



Association between maternal and neonatal factors and Apgar in usual risk neonates*

Associação entre fatores maternos e neonatais e o Apgar em recém-nascidos de risco habitual

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Objective: to verify the association between maternal and neonatal factors and the Apgar score <7 at five minutes of life. **Methods:** cross-sectional study with 134 newborns. For the analysis of the data collected through an instrument developed by the researchers, we used the description of the absolute and relative frequencies and applied the Chi-square or Fisher's exact tests. **Results:** of the total number of newborns, 63.0% had primigravida mother, 56.0% were male, 79.0% had been born from normal delivery, 65.0% had required oxygen and 45.0% had been resuscitated in the delivery room. Among women, 71.0% had made use of oxytocin. **Conclusion:** use of oxytocin, oxygen and resuscitation in the delivery room showed a significant association with Apgar <7 at five minutes of life. Birth weight, rupture membrane time, meconium clearance, type of delivery, and parity were not related to the low Apgar score.

Descriptors: Infant, Newborn; Intensive Care Units, Neonatal; Pregnancy Outcome; Apgar Score.

Objetivo: verificar associação entre fatores maternos e neonatais e o índice de Apgar <7 aos cinco minutos de vida. **Métodos:** estudo transversal com 134 recém-nascidos. Para análise dos dados coletados com instrumento elaborado pelos pesquisadores, utilizou-se a descrição das frequências absolutas e relativas e a aplicação dos testes Qui-quadrado ou exato de Fisher. **Resultados:** do total de recém-nascidos, 63,0% tinham mãe primigesta, 56,0% eram do sexo masculino, 79,0% nasceram de parto normal, 65,0% demandaram oxigênio e 45,0% foram reanimados na sala de parto. Entre as mulheres, 71,0% utilizaram ocitocina. **Conclusão:** uso de ocitocina, oxigênio e reanimação em sala de parto mostraram associação significativa com Apgar <7 aos cinco minutos de vida. Peso ao nascer, tempo de bolsa rota, eliminação de mecônio, tipo de parto e paridade não se relacionaram ao baixo valor de Apgar.

Descritores: Recém-Nascido; Unidades de Terapia Intensiva Neonatal; Resultado da Gravidez; Índice de Apgar.

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Introduction

Neonatal morbidity and mortality rates encompass conditions beyond the life and health issues of the population, as they can also measure the socioeconomic development level of a country⁽¹⁾.

Neonatal mortality was the subject of discussion in studies addressing the Millennium Development Goals, since it represents a significant portion of infant mortality, a relevant health indicator. In Brazil, every two deaths in children under one year of age, at least one occurs in the first six days of life⁽²⁾, which highlights the importance of policies to strengthen prenatal care, delivery and newborn care policies.

Gestation is considered as being of usual risk or low risk when there is a lower demand for technological density and the maternal and perinatal morbidity and mortality rates are equal to or lower than those of the general population⁽³⁾. Therefore, it is expected as a result of a usual risk pregnancy that the mother and the newborn do not present comorbidities due to pregnancy, not even remaining for a longer time in the hospital environment.

However, it is known that some usual risk pregnant women and/or children develop complications at the time of birth and delivery. A cross-sectional study analyzing more than 10 million birth records between 2011 and 2013 aimed to raise unexpected complications in low-risk pregnancies and showed that 38.0% of the sample was considered at usual risk, among which 29.0% presented some unexpected complication, such as uterine rupture and admission to the adult intensive care unit. Among the newborns, the complications were low birth weight, assisted ventilation and admission to neonatal intensive care unit⁽⁴⁾.

Thus, the unfavorable outcome of newborns intensifies the need for interventions, such as admission to neonatal units and, consequently, increased morbidity and length of hospital stay. These situations are

configured as unexpected events, generating concern and distress in the family.

The literature has focused on the study of the outcomes of high-risk pregnant women, as well as of newborns who at birth showed, mainly, prematurity and low weight, since they are considered more vulnerable to greater neonatal morbidity and mortality⁽⁵⁻⁶⁾. In order to assess the risk of neonatal morbidity and mortality, one of the indicators used is the Apgar index, proposed by Virginia Apgar, in 1952, as a clinical evaluation of the newborn in the first and fifth minutes of life; it is very useful in the analysis of the need for neonatal resuscitation⁽⁷⁾, thus allowing to estimate the neonate vitality at birth, in which the higher its value, the lower the risks of complications at birth⁽⁸⁾.

