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The impact of the covid-19 pandemic on a rural pregnant population with opioid use: a comparative study of pre- and post-pandemic

Abstract

Background: Opioid use disorder (OUD) in pregnancy poses risks to both the pregnant person and neonate. The COVID-19 pandemic disrupted healthcare access, including medications for OUD (MOUD). In this study, we hope to elucidate the impact of the pandemic on opioid use, access to medications for opioid use, and overall health outcomes.

Methods: A retrospective chart review was conducted at a single academic center in New Mexico. Maternal-infant dyads were divided into a pre-COVID-19 and post-COVID-19 cohort. Maternal demographics, opioid use, and infant hospitalization data were analyzed.

Results: Among 415 dyads (248 pre-COVID-19 and 167 post-COVID-19), MOUD use declined post-COVID-19 (64.7% vs 81.9%; p<0.001), as did the rate of stable housing (73.2% vs 85.5%; p<0.01). Illicit opioid use shifted from heroin (48.4%) to fentanyl in the post-COVID-19 cohort (56.9%; p<0.001). No significant differences were observed in length of birth hospitalization (16.9 days vs 18.5 days; p=0.46) or need for pharmacological treatment for neonatal opioid withdrawal syndrome (27.8% vs 35.9%; p=0.08).

Conclusions: The COVID-19 pandemic reduced MOUD access and housing stability, though neonatal outcomes remained stable.

Keywords: prenatal opioid exposure, opioid use disorder, pregnancy, covid-19 pandemic

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Introduction

Over 45,000 overdose deaths in the United States (U.S.) were reported in 2024 due to synthetic opioids.[1] Opioids are defined as a group of analgesics that act on three different opioid receptors, mu-opioid peptide, delta-opioid peptide, and kappa-opioid peptide, and are commonly used in clinical practice to provide pain relief.[2–4] These can be natural (derived from plants), semi-synthetic, and synthetic (made in a laboratory). Opioids have a high potential for misuse due to the activation of pleasure pathways in the brain, with resultant euphoria and pleasurable sensations.[3] The misuse of opioids in the U.S. has continued to increase over the last 30 years, with a paralleled increase in the pregnant population.[3] Between 2010 and 2017, the estimated rate of maternal opioid use disorder (OUD) in the U.S. increased from 3.5 to 8.2 individuals per 1,000 delivery hospitalizations.[5] The highest rates of maternal OUD were observed among non-Hispanic white individuals, Medicaid recipients, and individuals living in zip codes within the first quartile of the income level.[5] There are significant consequences of opioid use during pregnancy; pregnant individuals with OUD have an increased risk of death and preterm labor, while the infant outcomes can include growth restriction, neonatal opioid withdrawal syndrome (NOWS), and long-term developmental consequences.[6]

In New Mexico, between 2016 and 2019, 34.9% of pregnant individuals used at least one psychoactive substance during pregnancy, with resultant in-utero exposure to the developing fetus.[7] This rate is significantly higher than the national average. Data from Medicaid-covered births in the U.S. showed that the rate of in-utero substance exposure ranged from 2.74% to 3.01% between 2016 and 2020, notably lower than the 34.9% observed in New Mexico during a similar period of time.[8] The complete cessation of opioid use during pregnancy can be very dangerous and is not recommended due to the acute dangers of withdrawal on the pregnant individual and the fetus.[9,10] Fortunately, to mitigate these risks, there are treatment options for pregnant individuals with OUD. Commonly used medications approved by the U.S. Food and Drug Administration (FDA) for medications for opioid use disorder (MOUD) treatment include methadone, buprenorphine, and naltrexone.[4] Methadone is a full mu-opioid receptor agonist that was the first medication approved for the treatment of OUD in 1972.[4,11] Buprenorphine, the most recently approved treatment option by the FDA in 2008, is a partial mu-opioid receptor agonist that produces less receptor activation than methadone.[4,12] Buprenorphine can be used on its own or in conjunction with naloxone, an opioid reversal medication.[4,12] Naltrexone differs from the other two treatments as it has an antagonist action on mu-receptors and to a lesser extent kappa and delta receptors[4] It was approved for use in OUD by the FDA shortly after methadone in 1984.[12] These medications have been associated with improved outcomes for pregnant individuals and their neonates, although further research continues to determine which therapy is most beneficial during pregnancy for both the pregnant individual and the developing fetus.[9,13]

