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ORIGINAL ARTICLE

Rooming-in: maternal factors associated with the presence of clinical complications in the newborn

Alessandra Pinheiro Rios^{1,2}, Adriana Cersosimo^{1,2}, Vivian Figueiredo³, Mariah Pinheiro Rios Lima⁴, Israel Figueiredo Junior²

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Abstract

Introduction: rooming-in is a physical area prepared to receive mother-child binomials after childbirth and is important for the recognition and resolution of intercurrents. **Objective:** to establish the main clinical alterations in newborns who were discharged after staying in a rooming-in system and to verify the association of prenatal/birth situations with the presence of these neonatal transient situations. **Methods:** a cross-sectional study, through the reading of medical records of postpartum women hospitalized in a low-risk public maternity hospital. Mann-Whitney and Chi-square/logistic regression tests were used to verify differences between means in continuous variables and associations between categorical variables. **Results:** The 512 mothers were mostly from Niterói (n=411; 80.3%), with a mean age of 23.48 years, with 29.3% under 20 years of age (n=150) and 82, 2% (n=421) had completed elementary school. Among the newborns, only 15.4% (n=79) required resuscitation in the delivery room, half of them were male (50.0%), mean birth weight 3287.26 grams and gestational age 39.5 weeks. Seventy newborns presented clinical alterations (13.7%) and the suspected sepsis, jaundice and syphilis were the main causes of an increase in hospital stay. The group of newborns with complications showed a greater chance of belonging to the group of mothers who had problems in prenatal care (95% CI OR: 2.930; 1.733 -4.953; $p<0.001$). **Conclusion:** only a small number of newborns required clinical treatments in the rooming-in and there was an association between these clinical complications and the history of maternal problems during pregnancy.

¹ Maternidade Municipal Alzira Reis, Secretaria Municipal de Saúde, Niterói - Rio de Janeiro - Brasil.

² Hospital Universitário Antônio Pedro, Universidade Federal Fluminense, Niterói - Rio de Janeiro - Brasil.

³ Faculdade de Medicina, Campus Center V - Arcos da Lapa, Universidade Estácio de Sá, Rio de Janeiro - Rio de Janeiro - Brasil.

⁴ Fundação Técnico-Educacional Souza Marques, Faculdade de Medicina, Rio de Janeiro - Rio de Janeiro - Brasil.

Correspondence to:

Vivian Figueiredo.

Universidade Estácio de Sá, Faculdade de Medicina, Campus Center V. Rua Riachuelo, 27, Centro, Rio de Janeiro, RJ, Brasil CEP: 20230-010. E-mail: viviancf13@gmail.com

INTRODUCTION

The rooming-in system is the best method to help mothers adapt to their newborn children. In this system, the healthy newborn is placed at their mother's side, 24 hours a day, in the same environment, from birth until discharge.¹

Medical care is provided to mother and child, including late preterm infants.² Rooming-in is offered to mothers with clinical conditions that allow contact with their newborns, who must display good vital signs, temperature control, and the ability to suckle and swallow.

An uneventful stay is the norm, but some newborns require additional care, including drug therapy, which may prolong hospitalization.³⁻⁵ Little has been published about the main complications affecting newborns in a rooming-in setting immediately after birth. Given the strategic importance of this subject in the care of mothers and neonates, we hypothesized that low maternal age and a reduced number of prenatal consultations might be associated with the occurrence of adverse events in newborns during hospitalization.

This article lists the main complications affecting newborns who were discharged after staying in a rooming-in setting and analyzes the association between prenatal and birth conditions and the presence of transient neonatal complications.

METHODS

This cross-sectional, descriptive study compared the medical records of newborns and mothers included in the control group against those of newborns who were referred to a hospital or who died in a low-complexity care unit. The Research Ethics Committee of the Fluminense Federal University approved this study under certificate no. 023136714.7.0000.5243.