Thus, this work is justified by the possibility of contributing to the construction of knowledge about neonatal health surveillance. The relevance is due to the scarcity of studies that address the issue of hospitalization of newborns resulting from low-risk pregnancies and to address the factors that may influence the hospitalization of these children who, according to the expected, should have a good outcome. Therefore, the objective was to verify the association between the maternal and neonatal factors and the Apgar score <7 at five minutes of life.

Methods

This is a cross-sectional study developed by participants in the Education Program through Work - Health Surveillance in a public, non-governmental philanthropic hospital that exclusively serves the Unified Health System, located in Belo Horizonte, MG, Brazil. It was carried out between the months of December 2014 and June 2015.

It was identified 139 newborns, children of pregnant women at usual risk, who needed to be admitted in neonatal unit after birth. Of these, five were excluded due to lack of data recorded in medical re-

cords, totaling 134 newborns, who constituted the sample of this research.

The Apgar score <7 at five minutes of life was defined as the outcome variable, because it was considered unfavorable for the birth of the newborn of a usual risk pregnant woman.

Inclusion criteria were newborns admitted in the neonatal units, whose mothers were aged between 16 and 34 years old and whose admissions in the maternity ward were considered as usual risk and who had had no interurrences during gestation; gestational age between 37 weeks and zero days and 40 weeks and six days; newborns from the maternity ward itself; and date of admission in the early neonatal period, that is, up to seven days after birth. The medical records in which the registration number did not correspond to the woman's name or the registration number of the neonatal units spreadsheet were not found in the Medical and Statistical Archive Service were excluded. Newborns requiring admission in more than one neonatal unit were counted only once.

Data collection started from the admission records in neonatal units in the year 2013. The annotations collected were the newborn's mother's name, the date of birth and of admission to the neonatal unit, the origin of the newborn, gestational age and weight. A search was made for the medical records of the children's mothers to verify compliance with the usual risk gestation criteria.

For data collection, an instrument was developed by the researchers, which included information from the woman's admission to the data on the newborn. The instrument was submitted to evaluation by experts and the suggested corrections were made. Subsequently, a pilot test was performed to verify the adequacy to the study objectives, and no need for further adjustments was verified. Among the information collected, the following were the ones used on the mother's admission: age, search for another care service, number of pregnancies, rupture membrane

time, oxytocin use, pharmacological analgesia and type of delivery. Regarding the newborn's admission, the information collected were meconium clearance, non-reassuring situation, weight, sex, Apgar, oxygen use and resuscitation in the delivery room.

The data were tabulated in the Epi-info program, with double typing, and analyzed through the Statistical Package for the Social Sciences program, version 19.0. Initially, the clinical profile of the sample was analyzed through absolute and relative frequencies. Comparative analyzes were performed on two subgroups: neonates with Apgar <7 (n=21) and Apgar \geq 7 (n=113), at the fifth minute of life. Chi-square or Fisher's exact tests were used, with a 95% significance level.

The study complied with the formal requirements contained in the national and international regulatory standards for research involving human beings.

Results

The mothers of neonates who required admission in the neonatal units had a mean age of 22.8 years (standard deviation (SD): 4.9), 63.0% of them were in the first gestation and 56.0% sought care in another health service. Pharmacological analgesia was the method used to relieve pain used by 40.0% of the women; and 71.0% used oxytocin. Cesarean birth occurred in 21.0% of the women.

The use of oxytocin was the only variable that showed association with the outcome variable ($p=0.038$) (Table 1).

The mean gestational age of the newborns was 39 weeks and two days ($SD\pm 0.98$), 56.0% of the neonates were male and the weight ranged from 1,385.0 g to 4,445.0 g, with mean of 3166.5 g ($SD\pm 0.491$). Low weight occurred in 8.0% of those admitted to a neonatal unit and children of women whose gestation was considered low risk at the time of admission. Of the

134 neonates admitted in neonatal units, 16.0% presented Apgar <7 in the fifth minute of life, oxygen therapy was used in 65.0% of newborns in the delivery room and 45.0% required resuscitation.