Coronavirus (COVID-19), caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), was declared by the World Health Organization (WHO) as a global pandemic on March 11, 2020.[14] The COVID-19 declaration lasted three years before expiring on May 11, 2023, after a statement issued by the Secretary of Health and Human Services.[15,16] The pandemic introduced significant barriers to the accessibility of healthcare globally due to stay-at-home orders and clinic closures.[17,18] It is hypothesized that difficulties accessing healthcare were amplified during the pandemic in higher-risk populations that historically faced barriers related to poverty, unstable housing, incarceration, and limited insurance coverage.[19] Before the pandemic, a systematic review analyzed 21 qualitative and mixed-method studies to identify consistent barriers to MOUD access

and retention. These barriers included stigma, economic hardship, transportation limitations, and a lack of provider availability.[20] Typically, MOUD is administered in a clinic setting, requiring daily visits by the individual receiving treatment. In response to the challenges created by COVID-19, the federal government temporarily expanded access to opioid replacement therapies by allowing Opioid Treatment Programs (OTPs) in some states to dispense up to 28 days of take-home methadone doses.[21–24] A prior concern for dispensing multiple methadone doses at a time was related to concern for potential negative outcomes, which was not observed following this policy change.[22]

While the COVID-19 pandemic negatively impacted general access to healthcare, there was also the additional strain on mental health, which has the potential to worsen OUD.[25] The combination of increased barriers, mental health stress, and additional currently unidentified variables may have resulted in an increase in the use of illicit substances, a decrease in compliance with prescribed MOUD, or a decrease in overall prenatal care. Thus, this study aims to assess how the COVID-19 pandemic affected the accessibility of MOUD in pregnant individuals and subsequent outcomes in their neonates in a rural population. We hypothesized that the pandemic-related treatment barriers led to a decreased use of MOUD, an increase in the use of illicit substances, and resultant worse outcomes for both the pregnant individual and their neonate.

Materials and methods

Participant identification

Following approval from the University of New Mexico Health Sciences Center's Institutional Review Board (IRB; protocol #23-354), an honest broker was used to identify potential participant charts. International classification of diseases codes, 10th revision, clinical modification (ICD-10-CM), were provided to the honest broker (including O99.32, P04.14, Z3A.0, and P96.1). A chart review was then completed using the electronic medical record (EMR) system at the University of New Mexico Hospital (UNMH). The criteria used to identify the charts included maternal drug screens positive for opioid exposure, infant medication-assisted treatment, and clinical events related to infant NOWS. Individual charts were reviewed to ensure all inclusion and exclusion criteria were met. All pregnant individuals 18 years of age or older with documented use of unprescribed opioids or MOUD during pregnancy were included if their infant was delivered at UNMH. Exclusion criteria included pregnant individuals under the age of 18 years old, incarcerated individuals at the time of delivery, nonviable neonates, or wards of the state (Figure 1).

