the poison®

ORIGINAL ARTICLE

Retrospective toxicological analysis of cocaine and cannabis use in postpartum women with social risk factors at a tertiary hospital (2020–2025)

Claudia B. Parodi[1]*, María V. Repetto[1], Cecilia M. Contartese[1], Jésica N. Taiman[2], María P. Osorio[2] and Ignacio M. Gallo[1]

[1] Toxicology Laboratory Section, Department of Biochemistry, 'Prof. Alejandro Posadas' National Hospital, El Palomar, Buenos Aires, Argentina.
[2] National Poison Center (CNI) - 'Prof. Alejandro Posadas' National Hospital, El Palomar, Buenos Aires, Argentina.
**claudiabparodi@yahoo.com*

Submitted: 01/05/2025 - Accepted: 25/05/2025 - Published: 30/06/2025 - DOI: https://doi.org/10.62129/DGRP3025

ABSTRACT. Substance abuse during pregnancy and breastfeeding is an increasing public health concern within our community. This study examines the prevalence of maternal substance use at a tertiary-level hospital, identifies the types of substances detected, and explores the correlation between their metabolites. Homogeneous enzyme immunoassay (HEIA) techniques were employed for toxicological analysis in the selected cases. The results reveal a 7.87% prevalence of substance use within the studied population.

Key words: *Substance abuse; Pregnancy; Breastfeeding; Toxicological analysis; Homogeneous enzyme immunoassay.*

The use of illicit drugs by pregnant women during the perinatal period has experienced a concerning increase, negatively impacting both maternal and fetal health. In this regard, the World Health Organization (WHO) states that 'the consumption of psychoactive substances during pregnancy represents a public health issue due to its adverse effects on the fetus, including low birth weight, premature birth, and neurodevelopmental disorders'.[1] In a study conducted at the Dr. J. A. Fernández Hospital in Buenos Aires, Cortese et al.[2] found that alcohol consumption had a prevalence of 46.3%, followed by tobacco at 12.1%, marijuana at 5.6%, and cocaine at 4.7% among hospitalized pregnant women. Neonates born to mothers with urine positive for any substance had lower birth weight and a shorter gestational age. Similarly, in the United States, the National Institute on Drug Abuse (NIDA) estimated that approximately 5.4% of pregnant women used substances in 2020.[3] In our region, we have identified analogous trends, coinciding with greater vul-nerability in areas with limited access to adequate healthcare.

The most commonly detected substances include cannabinoids, cocaine, and benzodiazepines. Their use is associated with multiple complications, such as preterm birth, intrauterine growth restriction, and neonatal abstinence syndrome. Cocaine crosses the placental barrier and can induce vasoconstriction in the placental circulation, thereby increasing the risk of spontaneous abortion, intrauterine growth restriction, and placental abruption.[4] Prenatal exposure to cannabis may affect fetal neuro-development, disrupt neonatal sleep patterns, and reduce attention capacity during childhood.[5]

This study aims to assess the presence of a statistically significant association between the use of cocaine and cannabinoids, as determined by the detection of their metabolites in urine specimens.

MATERIALS AND METHODS

General aspects

This was a retrospective, observational, and descriptive study conducted on patients admitted to the Obstetrics Department of a tertiary-level hospital in Buenos Aires, Argentina.

Population

A total of 252 urine samples were analyzed, collected between January 2020 and January 2025, with the aim of detecting urinary metabolites of cocaine and cannabis. The study included postpartum women aged 16 to 46 years, with documented social or behavioral risk factors (e.g. history of substance use, socioeconomic vulnerability, or lack of prenatal care), who underwent toxicological screening within the first 24 hours following delivery.

Analytical techniques

The detection of drugs of abuse in urine samples was performed using a homogeneous enzyme immunoassay (HEIA) on the Abbott® Architect c4000 platform. This method allows for the qualitative detection of specific metabolites of psychoactive substances. The cut-off values for a positive result were 300 ng/mL for benzoylecgonine and 50 ng/mL for THC, in accordance with standard screening thresholds. No confirmatory testing was performed. The immunoassay does not require physical separation of sample components prior to measurement, enabling rapid, automated detection with high specificity. In this regard, Moffat et al.[6] state that urine testing is one of the most widely used methodologies for identifying recent drug use, as metabolites of substances such as cocaine and cannabis remain detectable in urine for several days after consumption.

Statistical analysis

The data used in this study were extracted using the Infinity information system and Power BI software, both provided by Roche® Laboratories. Statistical analyses were conducted using R software (version 4.3.2) and the RStudio interface. The statistical tests were selected based on the type of variables and the study design. The Chi-square test was applied to assess the association between categorical variables, such as substance use. A p-value < 0.05 was considered statistically significant.

RESULTS

A total of 252 urine samples were analyzed for the presence of psychoactive substance metabolites. The analytes assessed included benzoylecgonine (a primary metabolite of cocaine) and Δ^9-tetrahydrocannabinol (Δ^9-THC), the main psychoactive compound in cannabis. Regarding cocaine, 52 samples tested positive, while 200 samples tested negative. In the case of cannabinoids, 96 samples were positive and 156 samples were negative. The distribution of results is presented in Table 1.

