withdrawal include neurological, respiratory and gastrointestinal problems.⁵ In addition to the problems of withdrawal after birth, newborns may experience complications such as being born too soon, yellowing of the skin or eyes, birth defects, etc. Based on ICD-10 diagnosis codes included in the SoonerCare claims for newborns with withdrawal, a large proportion of the affected

newborns experienced respiratory problems. More than 44% of the affected newborns had respiratory infections, such as acute upper respiratory infections, bronchiolitis and cough. Nearly 24% of the affected newborns had respiratory stress, and 19% of the affected newborns experienced temperature disturbance. Other respiratory symptoms and signs were also prevalent among the affected newborns. Gastrointestinal problems were also common among newborns with withdrawal, among which nearly 24% experienced poor feeding and more than 15% had gastro-esophageal reflux disease. Neonatal jaundice, low birth weight and short gestation, and congenital malformations of cardiac septa were clinical signs and conditions present along with withdrawal symptoms among the affected newborns (Table 3).

Table 3. Top Clinical Symptoms and Conditions Among the Affected Newborns

Symptoms and Conditions (ICD-10)	Number of Newborns with Withdrawal	Percent of Newborns with Withdrawal
Respiratory infections (J06.x, J21.x, R05)	467	44.4%
Neonatal jaundice (P59.x)	460	43.8%
Respiratory stress of newborn (P22.x)	250	23.8%
Feeding problems of newborn (P92.x)	250	23.8%
Low birth weight and short gestation (P07.x)	228	21.7%
Other symptoms and signs involving the circulatory and respiratory system (R09.x)	208	19.8%
Temperature disturbance (R50.x, P81.x)	200	19.0%
Gastro-esophageal reflux disease (K21.x)	164	15.6%
Other respiratory conditions originating in the perinatal period (P28.x)	147	14.0%
Congenital malformations of cardiac septa (Q21.x)	118	11.2%

Conclusion

Substance abuse during pregnancy is associated with an increased risk of adverse pregnancy outcomes. Although opioids are attributed to withdrawal in over half of babies exposed prenatally and are considered the primary cause of withdrawal symptoms in newborns, other types of drugs or substances can pass through the placenta and result in a newborn suffering from withdrawal symptoms.^{4,5,10,11} It is important to recognize certain prescription medications and substances other than opioids could also cause or exacerbate neonatal withdrawal symptoms.^{4,5,10,24} Furthermore, the current version of ICD-10 coding system does not include a code that can exclusively identify newborns affected by maternal exposure to opioids at this time. However, we were able to use ICD-10 diagnosis codes to select substances such as alcohol, cocaine and other drugs of addiction that could also cause withdrawal symptoms in newborns. In this report, we used an expanded set of ICD-10 diagnosis codes to capture newborns with withdrawal symptoms caused by maternal exposure to select substances. The clinical signs of withdrawal can be benign and the onset of withdrawal symptoms can vary depending on several factors, including the types of drugs, the dose and duration of drug intake and the time since the last dose was taken.⁵ Due to the lack of standard protocol for screening and diagnosis in the clinical setting, the newborns with maternal exposure to substances could be discharged from hospitals before the clinical onset of withdrawal symptoms or sometimes left untreated. According to U.S. Government Accountability Office, neonatal withdrawal symptoms were not consistently diagnosed or coded in medical records due to a lack of national standards for screening, which may result in missed opportunities for identifying and treating newborns with withdrawal.²⁴ From the SoonerCare

claims for newborns with withdrawal, there was substantial variability in how neonatal withdrawal symptoms were coded, reflecting the lack of the uniform protocol for diagnosis within our state.

