

Detection of illicit psychoactive substances in the urine of mothers and newborn infants at a public hospital. Comparison between the 2009–2013 and 2014–2018 five-year periods

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ABSTRACT

Introduction. The use of illicit psychoactive substances during pregnancy is a growing problem. Few Latin American maternity centers implement a screening strategy, and published data are scarce.

Objectives. To compare the outcomes of 2 five-year periods of a postpartum strategy to screen for illicit psychoactive drugs.

Population and methods. This was a cross-sectional study. Immunoassay detection in urine of mother-newborn infant dyads in an Argentine public hospital between 2009 and 2018.

Results. Substances were detected in 76/191 dyads over 10 years. The most frequent detection criterion was reporting or history of drug use: 25/37 and 32/39 in each five-year period. Cannabis (21/37 and 26/39) and cocaine (19/37 and 16/39) predominated in both periods. No differences were observed in demographic, gynecological, pregnancy, or neonatal data between both five-year periods.

Conclusions. No differences were found in the frequency or type of substances detected over 10 years.

Keywords: *psychotropic drugs; postpartum period; newborn infant; cannabis; cocaine.*

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INTRODUCTION

The use of illicit psychoactive substances (ISS) during pregnancy may cause harm to mothers and children in both the short and long term.¹⁻³ The overall average prevalence of ISS use is 1.83%; however, this increases more than 7-fold when screened with any biological test.⁴

The most frequently detected ISS are cannabis and cocaine, although there are differences between countries and over time.⁵ In the United States, opioid use has increased rapidly in recent decades.⁶ In Mexico, methamphetamines ranked second to cannabis according to a recent study.⁷

The use of an ISS screening strategy may improve exposure identification and avoid the arbitrary selection of dyads for testing. However, screening is protocolized in only a minority of maternity centers.⁸ In Latin America, few articles on this subject have been published. In Argentina, the first 3 years of screening in the health care center where this study was carried out have been previously described.^{1,3,9}

The objective of this study is to compare 2 consecutive five-year periods of protocolized ISS screening of mother-newborn infant dyads in the postpartum period.

POPULATION AND METHODS

This was a retrospective, descriptive, and analytical cross-sectional study conducted in 2021 at Establecimiento Asistencial Dr. Lucio Molas (EALM). This is a general public hospital that covers an area of approximately 120 000 inhabitants.

The analysis included mother-newborn infant dyads admitted to the rooming-in area of the Department of Neonatology after leaving the delivery room who had an ISS detected in urine in the first 48 hours of life, from 2009 to 2013 and from 2014 to 2018.

Definition of ISS

These are psychoactive substances considered illegal in Argentina until 2022 or that, although they are prescribed drugs, are used without a prescription.

Screening criteria

Since 2009, ISS screening in the urine of mothers and newborn infants is requested in the presence of a suspicion criterion: current reporting or history of drug use, altered mental status in the mother, lack of antenatal care (0 or 1 control) or neonatal clinical symptoms. Samples

from newborn infants are collected in bags and samples from mothers, in collection bottles, after obtaining the informed consent.

Technique

Samples were analyzed in the laboratory using test strips for the qualitative detection of amphetamines, barbiturates, benzodiazepines, tetrahydrocannabinol, cocaine, methadone, methamphetamines, opioids, and phencyclidine (Acon Laboratories, USA). This multidrug test is a lateral flow immunochromatographic assay.

Data source

The facility's historical registry and health information system of the province of La Pampa.

Variables

The analysis included the year of detection, request criteria, substances detected, maternal age, sociodemographic data, gynecological history, pregnancy history, reported tobacco and alcohol use, neonatal data and course. In the case of pregnancies without antenatal care, serologies performed during hospitalization were reported.

Ethical considerations

The study was conducted in accordance with the Declaration of Helsinki. Confidentiality was maintained by coding and limiting access to the database to the investigators. The study was authorized by the Research Ethics Committee of EALM (32/2020).

Data storage and analysis

Excel 4.0 (Microsoft Office) was used for data entry, processing, and presentations. The InfoStat software was used for statistical analysis.¹⁰

Summary measures are described as mean and standard deviation (SD), median and interquartile range (IQR), or absolute frequencies and proportions. The comparisons between five-year periods were done using a t test or median test, or a test of proportions. Differences were considered statistically significant if the *p* value was < 0.05.

RESULTS

Between 2009 and 2018, urine samples were collected from 191 mother-newborn infant dyads who met at least 1 screening criterion. Of these, 76/191 (40%) were positive.