The study included the birth data of newborns admitted between the years 2004 and 2020 to the Alzira Reis Maternity located in Niterói, in the State of Rio de Janeiro, Brazil. The 22-bed maternity hospital comprises five wards, three prepartum, delivery, and pregnancy care rooms, two operating rooms, an intermediate unit room, and a procedure room. The institution is committed to delivering humanized care and promoting normal birth while securing the rights and catering to the individual needs of pregnant women. It features emergency care services and operates 24 hours a day without interruption, with care teams working 12-hour shifts. The day shift crew includes three obstetricians, two pediatricians, an anesthesiologist, three nurses, seven nursing technicians, a social worker, a nutritionist, a speech therapist, and a psychologist. The night shift team includes two obstetricians, a pediatrician, an anesthesiologist, three nurses, and six nursing technicians. Although care is mainly delivered to patients at usual levels of risk, the institution is equipped to provide advanced life support for mothers and newborns.

One of the authors collected the data from handwritten records after prior training to eliminate possible data collection biases. Records from the nursing team, social services, and other documents included in the medical records were tracked and collected for joint analysis. The study enrolled newborns and mothers with and without neonatal complications who were not discharged within 48-72 hours. The patients were randomly selected to cover the study period (average of 32 cases per year) based on a numerical list produced on Microsoft Excel®. Medical charts were selected based on the next-to-last figure of the patient record number. Records listed and not found or that did not contain the data needed for the study and the records of newborns who were referred to another hospital or who died were excluded (Figure 1). Pregnancies that culminated in unplanned out-of-hospital births were not included in the study group.

The database used in this cross-sectional study contained 82 variables. The majority were categorical, with 26 binary and the remainder belonging to several categories. Some had multiple possible answers, such as the ones describing prenatal events (25 categories), neonatal resuscitation procedures (5 categories), maternal complications in the maternity ward (16 categories), and early neonatal complications (31 categories).

The assessment of missing values revealed that no variable presented losses greater than 3%. Data about the mothers (municipality of residence, years of schooling, age, number of pregnancies, number of prenatal consultations, number of miscarriages, history of disease before and during pregnancy and prenatal care), births (type of birth, time of birth, need for resuscitation, type of resuscitation, 5-minute Apgar score), and newborns (sex, gestational age, weight, complications, care received, length of hospitalization) were collected. Transient complications generally included neonatal jaundice,⁶ hypoglycemia,⁷ low weight,⁸ macrosomia,⁹ and infection,¹⁰ among others. Breastfeeding-related complications were not included in the study, only clinical ones.

The patients were divided into two groups, one containing newborns discharged with their mothers within the expected timeframe (group with no complications - GNC) and newborns requiring treatment for more than 72 hours (group with complications - GWC). They were also analyzed for birth weight (> 2500 and < 2499 g [low birth weight]; < 3999 and > 4000g [macrosomia]), gestational age (> 37 and < 36 weeks and 6 days [preterm]), and need for resuscitation (0/1). The mothers were grouped by presence or absence of prenatal complications or not (0/1), age (< 19 and > 20 years), number of prenatal consultations (< 5 and > 6 consultations), color (0/1), years of schooling (< 7 and > 8 years), delivery (0/1), and time of birth (day/night).

Categorical variables were analyzed based on counts, frequency, and valid percentages. The Chi-square with Fisher's Exact Test was used to verify potential associations between cross-references of cases of binary variables.

