

Oral and general motor behavior of newborns from crack and/or cocaine using mothers

Comportamento motor oral e global de recém-nascidos de mães usuárias de crack e/ou cocaína

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ABSTRACT

Purpose: To analyze the oral and general motor behavior of newborns from women that used crack and/or cocaine when pregnant and verify if there is any relationship between the development of the oral and the general sensorimotor systems. **Methods:** Cross-sectional study assessing 25 premature and full-term newborns from women who were crack and/or cocaine users and comparing them to another group composed of 25 newborns without the studied factor. The oral and general sensorimotor systems were evaluated by using the Preterm Infant Oral Feeding Readiness Assessment Instrument and the Test of Infant Motor Performance (TIMP). The results compared scores found in both scales and their relationship to the use of crack and/or cocaine during pregnancy. **Results:** No deviation was found by the TIMP when comparing the newborns from crack and/or cocaine-using mothers to the ones from non-using mothers. The results from the Preterm Infant Oral Feeding Readiness Assessment Instrument showed deviations. A relationship between the results from babies who presented a delayed TIMP and a lower score in the Preterm Infant Oral Feeding Readiness Assessment Instrument was observed. **Conclusion:** The low performance observed in the Preterm Infant Oral Feeding Readiness Assessment Instrument suggests that oral motor responses change with the use of drugs during pregnancy. The correlation between both instruments shows that the development of the oral sensorimotor system can be related to general motor development.

Keywords: Infant, newborn; Infant, premature; Crack cocaine; Psychomotor performance; Stomatognathic system; Child development

INTRODUCTION

Oral motor development is associated with general motor development. The theory of dynamic systems emphasizes an organizational relationship between their different components^(1,2).

Drug addiction involves physical, psychological and social disorders. In 2005, the Brazilian Center for Information on Psychotropic Drugs (*Centro Brasileiro de Informações sobre Drogas Psicotrópicas* – CEBRID) conducted research to estimate drug use prevalence in 108 Brazilian cities, comprising a total population of 47,135,928 inhabitants aged between 12 and

65. A percentage of 0.7% of the 7939 individuals interviewed had used crack at some point in their lives⁽³⁾.

Crack was described by American socio-ethnographers in the literature in the 1980s as a new and potent form of cocaine use. When inhaled, the drug releases a massive amount of the substance to the brain resulting in more stimulating and pleasant effects⁽⁴⁾. Crack effects on users are identical to those of cocaine, although faster acting and more intense⁽⁵⁻⁷⁾. What is impressive in looking at the expansion in crack use is the rapidity of mental, organic and social deterioration that this drug produces⁽⁴⁾.

It is well known that crack use during pregnancy can result in spontaneous abortions, premature births, fetal growth decreases, and other perinatal changes. Additionally, those who survive to birth may present mental and behavioral disorders, including mental retardation, which bring serious accompanying consequences to their lives^(8,9).

Prenatal exposure to drugs can lead to symptoms related to intoxication or abstinence⁽⁶⁾. Cocaine crosses the hemato-encephalic barrier, reaching the brain concentrations, and can affect brain formation⁽¹⁰⁾. It can cause brain growth and cortical development changes, causing neuronal differentiation and migration disorders⁽¹¹⁻¹³⁾. There are countless neurobehavioral effects from cocaine, like feeding and sleeping difficulties,

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Conflict of interests: None

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changes in the regulation of consciousness states, signs of stress, excitability, motor immaturity, altered reflexes, and signs of abstinence⁽¹³⁻¹⁷⁾.

Regarding the motor oral and global pattern of newborns, studies indicate an increase of tonus and altered reflexes in babies exposed to cocaine during the prenatal period, as well as changes in the maintenance of the state of consciousness, in oral reflexes, and in the sucking pattern^(18,19).

It is believed that children born after unfavorable or incomplete pregnancy under adverse socioeconomic situations are exposed to different risks, like motor growth and development delays. As a result, they are more prone to neuropsychomotor development delays⁽²⁰⁾.

Therefore, this study aimed to analyze the oral and global motor behavior of newborns from mothers who used crack and/or cocaine during their pregnancy and comparing it to the behavior of newborns from non-use mothers. In addition, we investigated if there is any relationship between the development of the general and the oral motor systems.

METHODS

This is a cross-sectional study with data collection conducted in the Joint Rooming and Neonatal Intensive Care Unit (NICU) of Hospital Nossa Senhora da Conceição and Hospital da Criança Conceição, which belong to the Grupo Hospitalar Conceição (GHC), a public institution in the city of Porto Alegre (RS), Brazil. The total sample was composed of 25 newborns from crack and/or cocaine user mothers who were compared to another group of 25 newborns from non-user mothers according to gestational age and corrected gestational age. Newborns were divided into four groups: Group 1 (GEP) premature newborns from crack and/or cocaine using mothers (eight babies); Group 2 (GCP) premature newborns from non-using crack and/or cocaine mothers (eight babies); Group 3 (GET) full-term newborns from crack and/or cocaine using mothers (17 babies); Group 4 (GCT) full-term newborns from non-using crack and/or cocaine mothers (17 babies).