Table 1 shows the number of dyads who were in the rooming-in area, number of dyads who met

the criteria, positive samples for ISS, and criteria for screening request, comparing both five-year periods. The most frequent criteria were report or history of drug use and lack of antenatal care.

Table 2 shows demographic, gynecological, and pregnancy data: 65/76 mothers smoked tobacco and 22/66 consumed alcohol, with no

differences between both five-year periods. In 10/76 cases, no alcohol use was registered.

Table 3 describes the history of ISS use in the mothers and their partners, with the number and frequency of ISS detected in urine. Cannabis (21/37 and 26/39) and cocaine (19/37 and 16/39) were detected most frequently in each 5-year

TABLE 1. Characteristics of the eligible population

	2009–2013	2014–2018	p value
Dyads in the rooming-in area immediately after birth	6069	6563	-
Dyads in the rooming-in area who met screening criteria	114	110	0.418
Dyads who met screening criteria but did not have a urine sample*	16/114	17/110	0.852
Dyads positive for ISS in urine	37/98	39/93	0.657
Criteria to request urine sample**:			
• Report or history of drug use	25/37	32/39	0.188
• Lack of antenatal care	12/37	10/39	0.615
• Neonatal clinical symptoms***	7/37	10/39	0.586
• Feeding difficulty	5/37	5/39	> 0.999
• Tachypnea	3/37	2/39	0.6701
• Tremor	1/37	4/39	0.359
• Hyporesponsiveness	2/37	3/39	> 0.999
• Hypotonia	3/37	2/39	0.6701
• Irritability	1/37	0/39	-
• Altered mental status in the mother	3/37	0/39	-

ISS: illicit psychoactive substance.

*No urine sample due to refusal to give consent or because no consent was requested. **Two criteria were observed in 23 dyads (30%). ***More than 1 clinical manifestation was observed in 11 newborn infants.

TABLE 2. Comparison of demographic, gynecological, and pregnancy data for dyads positive for illicit psychoactive substances between both five-year periods; n = 76. Rooming-in area of Establecimiento Asistencial Dr. Lucio Molas, 2009–2018

	2009–2013	2014–2018	p value
Number of positive dyads	37/98	39/93	0.657
Average maternal age (SD)	21.73 (4.23)	23.59 (4.77)	0.077
Place of residence in Santa Rosa or Toay	36/37	36/39	0.615
Maximum level of education attained	0.460		
• Incomplete primary education	0/37	1/39	
• Complete primary education	9/37	14/39	
• Incomplete secondary education	9/37	14/39	
• Complete secondary education	24/37	4/39	
• Complete tertiary education	0/37	1/39	
Median gravidity count (IQR)	2 (1)	3 (4)	0.655
Mothers with abortion/miscarriage	16/37	21/39	0.370
Median antenatal care visits (IQR)	3 (6)	4.5 (3)	0.355
Infections during latest pregnancy	4/37	6/39	0.737
• Syphilis	3/37	5/39	0.712
• Genital herpes	0/37	1/39	-
• Toxoplasmosis	1/37	0/39	-
• Human immunodeficiency virus	0/37	0/39	-
Use during pregnancy			
• Alcohol*	13/30	9/36	0.127
• Tobacco	31/37	34/39	0.752

SD: standard deviation. IQR: interquartile range.

*Missing data were excluded by changing the denominator.

period, respectively.

Table 4 shows the comparative data from birth and the neonatal period. The reasons for transfer to the neonatal intensive care unit (NICU) from the rooming-in area were respiratory distress and feeding difficulty (4/76), feeding difficulty (3/76), and hypoglycemia (1/76).

Also, 4/76 newborn infants were readmitted due to feeding difficulty and 2/76 due to poor weight gain. One newborn was readmitted dead. The mother had used tobacco during pregnancy (40 cigarettes/day), and both were positive for cocaine and had tested negative prior to discharge.

TABLE 3. Positive results in maternal and neonatal samples, history of illicit psychoactive substance use among mothers and their partners, and illicit psychoactive substances found in mother-newborn infant dyads comparing both five-year periods. N = 76. Rooming-in area of Establecimiento Asistencial Dr. Lucio Molas, 2009–2018

	2009–2013	2014–2018	p value
Number of positive dyads	37/98	39/93	0.657
Positive maternal samples	36/37	38/39	> 0.999
Positive neonatal samples	25/37	24/37	> 0.999
Years of maternal ISS use	4.30	5.23	0.212
Partner who uses ISS*	6/26	23/36	> 0.999
Type of ISS detected in urine:			
• Tetrahydrocannabinol	21/37	26/39	0.479
• Cocaine	19/37	16/39	0.490
• Phencyclidine	4/37	3/39	0.708
• Benzodiazepines	5/37	3/39	0.475
• Amphetamines	0/37	3/39	-
• Barbiturates	0/37	1/39	-
• Opioids or methamphetamines	0/37	0/39	-
One ISS detected	13/37	15/39	0.815
Two ISS detected	8/37	11/39	0.600
Three ISS detected	2/37	1/39	0.610

ISS: illicit psychoactive substance.