Based on our study, 1,051 newborns experienced withdrawal symptoms, representing approximately 4% of total SoonerCare-paid live births in 2016. Compared to the overall Oklahoma births, late or no prenatal care was more likely to be reported by mothers of newborns with withdrawal. Almost 10% of mothers of newborns with withdrawal did not have prenatal care, compared to 2% for mothers in general.²⁵ By contrast, only 42% of mothers of newborns with withdrawal and 68% of mothers in general started prenatal care in the first trimester.²⁵ Nearly 18% of newborns with withdrawal were premature, compared to over 10% for Oklahoma births in general.²⁵ Newborns with withdrawal were more than twice as likely to be admitted to NICU during their hospital stay following delivery as Oklahoma births in general (19% versus 8%, respectively).²⁵ Further analyses could help address health disparities in newborns with withdrawal. More than 81% of the affected newborns had withdrawal symptoms diagnosed as early as at birth, nearly 2% of the affected newborns had withdrawal symptoms diagnosed as late as 5 to 10 days after birth, and almost all of the affected newborns had withdrawal symptoms diagnosed within 28 days of birth. Respiratory and gastrointestinal problems were the major withdrawal symptoms present among the affected newborns. In addition to the withdrawal symptoms, the affected newborns also experienced other adverse outcomes and complications, including neonatal jaundice, low birth weight and short gestation, and congenital malformations of cardiac septa. Identifying newborns with withdrawal symptoms using an expanded set of ICD-10 diagnosis codes was a unique effort. Therefore, there are no comparable figures available nationally for newborns with withdrawal symptoms at this time.

Preventing in-utero exposure to opioids and other substances is a shared vision of all health care fields. The providers and hospitals in Oklahoma are taking steps to establish and promote a protocol for standardized diagnosis and care for newborns with withdrawal symptoms. Collaborative efforts across multiple agencies is important in establishing and implementing a public health protocol for preventing prenatal substance abuse. Risk factors such as mental health issues, environmental stresses and polysubstance interaction should be taken into account when developing interventions for controlling increased risks of substance abuse among pregnant women. Further research on the effects of the risk factors could help to optimize assessment of newborns with withdrawal, as well as reduce the severity of the effects of prenatal drug exposure to the infants. Future assessment of childhood health and development may help evaluate long-term effects of prenatal drug exposure on the affected infants. Trends in the incidence and demographic features of newborns with withdrawal can be explored once multiple years of data are available.

Limitations

Data limitations include, but are not limited to, the completeness and accuracy of the SoonerCare administrative claim data. The diagnosis code is an optional field on a claim. The patient may have not been seen or treated for that diagnosis on the date of service. The data extract only included paid claims. SoonerCare-eligibility files were extracted based on the Medicaid Delivery Dates Table. Adoption and custody issues, as well as unmatched mothers and babies, are other limitations of the data. Due to frequent updates of data in OKMMIS, SoonerCare data are “point in time” and a representation of the data as of the extract date. SoonerCare births that occurred out-of-state were excluded from this study. SoonerCare-partial-paid claims, such as Third Party Liability and Medicare are included.

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Oklahoma Medicaid – Birth Data Match Project

Oklahoma Medicaid – Birth Data Match Project is supported by an inter-departmental agreement between the Oklahoma Health Care Authority and Oklahoma State Department of Health Maternal and Child Health Service. OHCA developed and provided the Medicaid Delivery Dates Table (Mother - Infant linked) which was used for extracting SoonerCare data from Oklahoma Medicaid Management Information Systems. Probabilistic and deterministic data linkage between the SoonerCare data and birth data was conducted in SAS (version 9.4) and Link King (version 9.0).

Acknowledgements

We would like to acknowledge the Maternal and Child Health Assessment Division at Oklahoma State Department of Health and the Office of Data Governance and Analytics at Oklahoma Health Care Authority for the contributions and support to this report.

Additional Information

This publication was issued by the Oklahoma State Department of Health, an equal opportunity employer and provider. A digital file has been deposited with the Publications Clearinghouse of the Oklahoma Department of Libraries in compliance with section 3-114 of Title 65 of the Oklahoma Statutes and is available for download at documents.ok.gov. | Issued December 2019.

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