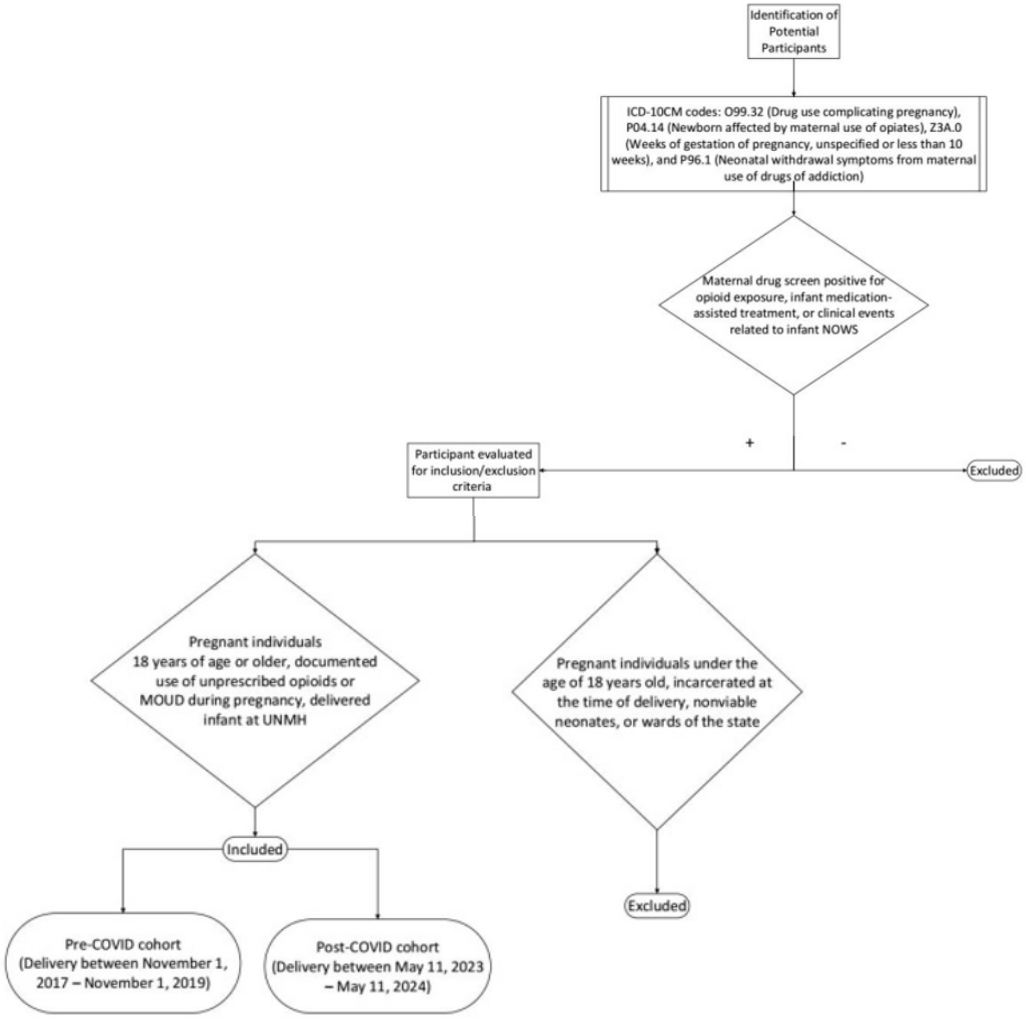

Figure 1 Flowchart of participant selection and cohort formation.

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Data collection

Two cohorts of participants had data collected based on the timing of their delivery. The pre-COVID-19 cohort included individuals meeting inclusion / exclusion criteria who delivered their infant between November 1, 2017 – November 1, 2019. The post-COVID-19 cohort included individuals meeting inclusion / exclusion criteria who delivered their infant between May 11, 2023 – May 11, 2024. Information regarding opioid use and other substances used during pregnancy was collected from the pregnant individual's or neonate's chart at either the initial prenatal visit, toxicology reports, or via documentation on newborn history and physical. If opioid use was documented within notes, this was counted as "self-report." If information regarding opioid use was discovered on a toxicology screen, this was counted as "toxicology." Information was also collected on additional substances used during pregnancy, including alcohol, tobacco, marijuana, benzodiazepines, methamphetamine, and cocaine. Additional maternal information collected included age, ethnicity, insurance type, housing stability, education level, and mode of delivery. Infant information collected included if there was confirmation of in-utero drug exposure, requirement of pharmacologic treatment, maternal breastfeeding, and infant length of stay during the birth hospitalization.

Data analysis

Upon completion of the data collection, statistical analysis was completed. Mean values with standard error of the means were calculated to provide summary data on continuous variables. Chi-square or student's t-test was used for categorical or continuous variables. A p-values of < 0.05 was considered statistically significant.

Results

A total of 415 maternal-infant dyads were reviewed, with the pre-COVID-19 cohort including 248 maternal-infant dyads and the post-COVID-19 cohort including 167 maternal-infant dyads. All 415 maternal-infant dyads had confirmed opioid use during pregnancy (prescribed or illicit). In comparing the pre-COVID-19 cohort and post-COVID-19 cohort, there was no significant difference in maternal age (29.7±0.3 vs 30.3±0.4 years, p=0.07, Table 1), mode of delivery (vaginal birth 70.2% in pre-COVID-19 cohort vs 68.2% in post-COVID-19 cohort, p=0.68, Table 1) or the insurance type (Medicaid 83.5% in pre-COVID-19 cohort vs 86.8% in post-COVID-19 cohort, p=0.35, Table 1). A significant difference was noted in housing stability, with fewer individuals reporting stable housing in the post-COVID-19 cohort (73.2%) compared to the pre-COVID-19 cohort (85.5%, p=0.001, Table 1).