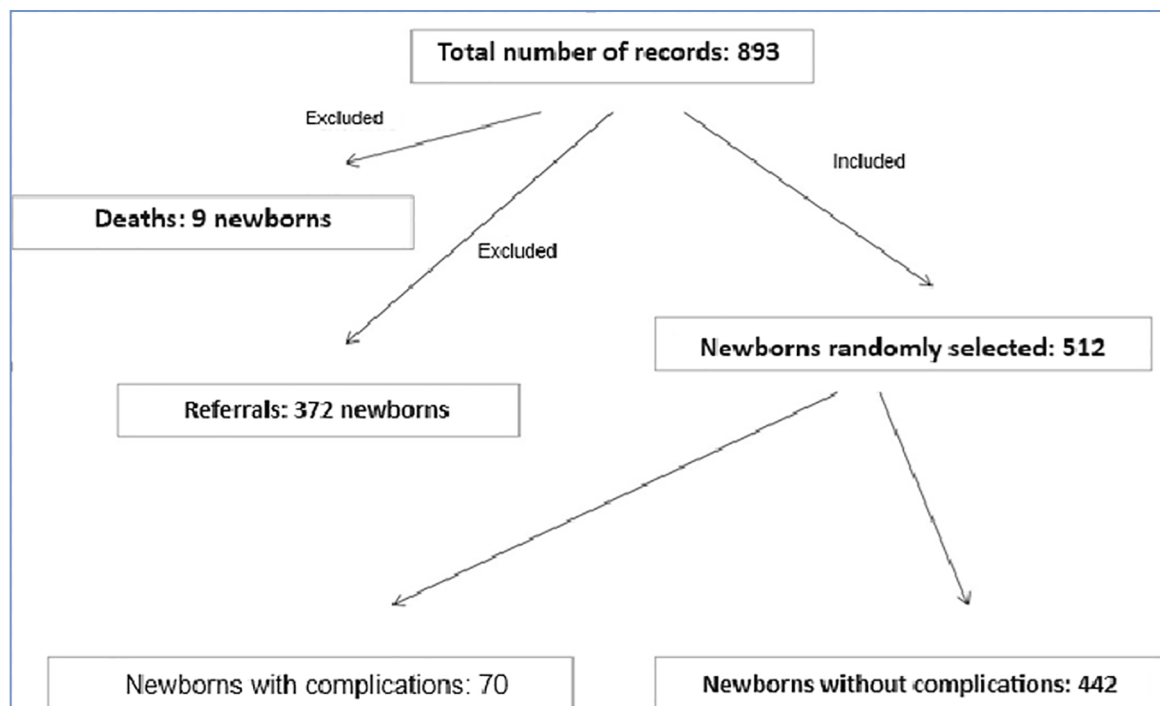


Figure 1. Study flowchart.

A Binary Logistic Model was used to test the association of predictive factors related to maternal and birth data (independent variables) with the presence or absence of rooming-in clinical complications (dependent binary variable), observing the p-value, the Odds ratio (OR) with its confidence interval not containing 1. Maternal variables were selected based on technical criteria, understanding that these variables are frequently included in scientific studies as possible causes of transient neonatal disorders. The analysis method was insertion, considering all variables at once. Furthermore, the variance inflation factor and tolerance were examined to rule out multicollinearity between predictor variables, considering values of >0.1 and <10 , respectively, as references.

Variables with multiple responses were set to generate frequencies and allow the creation of cross-referencing tables. This method, known as multiple response analysis, is used to record data in which each individual may check more than one option in a survey item, allowing the number of times each option appeared in each newborn medical record to be counted. For example, a newborn could present more than one clinical complication, yielding more complications than the number of newborns with these complications.

Continuous variables (maternal age, pregnancy number, number of prenatal consultations, gestational age, weight, 5-minute Apgar score, time to discharge in hours) and descriptive ones (mean, confidence interval [CI], median, standard deviation [SD], minimum [MIN] and maximum [MAX] values) underwent normality tests to allow the choice of a parametric or non-parametric test. The t-test and the

Mann-Whitney Test were used in two groups. ANOVA and the Kruskal-Wallis Test were adopted in more than two groups, depending on whether the continuous variables had a normal distribution. The data obtained were processed in the PC/SPSS 24.0 program (IBM SPSS Statistic)®, and a p-value of less than 0.05 was considered significant.

RESULTS

A total of 512 pairs of newborns and mothers were analyzed. The mothers were mainly from Niterói ($n=411$; 80.3%), with an average age of 23 years. Almost a third (29.3%) were under 20 years of age ($n=150$; average: 17.29; 95% CI: 17.03-17.54; median:18; Min:12; Max:19; SD: 1.57). Complications during prenatal were reported in 149 women, with urinary infection ($n=118$; 79.7% of cases), syphilis ($n=16$; 10.8% of cases), and hypertension ($n=7$; 4.7% of cases) topping the list.