The sample was characterized regarding gestational age (GA), corrected gestational age (CGA), days of life, mother's age, birth weight, and weight at evaluation, which are described in Table 1. Twelve infants were female and 38 were male.

The target population in this study was composed of all babies identified as being born from mothers who used crack and/or cocaine between May and October 2010. Cases of mothers using crack and/or cocaine were identified by means of researcher contact with the hospital units' medical and nursing teams, social workers, and review of medical records. After the approval of the Research Ethics Committee, parents and/or guardians who accepted participation in the study signed the Informed Consent Form.

Exclusion criteria established were: refusal to participate in the study; hospital discharge or death before 24 hours of life or without the application of any instruments; corrected age lower than 34 weeks (at evaluation), and pregnancy length lower than 30 weeks; congenital malformations; congenital cardiopathies; syndromes under investigation; use of central nervous system depressant drugs up to six hours before the evaluation; grade II and grade IV intraventricular hemorrhage; neonatal anoxia; alternative feeding; clinical instability at evaluation, such as the use of oxygen, the need for monitoring, venous infusion and mechanical ventilation.

Oral and global motor sensory system evaluations were conducted by a speech-language pathologist and two physical therapists. The Test of Infant Motor Performance (TIMP)⁽²¹⁾ and the Preterm Infant Oral Feeding Readiness Assessment Instrument (*Instrumento de Avaliação da Prontidão do Prematuro para Início da Alimentação Oral* – IAPPIAO) were used^(22,23). The TIMP scale assesses motor performance and movement quality in newborns from 32 post-conceptual weeks to 4 months of corrected age, and is composed of 42 items divided into 13 observed and 29 elicited items. The first 13 are evaluated by observation of baby responses, and the 29 elicited items, i.e., those which provoke reactions, are marked in accordance with motor performance on a scoring scale of from zero to six⁽²¹⁾. The IAPPIAO is composed of items that evaluate the state of behavioral organization, general posture and tonus, oral posture (lips and tongue), oral reflexes, and non-nutritive sucking pattern. The movement of oral structures, strength, rhythm, and signs of stress are observed within the last item. Instruments were applied from 34 weeks of corrected pregnancy length in the premature group and just once to each newborn. The IAPPIAO performance varies because its score rating does not identify a normal or delayed pattern.

Table 1. Sample characterization

Variable	Premature		Full-term	
	Cases	Non-cases	Cases	Non-cases
GA (in weeks) (mean±SD)	34.2±2.1	33.8±2.1	38.8±1.0	38.6±1.3
CGA (in weeks) (mean±SD)	36.2±1.2	36.5±1.0		
Days of life (mean±SD)	14.6±13.6	21.1±14.3	6.2±7.0	6.8±3.3
Mother's age (in years) (mean±SD)	25.6±5	29.8±7.2	26.7±6.8	24.0±5.05
Weight at birth (in grams) (mean±SD)	1982.5±418.7	1866.3±625.6	2664.7±562.1	3131.7±421.9
Apgar 1' (median)	8 (8-9)md	8 (7.25-8)	8.5 (8-9)	8 (7.5-9)
Apgar 5' (median)	9 (8-9)md	9 (8.25-9)	9 (9-9)	9 (9-9)
Present weight (in grams) (mean±SD)	2010.0±205.6	2136.2±292.6	2643.5±492.3	3137.9±444.3

Note: GA = gestational age; CGA = corrected gestational age; SD = standard deviation

TIMP data were interpreted through the total score obtained and matched against the motor performance rating table (low, medium or high).

As well as scale application, a clinical oral-motor assessment of the oral acceptance of diet by using the cup and/or baby bottle method was performed. Behaviors were recorded as adequate, altered, present, or absent, so the oral-motor protocol was applied during the preprandial period. Evaluations did not occur at the same time but at a maximum interval of 48 hours and a minimum time elapsed after birth of 24 hours.

Data statistics treatment was performed through the SPSS Program version 16. Tests used were Student's t test and Fisher's Exact test. The significance level adopted was 5%.

RESULTS

Newborns from drug using mothers and non-drug using mothers were classified as having results within average or delayed in accordance with the scores obtained from the TIMP scale. Regarding Group 1 (GEP), 37.5% obtained a score within the average, and 62.5% obtained a score that indicated delay; regarding Group 2 (GCT), half of the babies were within average, and the other 50% showed delay; regarding Group 3 (GET), 17.6% were within the average and 82.4% were delayed; regarding Group 4 (GCT), 23.5% obtained scores within the average and 76.5% showed delay. There was no association between results.