Table 1 Maternal characteristics

Variable	Pre-COVID-19 (n=248)	Post-COVID-19 (n=167)	p-value
Maternal characteristics:			
Age in years (Mean +/- SEM)	29.7±0.3	30.3±0.4	0.07[1]
Insurance type:			
Medicaid	207 (83.5%)	145 (86.8%)	0.35[2]
Other	41 (16.5%)	22 (13.2%)	
Mode of delivery:			
Vaginal	174 (70.2%)	114 (68.2%)	0.68[2]
Ceserian section	74 (29.8%)	53 (31.8%)	
Housing stability:			
Yes	212 (85.5%)	122 (73.2%)	0.001[2*]
No	36 (14.5%)	45 (26.9%)	
Highest level of education:			
Less than high school	2 (0.8%)	11 (6.6%)	0.001[2*]
High school	66 (26.6%)	59 (35.3%)	
Technical	0 (0.0%)	2 (1.2%)	
College	39 (15.7%)	22 (13.2%)	
Graduate	2 (0.8%)	1 (0.6%)	
Unknown	139 (56.0%)	71 (42.5%)	

[1]Based on t-test; [2]Based on Chi-Squared analysis; *Statistically significant

The characteristics of substance use were significantly different between the cohorts. Interestingly, the information regarding substance use in the medical record was significantly more commonly obtained via self-report in the pre-COVID-19 cohort (53.6%) compared to the post-COVID-19 cohort (13.8%, p<0.001, Table 2). More individuals had reported MOUD in the pre-COVID-19 cohort (81.9%), with a dramatic decrease in MOUD following the pandemic (65.2%, p<0.001, Table 2). Despite the decrease in MOUD in the post-COVID-19 cohort, there was no difference in the percentage of individuals with known illicit opioid use. However, one of the most striking differences between cohorts was the shift in the specific illicit opioid type used during pregnancy. Heroin use was significantly higher in the pre-COVID-19 cohort (48.4% vs 16.2%, p<0.001, Table 2), whereas fentanyl use dramatically increased in the post-COVID-19 cohort (56.9% vs 2.0%, p<0.001, Table 2). There was also an increase in the use of other substances during pregnancy in the post-COVID-19 cohort, with methamphetamine use increasing from 44.8% to 53.3%.

Table 2 Types of substances used during pregnancy

Variable	Pre-COVID-19 (n=248)	Post-COVID-19 (n=167)	p-value
Method substance use information was obtained:			
Self-report	133 (53.6%)	23 (13.8%)	<0.001[2*]
Toxicology	108 (43.5%)	139 (83.2%)	
Prescribed opioid use:			
Yes	203 (81.9%)	109 (65.2%)	0.0001[2*]
No	45 (18.1%)	58 (34.8%)	
Known illicit opioid use:			
Yes	148 (59.7%)	108 (64.7%)	0.30[2]
No	100 (40.3%)	59 (35.3%)	
Type of opioid used:			
Heroin	120 (48.4%)	27 (16.2%)	<0.001[2*]
Fentanyl	5 (2.0%)	95 (56.9%)	
Oxycodone	4 (1.6%)	0 (0.0%)	
Buprenorphine	47 (19.0%)	12 (7.2%)	
Methadone	88 (35.5%)	51 (30.5%)	
Suboxone	66 (26.6%)	28 (16.8%)	
Other substances used during pregnancy:			
Tobacco	146 (58.9%)	81 (48.5%)	0.0007[2*]
Marijuana	88 (35.5%)	41 (24.5%)	
Alcohol	15 (6.0%)	14 (8.4%)	
Cocaine	20 (8.0%)	13 (7.8%)	
Methamphetamine	111 (44.8%)	89 (53.3%)	
Benxodiazepines	40 (16.1%)	5 (3.0%)	