Only 15.4% of the newborns required some form of resuscitation in the delivery room, with oxygen therapy ranking as the most used procedure (46/79; 58.2%), followed by self-inflating bag with positive pressure ventilation (31/79; 39.2%), and orotracheal intubation with positive pressure ventilation (2/79=2.5%). Most newborns were described as appropriate for gestational age ($n=449$; 87.7%), and some had clinical complications in the postpartum period ($n=70$; 13.7%) without requiring referral to a complex care unit. Suspicion of sepsis and hyperbilirubinemia were listed as the main reasons for the 76 adverse events described in the medical records

(Table 1). We found an association between newborns with complications and prematurity (n=6/512; 1.1% [mean: 251.66 days – between 35 and 36 weeks; SD: 5.75]; Fisher: p< 0.001; 95% CI OR: 0.029; 0.003-0.256), low birth weight (n=7/512; 1.3% [mean: 2358.57; SD: 161.00]; Fisher: p=0.008; CI OR 95%: 8.869; 1.941-40.515), macrosomia (n=23/512; 4.5% [mean: 4235.78; SD: 171.08]; Fisher: p=0.007; CI OR 95 %: 3.673; 1.496-9.021), and need for resuscitation (Table 2).

The analysis of potential associations between maternal/birth factors and neonatal complications revealed that the newborns of mothers with adverse events reported during prenatal care had an almost threefold chance of developing complications (CI OR 95%: 2.899; 1.719 -4.890; p<0.001) (Table 3).

The average length of hospitalization was 64.87 hours (95% CI:60.75-68.99; median=50.00; MIN: 24; MAX: 384; SD: 47.40).

Table 1. Analysis of multiple responses: Clinical complications in 70 newborns in rooming-in.

		N	Proportion
Complications in newborns	Suspicion of sepsis	24	31.6%
	Neonatal jaundice	15	19.7%
	Congenital syphilis	14	18.4%
	Macrosomia	12	15.8%
	Prematurity	4	5.3%
	Hypoglycemia	3	3.9%
	Low weight	2	2.6%
	Malformation	2	2.6%
Total		76	100.0%

Table 2. Associations between neonatal complications and maternal, birth, and newborn characteristics.

		Newborns		
	Categorical	GNC	GWC	p (Fisher)
Mothers				
Years in school	<8 years	360	61	0.313
	>9 years	82	9	
Prenatal complications	No	328	35	<0.001
	Yes	114	35	
Type of delivery	Vaginal	293	46	1.000
	Cesarean	149	24	
Time of birth	Day	235	39	0.701
	Night	207	31	
Continuous		GNC	GWC	p (M.W)
Maternal age (years)	Mean/SD	23.54/5.92	22.40/5.66	0.098
Number of pregnancies (n)	Mean/SD	1.72/1.02	1.76/1.09	0.929
Number of prenatal consultations (n)	Mean/SD	7.90/2.98	8.19/2.73	0.289
Gestational age (days)	Mean/SD	277.11/7.71	276.45/10.14	0.987
Newborns				
Categorical		GNC	GWC	p (Fisher)
Sex	Male	220	36	0.898
	Female	222	34	
Need for resuscitation	No	380	53	0.033
	Yes	62	17	
Continuous		GNC	GWC	p (M.W)
Birth weight (grams)	Mean/SD	3278.23/382.51	3356.81/527.95	0.328
5-minute Apgar score	Mean/SD	9.20/0.60	8.99/0.83	0.054
Time to discharge (Hours)	Mean/SD	51.55/10.22	150.20/87.56	<0.001

Table 3. Association between maternal and birth factors with newborn complications.