Regarding newborn performance with the IAPPIAO (Table 2), a difference between Groups 3 and 4 was observed ($p=0.02$). This result indicates that full-term newborns from women who used crack and/or cocaine during pregnancy showed a worse performance (lower score) with the IAPPIAO.

Table 2. Preterm Infant Oral Feeding Readiness Assessment Instrument (IAPPIAO)

Groups	n	Scores	Groups
G1	8	32.3± 3.9	0.57
G2	8	31.3± 2.8	
G3	17	30.0± 5.2	0.02*
G4	17	33.3± 1.9	

* Significant values ($p<0.05$) - Student's t Test

Note: G1 = premature babies from crack and/or cocaine using mothers; G2 = premature babies from non crack and/or cocaine using mothers, G3 = full-term babies from crack and/or cocaine using mothers; G4 = full-term babies from non crack and/or cocaine using mothers; SD = standard deviation

Considering delays or performance within the average, an association between scores obtained with the IAPPIAO and the TIMP was observed (Table 3). It was possible to observe an association between the IAPPIAO and the TIMP scoring group, which showed a general behavior delay (full-term baby group). The significance was in the boundary when the IAPPIAO was compared to the TIMP group with score within the average (premature baby group).

The weights of newborns, premature and full-term babies from crack and/or cocaine using mothers were lower than the

Table 3. Association between TIMP and IAPPIAO results

TIMP Scores	n	IAPPIAO	TIMP scores
Within average	14	33.4± 1.7	0.06
Delay	36	31.1± 4.3	0.01*

* Significant values ($p<0.05$) - Student's t Test

Note: IAPPIAO = Preterm Infant Oral Feeding Readiness Assessment Instrument; TIMP = Test of infant Motor Performance; SD = standard deviation

weights of children of non-using mothers at birth and at evaluation. Average weight at birth for Group 3 was 2664±562 grams and 3131±421 grams for Group 4, which shows a difference. Regarding average weight at evaluation, this was 2643±492 grams for Group 3, and 3137±444 grams for Group 4, which is also significant. The same occurred in the comparison between Groups 1 and 2.

DISCUSSION

Prematurity is described in the literature as one of the consequences of drug use during pregnancy⁽²³⁾. However, we found a reduced number of premature babies compared to the number of full-term newborns.

In attempting to conduct a study in which the difference between groups was only the use of crack and/or cocaine by mothers during pregnancy, we compared the sample regarding pregnancy length and corrected pregnancy length because premature newborns have specific needs and are more fragile in terms of post-natal clinical conditions compared to full-term newborns. One can notice an important difference when comparing the weight at birth and at evaluation between risk and non-risk groups, both for premature as well as for full-term babies. We found a significant association between the mother's use of crack and/or cocaine, and reduced weight at birth and at evaluation. This result suggests that the use of such drugs during pregnancy can result in low birth weight and consequently a lower weight at hospital discharge. According to the literature, low weight is described as a consequence of cocaine use during pregnancy⁽²⁴⁾.

By analyzing results from the evaluation of motor performance with the TIMP scale, it was possible to detect delays within the population studied, as previously observed⁽²¹⁾. The same author compared TIMP results to those of the Alberta Infant Motor Scale, and concluded that for babies under three months of age, the TIMP is highly valid in predicting motor performance and identifying children liable for early intervention⁽²⁵⁾.

In our study, it was not possible to observe any differences regarding delays when the groups of newborns from mothers using crack and/or cocaine (Groups 1 and 3) were compared to the groups of newborns from mothers who did not use these drugs (Groups 2 and 4), both regarding oral as well as general motor performance. This result might suggest that the drug as an isolated factor would not be able to generate motor delays within this population, also considering that newborns from non-user mothers also showed delays. A group of researchers used the Bayley Scale of Infant Development to evaluate

newborns from cocaine using mothers during their first 30 hours of life.

This instrument evaluates babies from newborns to 30 months old and is divided into three scales: mental, psychomotor and behavioral. Changes in the motor evaluation of newborns from cocaine using mothers were also found in the mentioned study⁽²⁶⁾.

Another study performed in Amsterdam assessed a control group and a group of babies from cocaine using mothers and followed them up to 5.5 years of age. The author concluded that children from drug using mothers had behavioral and cognitive development problems, but no difference was found regarding motor development⁽²⁷⁾.