[1]Based on t-test; [2]Based on Chi-Squared analysis; *Statistically significant

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While overall breastfeeding rates were low (roughly 38% of the total population breastfed), there was no difference between the pre-COVID-19 and post-COVID-19 cohorts (p=0.20, Table 3). During the post-COVID-19 cohort, infants were more likely to have confirmatory testing for in-utero opioid exposure compared to the pre-COVID-19 cohort (56.3% in the post-COVID-19 cohort vs 43.5% in the pre-COVID-19 cohort, p=0.01, Table 3). Infants did not have a difference in the average length of stay for the birth hospitalization between the two cohorts (16.9±1.3 vs 18.5±1.8 days, p=0.46, Table 3).The percentage of infants that required pharmacological treatment was higher in the post-COVID-19 cohort, but did not reach significance (35.9% in the post-COVID-19 cohort vs 27.8% in the pre-COVID-19 cohort, p=0.08, Table 3). It is interesting to note that during the COVID pandemic, the care approach and assessments of infants with NOWS was changed throughout the hospital from the Finnegan assessment to the Eat, Sleep, and Console care approach.

Table 3 Neonatal outcomes

Variable	Pre-COVID-19 (n=248)	Post-COVID-19 (n=167)	p-value
Neonatal data:			
Length of Stay (days +/- SEM)	16.9±1.3	18.5±1.8	0.46[1]
Confirmed in-utero opioid exposure:			
Yes	108 (43.5%)	94 (56.3%)	0.01[2*]
No	140 (56.5%)	73 (43.7%)	
Infant required pharmacological treatment:			
Yes	69 (27.8%)	60 (35.9%)	0.08[2]
No	179 (72.2%)	107 (64.1%)	
Breastfed:			
Yes	100 (40.3%)	57 (34.1%)	0.20[2]
No	148 (59.7%)	110 (65.9%)	

[1]Based on t-test; [2]Based on Chi-Squared analysis; *Statistically significant

Discussion

Opioid misuse during pregnancy undoubtedly continues to pose significant detrimental risks to both the pregnant individual and the neonate, especially when access to MOUD is disrupted (CDC 2022). In this study, we observed a notable decrease in prescribed opioid use in the post-COVID-19 cohort. Access to MOUD is directly correlated with accessibility to healthcare which was drastically impacted by the COVID-19 pandemic, thus making MOUD less accessible in this population. New Mexico was among the 35 states that adopted opioid treatment programs prescribing take-home methadone under federal emergency guidance.[26] Despite this increased flexibility of MOUD, which has continued even post the COVID-19 pandemic, these results suggest the efforts may not have been sufficient, particularly in rural areas. One potential reason is the fear of seeking medical care in more rural areas. Evidence shows health disparities disproportionately impact minority groups such as Hispanic and Indigenous communities, which comprise a large portion of the rural population in this study. These populations have a long-recognized history of medical mistrust, which likely also contributes to reduced healthcare accessibility.[27–29]

In our evaluation of these high-risk pregnant individuals, a key characteristic was housing stability, which significantly declined in the post-pandemic group. Housing insecurity has been linked to lower prenatal care utilization and limited continuity in substance use treatment, both of which have important implications on the health of pregnant individuals and their neonates.[30] The unemployment rate in New Mexico increased from 5.2% in 2018 to as high as 9.3% in 2020, which surpassed the national rate of 8.1%,[31] which likely exacerbated access to health care. Individuals with unstable housing also face additional barriers such as challenges with transportation, provider discrimination, and limited access to technology, further preventing them from receiving the medical standard of care.[32–34] New Mexico continues to face challenges with provider availability and remains one of the most underserved states for MOUD prescribers. It is estimated that between 2017 and 2021, New Mexico lost 30% of its healthcare providers, including physicians, pharmacists, and nurses,[35,36] with resultant additional difficulties for individuals to obtain appropriate health care.