Table 1 – Characteristics of mothers of usual risk neonates hospitalized in Neonatal Unit associated with Apgar in the fifth minute of life (n=134)

Parameter	Apgar≥7 (n=113)	Apgar<7 (n=21)	p
	n(%)	n(%)	
Primigravida			
Yes	69 (61.1)	15 (71.4)	0.367*
No	44 (38.9)	6 (28.6)	
Rupture membrane time (hours)			
<18	103 (91.2)	17 (81.0)	0.234 [†]
>18	10 (8.8)	4 (19.0)	
Use of oxytocin			
Yes	71 (67.0)	18 (90.0)	
No	35 (33.0)	2 (10.0)	0.038**
Pharmacological analgesia in labor			
Yes	44 (38.9)	10 (47.6)	0.476 [†]
No	69 (61.1)	11 (52.4)	
Type of birth			
Normal	89 (78.8)	17 (81.0)	1.000 [†]
Cesarean section	24 (21.2)	4 (19.0)	
Sought another service			
Yes	62 (56.4)	11 (55.0)	
No	48 (43.6)	9 (45.0)	0.910**§

*Chi-square test, p <0.05; [†] Fisher's exact test; [‡]n(valid)=126; [§]n(valid)=130

The characteristics of the newborns who had an association with the Apgar score <7 at five minutes of life were the use of oxygen in the delivery room (p=0.001) and neonatal resuscitation (p<0.001) (Table 2).

Table 2 – Characteristics of newborns admitted to the Neonatal Unit, children of usual risk mothers and association with Apgar at five minutes of life (n=134)

Parameter	Apgar≥7 (n=113)	Apgar<7 (n=21)	p
	n(%)	n(%)	
Meconium clearance before birth			
Yes	16 (15.7)	2 (11.8)	0.505* [†]
No	86 (84.3)	15 (88.2)	
Non-reassuring situation			
Yes	6 (5.3)	1 (4.8)	1.000*
No	107 (94.7)	20 (95.2)	
Weight (g)			
> 2500	98 (94.2)	10 (76.9)	0.061**§
< 2500	6 (5.8)	3 (23.1)	
Sex			
Female	50 (44.2)	9 (42.9)	0.906 [†]
Male	63 (55.8)	12 (57.1)	
Use of oxygen in the delivery room			
Yes	67 (59.8)	20 (95.2)	0.001*
No	45 (40.2)	1 (4.8)	
Resuscitation in the delivery room			
Yes	37 (34.3)	20 (100.0)	<0.001* [†]
No	71 (65.7)	-	

*Fisher's Exact Test; [†]n (valid)= 119; [‡] Chi-square test, p<0.05; [§]n (valid)= 117; ^{||}n (valid)= 133; [¶]n (valid)= 128.

Discussion

The present study presented limitations, such as having been performed in a single hospital and the use of data from secondary sources.

Regarding the use of oxytocin, unlike the results presented in this study, a study to evaluate the implications of obstetric and neonatal outcomes under labor stimulation with oxytocin shows that there was no association between oxytocin use for labor stimulation and Apgar rates in the fifth minute <7⁽⁹⁾. Oxytocin use, especially at high doses and without

adequate monitoring, may pose serious risks to the mother and fetus, such as uterine tachysystole and impaired fetal heart rate, due to the prolongation of uterine contractility that may lead to decreased blood flow to the fetus⁽⁹⁻¹⁰⁾.

In this study, the time of the woman's stay in the institution before the delivery has not been observed, nor in which phase of labor she was at the time of admission. However, it is possible to assume that the longer the mother stays in the maternity ward, the greater the chance of being exposed to interventions. The high percentage of oxytocin use may be due to the early admission of the woman in view of the need to increase the rotation of beds in the pre-partum period, which may justify the frequent acceleration of labors⁽¹¹⁾. However, this practice should be routinely discouraged in services due to the risks to the mother and the fetus, and it should be performed only in necessary situations⁽¹⁰⁾.

It was also observed that there was no association between the number of pregnancies and Apgar <7 at five minutes of life, however, it was noticed a high percentage of usual risk primigravidae who had children hospitalized in a neonatal unit, representing almost two thirds of the total (63.0%) of the study population. A study of maternal and neonatal complications in low-risk pregnancies found that the possibility of unexpected complications among low-risk pregnancies is more frequent in primiparous women (41.0% with at least one complication selected by the study) than in multiparous women (19.0% with at least one complication selected by the study)⁽⁴⁾. Primiparous women tend to have more complications at delivery, since labor/delivery is often more prolonged and more difficult than in multiparous women⁽⁹⁾.