Variables	OR	95% CI for OR		p-value
		Lower	Upper	
Maternal age	.953	.902	1.007	.088
Number of pregnancies	1.166	.887	1.534	.271
Number of prenatal consultations	1.038	.949	1.135	.417
Years of schooling (1)	.741	.344	1.596	.444
Prenatal adverse events (1)	2.899	1.719	4.890	.000
Type of delivery (1)	1.062	.606	1.862	.833
Time of birth (1)	1.143	.674	1.940	.619

a. Variable(s) entered: Independent variables: Maternal age (years), Number of pregnancies (n), Number of prenatal consultations (n), Years of schooling (< 7/> 8 years), Prenatal adverse events (no/ yes), Birth (vaginal/cesarean), Time of birth (day/night). Dependent variable: newborn complications (no/yes). OR: odds ratio; CI: Confidence interval.

DISCUSSION

Clinical complications among newborns in regular care were few and sparse, with rates similar to those described by Lee et al., where there was a need to suspend neonatal care.¹¹ This was expected and consistent with the daily observations of the rooming-in system.

Many transient complications may affect newborns. Multidisciplinary care teams must pay extra attention to cases of neonatal asphyxia since this complication has been associated with hospitalization and death,¹² and teams in charge of resuscitation must be trained on the most current protocols.¹³ The need for resuscitation must be continuously assessed. Careful physical examination followed by prophylactic medication when needed, vaccines, adequate nutrition, safe sleep, and hygiene measures are necessary to promote newborn well-being.¹⁴ It was interesting to notice that two of the first three clinical complications evaluated were of infectious origin. In neonatal life, infection is generally associated with maternal, birth, and postpartum complications, which are sometimes challenging to identify. The two cases suspected of sepsis⁵ and congenital syphilis, a growing issue in Brazil,¹⁵ required extended hospitalization and careful assessment regarding the use of antibiotics and other specific medications, particularly in symptomatic cases.^{16,17} Newborns with unconjugated hyperbilirubinemia, negative direct Coombs tests, and without hemolysis generally stay in hospital for longer. The reasons include delayed umbilical cord clamping,¹⁸ hematoma resorption,¹⁹ low fluid intake,¹⁹ and excessive weight loss,⁴ among others. These conditions are sometimes not diagnosed, and some newborns may require phototherapy.²⁰ Macrosomia²¹ also drew attention as a more critical factor than low birth weight², and the two call for specific care.

Although we initially hypothesized that maternal age and the number of prenatal consultations were associated with the occurrence of transient prenatal complications, none were linked to the need for extended newborn hospitalization. There were many similarities between the women in the

two groups, and the only factor associated with neonatal complications was having a history of prenatal adverse events. Many reported maternal complications, such as the use of opioids,²² fatigue, and trouble sleeping,²³ were not seen in our population. Care teams must be trained to treat pregnant women with infectious diseases, including UTI²⁴ and syphilis^{25,26}, and prescribe the tests and treatments required for mothers²⁷ and newborns.^{28,29} It is worth noting that the logistic regression showed a greater chance of newborns of mothers with complicated pregnancies developing complications.

The analysis of the length of hospitalization showed that discharge took place within 48-72 hours, as usually observed in Brazilian maternity wards. This practice differs from that of many South Korean institutions, in which specialized postpartum care centers called Sanhujoriwon keep mothers for two weeks after birth.³⁰ In cases where newborns needed additional care, the length of hospitalization moved up to 6-7 days, at which time they were discharged or referred to advanced care. The length of hospitalization must be defined based on medical guidelines and the criteria stipulated for full-term³¹ and low birth weight newborns,³² which are only sometimes observed.³³

Our study's limitations include using a database developed for the control group. The study was not initially designed to focus on populations served by low-complexity maternity hospitals. Another limitation was that the data spanned for many years, which means the criteria in use and the specialized staff may have fluctuated. However, the center was under the same medical director throughout.

In conclusion, only a small number of newborns required treatment, and suspicion of sepsis was the main reason for extended hospitalization. An association was observed between postpartum complications in newborns and a history of maternal complications during pregnancy.

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