Interestingly, despite reduced MOUD use and greater housing instability, the neonatal outcomes such as the need for pharmacologic NOWS treatment and length of hospital stay did not significantly increase in the post-COVID-19 cohort as hypothesized. This finding may be attributable to the implementation of the Eat, Sleep, Console (ESC) care approach during the COVID-19 pandemic. The Finnegan Neonatal Abstinence Scoring System (FNASS) was used previously and is a 31-item scale that aims to quantify the severity of NOWS by evaluating the neonates' symptoms and to help guide treatment. However, the FNASS is long and complex, and overall, very subjective. This scale has resulted in over-treatment and longer hospital stays when compared to the ESC care approach.[37] The ESC care approach prioritizes non-pharmacological interventions are the first-line treatment for these infants and encourages caregiver involvement to manage symptoms of NOWS. The goal is to ensure infants can maintain appropriate functioning regarding eating, sleeping, and their ability to console. The use of the ESC care approach has been shown to decrease the need for pharmacological treatment for NOWS and shorten the length of the birth hospitalization when compared to usual treatment.[38] Thus, although the compliance with MOUD was decreased, the use of the ESC care approach may have mitigated any changes that would have otherwise been observed.

The observed shift from heroin to fentanyl use is especially concerning. Fentanyl is a highly potent synthetic opioid that is frequently illicitly mixed with other substances, further increasing the dangers of its use in all people, but particularly in pregnant people.[39] This shift reflects the national trends and may be due to the rising prices and decreased availability of heroin. Though this shift may be regionally specific, an overall disruption in opioid supply has previously been described.[40] Additionally, even though it was not the primary focus of this study, the use of other substances such as methamphetamines, marijuana, and tobacco should also be acknowledged. Polysubstance use is prevalent in this population and can further complicate neonatal outcomes, including but not limited to withdrawal symptoms, preterm birth, and fetal growth restriction.[41] Additionally, there was an increase in buprenorphine prescriptions in patients with OUD in the post-pandemic cohort. This change could reflect the previously described increase in treatment management via telehealth and the ability for advanced practice providers (APP) such as nurse practitioners and physician assistants to prescribe buprenorphine.[42–44] Studies are ongoing to determine if one prenatal treatment is superior to the other, but the increased buprenorphine prescriptions may also highlight a shift in the treatment approach in this population.

This study also highlights a potential decline in the patient-provider relationship and engagement post-pandemic, which can be seen in the significant decrease in self-reporting substance use in this population. This difference could be secondary to the limited in-person visits, reduced continuity of care, or the challenge of creating a safe environment. Although telehealth has shown a similar efficacy

to in-person visits and can help increase MOUD access in this population, especially in rural areas, its success depends largely on provider training and the patients' access to technology,[45] which is likely limited in this population.

Conclusion

These conclusions provide valuable insight into the effect of COVID-19 on vulnerable pregnant individuals. Strengths of this study include a comparison of MOUD and multiple other contributing factors between patient cohorts pre and post covid. Thus, this study allows us to draw conclusions on the effect of the pandemic on this population. However, there are certain limitations that may prevent the application of these findings to a broader population. This study was designed as a single-site and retrospective study at an academic medical center in New Mexico. Thus, MOUD access in this region may be overall less in comparison to other parts of the country, given the rurality of the state. Additionally, it is possible that patients sought care outside of the academic healthcare system, which would not be known based on the chart review. Additionally, the time gap between the two cohorts spans over 4 years. Thus, it is possible that other community trends and/or shifts in treatment and preferences in care could be an additional influence on the results observed in this study.

In conclusion, the COVID-19 pandemic exacerbated already existing barriers for pregnant individuals with OUD, especially in rural areas such as within this study population. There were significant decreases in MOUD access and housing stability following the pandemic for a population already at high-risk. There has also been a significant shift towards illicit fentanyl use that further complicates clinical care and neonatal outcomes. Despite the above findings, neonatal outcomes were unchanged. However, your findings suggest that this population requires more support and urgent, accessible, and comprehensive care.

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Declarations

Authorship: KS, DV, and TM analyzed patient data regarding maternal demographics, opioid misuse, and infant hospitalization data. JM interpreted the patient data regarding neonatal outcomes and was a major contributor in writing the manuscript. All authors have read and approved the final manuscript.

Ethical approval: This study was approved by the University of New Mexico Health Sciences Center's Institutional Review Board, protocol #23-354.

Guarantor: JM is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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Conflicts of interest

The authors of this manuscript declare no financial or personal conflicts.

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