*Percentage estimated based on the number of mothers with a partner.

Table 4. Comparison of data from newborn infants who tested positive for illicit psychoactive substances between both five-year periods; n = 76. Rooming-in area, Department of Neonatology. Establecimiento Asistencial Dr. Lucio Molas, 2009–2018

	2009–2013	2014–2018	p value
Number of positive dyads	37/98	39/93	0.657
Male sex	20/37	21/39	> 0.999
Median gestational age at birth, weeks (IQR)	39 (2)	39 (3)	0.1537
Average birth weight, grams (SD)	3117.5 (526.1)	3166.3 (506.3)	0.682
Average birth height, cm (SD)	48.2 (2.3)	47.5 (2.0)	0.181
Average head circumference, cm (SD)	34.5 (1.7)	34.6 (1.4)	0.804
Microcephaly	0/37	3/39	-
Preterm newborn infants (35–36 weeks)	2/37	3/39	> 0.999
Small for gestational age newborn infants	4/37	6/39	0.737
Major malformation	0/37	0/39	-
Free O ₂ requirement at birth	6/37	10/39	0.403
Apgar score ≤ 7 at 1 minute*	3/37	7/39	0.311
Transfer to NICU from rooming-in area	3/37	5/39	0.712
Median length of rooming-in (IQR)	3 (2)	4 (3)	0.335
Readmission during the neonatal period	2/37	4/39	0.675

SD: standard deviation. IQR: interquartile range. NICU: neonatal intensive care unit.

*Recovered with an Apgar score > 8 at 5 minutes.

DISCUSSION

In both five-year periods, the 2 detection criteria that most frequently prompted a urinalysis were current reporting or history of substance use and the lack of antenatal care. The latter is a feature commonly described in studies on ISS use during pregnancy.^{2,11}

In this study, maternal samples showed a higher percentage of positive results than those of their newborn infants. In a similar study, it was observed that maternal samples had a higher sensitivity and specificity than neonatal samples, and a negative predictive value close to 100%.¹² This may be related to the small volume of neonatal samples, apart from the particular pharmacokinetics of the transplacental passage of each substance.

The most frequent ISS were cannabis and cocaine, which are the most commonly used during pregnancy worldwide.⁴ While some studies found that cocaine has been displaced from second place, cannabis remains as the leading substance used during pregnancy and is on the rise in some regions where it has been legalized for other uses.¹³ In the 10 years analyzed, neither methamphetamines nor opioids were detected, although these substances are very common in some countries and increasingly used in others.^{6,7}

In this study, mothers frequently combined ISS use with tobacco and alcohol. Smoking associated with ISS use increases the risk of adverse neonatal events.² Prenatal alcohol exposure is the main preventable cause of cognitive deficits during development.¹⁴ Despite this and the plenty of information available on its danger, alcohol use was the variable for which there were most missing data in this study. This is a limitation of its retrospective design.

A very important fact to guide future preventive actions is that, in more than half of the cases, their partners also used ISS. The use of ISS by women and their partners, or by direct family members, has been described previously.¹¹

In relation to the newborn infant who was readmitted dead, tobacco exposure has been related to sudden death. There is also an increased risk for sudden death among children exposed to different ISS during pregnancy.¹⁵

The advantages of the urine screening strategy are its low invasiveness, low cost, and rapid results.⁸ For this reason, it has been maintained for 10 years and continues in place. It has allowed to identify positive dyads, who were monitored clinically more frequently than usual,

and in whom breastfeeding was discontinued. The areas of Psychology and Social Services started the management of these dyads during their hospitalization. They were discharged with negative urine tests and scheduled appointments for neonatal control in the same week. The cases were reported to the relevant government agencies.

The main limitation of the screening strategy is in relation to diagnosis because the urine immunoassay has a low sensitivity and detects only a limited number of substances used up to 72 hours before. Studies using methodologies with a higher sensitivity and a detection window in biological samples, such as maternal hair, meconium, or umbilical cord blood, have reported an increasing use of a wide range of ISS during pregnancy.^{5,7} The disadvantages of these methodologies are their complexity and high cost, which limit their routine use.

CONCLUSIONS

The most commonly detected ISS were cannabis and cocaine. No changes were observed in the frequency or type of ISS detected over 10 years. ■

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