Thus, even in pregnant women considered to be at usual risk at admission, it is suggested that special attention should be paid to primigravida/primiparous women in order to identify signs of change in labor/

delivery evolution, thus allowing early intervention and reduction of unfavorable outcome in this population.

This study has not indicated association between the Apgar score and the use of pharmacological analgesia. This finding was corroborated by a study comparing the use of epidural analgesia and the non-use of pharmacological analgesia in nulliparous women aged 18-35 years, gestational age ≥ 37 weeks and control group⁽¹²⁾.

The results also show that a high percentage of women were admitted to the maternity hospital after having sought another service, mostly having been referred through the bed central system. A survey on childbirth and delivery in Brazil revealed that 16.2% of the women sought another maternity hospital before admission for childbirth care. The main reasons cited were the absence of birth conditions and the lack of vacancy for the mother and/or the baby⁽¹³⁾. Despite the numerous advances in the obstetric area in recent years, there is still little articulation between primary and tertiary care, which makes it difficult to link the pregnant woman and the health system, as well as the planning of the demand for childbirth, which can lead to losses in the continuity of maternal and neonatal care.

As in this study, the literature shows a predominance of males in the admissions of newborns in the Neonatal Intensive Care Unit⁽⁸⁾. This was also corroborated by a study on the causes of hospitalization of children under five years of age, which showed a percentage above 60.0% of the male sex, besides indicating as main cause of hospitalization the respiratory system affections⁽¹⁴⁾.

The prevalence of 8.0% of low birth weight infants in this study was high, considering that only low-risk women were included, and birth weight <2,500g occurs mainly in high-risk pregnancies, such as those with gestational age <37 weeks and with restricted intrauterine growth⁽¹⁵⁾. Results of a study with a popu-

lation of 4,011,139 usual-risk infants showed a prevalence of 2.1% of low birth weight⁽⁴⁾. The fact that the sample of this study is hospital-based and performed with newborns admitted to a neonatal unit may have caused the high prevalence.

The present study showed a statistically significant association between the Apgar score <7 and the use of oxygen, a fact that occurred in 65.0% of the sample. The use of oxygen in the delivery room should be performed in a judicious and rational manner. The use of supplemental oxygen at high concentrations in newborns with gestational age ≥ 34 weeks may delay spontaneous breathing and increase mortality⁽¹⁶⁾. Considering that the population is characterized as at usual risk, it is possible to deduce the risk exposure when submitted to supplemental oxygen therapy. The practitioner's evaluation and attitude-taking at the time of birth, therefore, are crucial in the care of the newborn.

The results of this study indicated that 100.0% of the neonates who had Apgar <7 at the fifth minute were resuscitated in the delivery room. It is known that resuscitation interferes with the value attributed to Apgar between the first and fifth minutes of life. Thus, it is expected that the infant with low vitality in the first minute and who has been resuscitated presents Apgar ≥ 7 in the fifth minute. In contrast, the low value for Apgar should not be used alone to indicate neonatal resuscitation, although it is important to inform the general state of the newborn and the response to resuscitation⁽¹⁶⁻¹⁷⁾. Thus, the agility and the consistent action of the practitioner in the attribution of this score are important to measure the effectiveness of resuscitation in the delivery room.

The practical applicability of this study is in the construction of knowledge about maternal and child health surveillance. By knowing the profile of newborns of women with usual risk pregnancies, admitted in neonatal units, practitioners can anticipate possible unexpected events and take assertive actions in the management of this group to reduce damages and seek possible improvements in care.

Conclusion

The use of oxytocin, oxygen and resuscitation in the delivery room showed a significant association with Apgar <7 at five minutes of life. Birth weight, rupture membrane time, meconium clearance, type of delivery, and parity were not related to the low Apgar score.

Collaborations

Duarte ED contributed to project design and relevant critical review of intellectual content. Saraiva JP and Rocha JS contributed to the project design and writing of the article. Vogt SE and Simão DAS contributed to the relevant critical review of the intellectual content and approval of the final version to be published.

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