The use of drugs during pregnancy, besides other factors, might result in altered reflexes, both regarding the oral as well as the general motor pattern⁽¹⁵⁻¹⁷⁾. Our study showed an association between the score given by the Preterm Infant Oral Feeding Readiness Assessment Instrument and the use of drugs by mothers of full-term babies in groups 3 and 4. The items that showed the strongest changes were “sucking reflexes” and “non-nutritive sucking pattern (SNN)” where a lack of coordination and inconsistency in maintaining the rhythm were observed. Regarding the sucking pattern, tongue movement alterations with absence of tongue cupping and arrhythmic sucking were observed. It is well known that inadequate sucking responses and an uncoordinated SNN pattern might be associated with reduced or exacerbated newborn responses, not only delays, or below normal behavior patterns. Excessive sucking responses, possibly related to altered dopaminergic activity, were observed in a study that evaluated newborns exposed to intrauterine cocaine⁽¹³⁾.

Another important factor is related to the lack of sucking/swallowing/breathing coordination observed during the clinical feeding evaluation.

This data cannot be measured with the instrument used because it only evaluates the baby’s readiness to begin oral feeding. But according to the conducted clinical evaluation, newborns within risk groups showed irritability when food was offered and did not present satiety upon consuming the entire diet amount. This pattern was reported many times during the period of data collection by nurses and nursing technicians who daily cared for the babies in the units where the research was conducted. The observed neurobehavioral effects of cocaine

included feeding difficulties as well as excitability and stress signs in newborns, which are probably related to abstinence symptoms^(13,15,16).

According to the Bobath Neuroevolutive Concept, adaptive responses needed for the development of the individual result from the interaction of different systems, among them, general motor and oral sensorimotor⁽²⁸⁾. This study showed a significant association and a bordering significance between the Preterm Infant Oral Feeding Readiness Assessment Instrument and the TIMP scale, regardless of the use of crack and/or cocaine during pregnancy. These results show that full-term or premature newborns with TIMP scores suggesting delays presented a worse performance regarding oral motor sensory system functions, according to the Preterm Infant Oral Feeding Readiness Assessment Instrument. In the case of babies performing within TIMP scale averages, we did not observe any statistical deviation, but a bordering significance ($p=0.06$). There is a strong relationship between the acquisition of general motor skills in normal children⁽²⁹⁾, therefore our study indicates that the development of the oral motor sensory system might be related to general motor development, which corroborates the findings from the literature^(6,29).

CONCLUSION

The drug use by mothers influences the performance of the newborn regarding the beginning of oral feeding by changing the sucking reflex and the non-nutritive sucking pattern (SNN), and a lack of coordination/inconsistency in keeping the rhythm. Additionally, there is an association between the development of the oral and global motor sensory systems, extremely important data if we consider that both of them are essential for the formation of better coordination and better performance of newborns submitted to risk factors regarding neuropsychomotor development delay. Our results reinforce the need for other studies focused on possible alterations brought about by the use of drugs during pregnancy, as well as the follow up of their repercussions over the long term.

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RESUMO

Objetivo: Analisar o comportamento motor oral e global de recém-nascidos de mães que fizeram uso de *crack* e/ou cocaína durante a gestação e verificar se há relação entre o desenvolvimento dos sistemas sensorio motor oral (SSMO) e motor global. **Métodos:** Estudo transversal, em que foram avaliados 25 recém-nascidos prematuros e a termo de mães usuárias de *crack* e/ou cocaína, pareados com outro grupo de 25 recém-nascidos sem o fator em estudo. As avaliações do SSMO e motor global foram realizadas por meio do Instrumento de Avaliação da Prontidão do Prematuro para Início da Alimentação Oral e do *Test of Infant Motor Performance* (TIMP), respectivamente. Os resultados compararam os escores encontrados nas duas escalas e a relação destes com o uso materno do *crack* e/ou cocaína durante a gestação. **Resultados:** No TIMP não foi constatada diferença na comparação entre os escores de recém-nascidos de mães usuárias de *crack* e/ou cocaína e os de mães não usuárias. No Instrumento de Avaliação da Prontidão do Prematuro para Início da Alimentação Oral, os resultados apresentaram diferença. Foi observada associação entre os resultados de bebês que apresentaram atraso no TIMP com menor escore no Instrumento de Avaliação da Prontidão do Prematuro para Início da Alimentação Oral. **Conclusão:** O baixo desempenho observado no Instrumento de Avaliação da Prontidão do Prematuro para Início da Alimentação Oral sugere que as respostas motoras orais estão alteradas pelo uso materno das drogas. A correlação entre os dois instrumentos mostra que o desenvolvimento do SSMO pode estar relacionado ao desenvolvimento motor global.

Descritores: Recém-nascido; Prematuro; Cocaína *crack*; Desempenho psicomotor; Sistema estomatognático; Desenvolvimento infantil

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