TABLE 1. Detection of cocaine and cannabinoid metabolites in urine samples (n = 252).

Substance	Positive (n, %)	Negative (n, %)
Cocaine	52 (20.63%)	200 (79.37%)
Cannabinoids	96 (38.10%)	156 (61.90%)

Assuming statistical independence between cocaine and cannabinoid use, the estimated probability of testing positive for both substances was approximately 7.87% (P[Cocaine ∩ Cannabinoids] = $0.2063 \times 0.3810 \approx 0.0786$), corresponding to an expected count of roughly 19.82 samples. Interestingly, 24 samples (9.52%) tested positive for both substances, exceeding the expected count under the assumption of independence. To evaluate the association between cocaine and cannabinoid use, a Chi-square test of independence was performed. The results indicated a statistically significant association between the presence of both metabolites: $\chi^2 = 4.23$, degrees of freedom (df) = 1, $p = 0.0397$. Table 2 shows the contingency table displaying the distribution of cocaine and cannabinoid test results in urine samples, illustrating the frequency of positive and negative cases for each substance and their co-occurrence. Additionally, the odds ratio was estimated at 1.52, suggesting that individuals who tested positive for one substance were approximately 1.5 times more likely to test positive for the other. These findings suggest that the concurrent use of cocaine and cannabinoids among the study population may occur more frequently than would be expected by chance alone.

TABLE 2. Contingency table of cocaine and cannabinoid test results in urine samples (n = 252).

	Cannabinoid +	Cannabinoid -	Total
Cocaine +	24	28	52
Cocaine -	72	128	200
Total	96	156	252

DISCUSSION

HEIA emerges as an effective tool for the early detection of maternal substance use in emergency settings, enabling timely preventive actions to protect the newborn. The findings of this study reflect an alarming clinical reality, consistent with international reports. The positivity rate was higher for cannabinoids (38.10%) than for cocaine (20.63%), suggesting that cannabis use or exposure is more prevalent than cocaine use in this sample of obstetric patients. Given that the p-value was < 0.05, the null hypothesis of independence between cocaine and cannabinoid use was rejected. This indicates a statistically significant association between the two substances: in this population, the use of one drug is associated with an increased likelihood of using the other.

Polydrug use is common among individuals who use illicit substances and is often associated with poorer clinical and social outcomes. Early identification of substance use during pregnancy allows for timely interventions that may significantly improve both maternal and neonatal outcomes.[7] From a preventive standpoint, there is an urgent need to develop early intervention programs, provide targeted education for women of reproductive age, and strengthen perinatal mental health services to address this growing public health concern.

CONCLUSIONS

Our findings highlight a high prevalence of cannabinoid and cocaine use among obstetric patients, with a significant association between both drugs. The increasing trend of illicit drug consumption during pregnancy underscores the need for early toxicological screening and the integration of comprehensive prevention and intervention strategies into maternal healthcare protocols.

Conflicts of interest

The authors declare no conflicts of interest.

REFERENCES

1 World Health Organization (WHO). Guidelines for the identification and management of substance use and substance use disorders in pregnancy. Geneva: WHO; 2014. Available from: https://www.who.int/publications/i/item/9789241548731

2 Risso M, Saa G, González Alcántara M, Cortese S, Bertola O, Madera C, et al. Consumo de alcohol y drogas en embarazadas internadas en un hospital de la ciudad de Buenos Aires, Argentina. Evaluación del impacto inicial en el recién nacido. Vertex Rev Arg Psiquiatr. 2023 Dec 30;34(162):7–15. Available from: https://doi.org/10.53680/vertex.v34i162.500

3 National Institute on Drug Abuse (NIDA). Substance use while pregnant and breastfeeding. NIDA; 2021. Available from: https://nida.nih.gov/publications/research-reports/substance-use-in-women/substance-use-while-pregnant-breastfeeding

4 Chasnoff I, Burns K, Burns W. Cocaine use in pregnancy: Perinatal morbidity and mortality☆. Neurotoxicology Teratol. 1987;9(4):291-3. Available from: https://doi.org/10.1016/0892-0362(87)90017-1

5 Gunn JK, Rosales CB, Center KE, Nuñez A, Gibson SJ, Christ C, Ehiri JE. Prenatal exposure to cannabis and maternal and child health outcomes: a systematic review and meta-analysis. BMJ Open. 2016;6(4):e009986. Available from: https://doi.org/10.1136/bmjopen-2015-009986

6 Moffat AC, Osselton MD, Widdop B, Galichet LY, editors. Clarke's analysis of drugs and poisons in pharmaceuticals, body fluids and postmortem material. 3rd ed. London: Pharmaceutical Press; 2004

7 American College of Obstetricians and Gynecologists (ACOG). Committee Opinion No. 711: Opioid use and opioid use disorder in pregnancy. Obstet Amp Gynecol. 2017;130(2):e81–94. Available from: https://doi.org/10.1097/aog.0000000000002235