ORIGINAL ARTICLE

EVALUATION OF NEONATAL MORTALITY RISK IN THE CRIB SCORE APPLICATION

CARLA AMARAL VIEIRA[1], SANDRA MARCIA RAMOS PIMENTEL AFIUNE[1], DANIELA CARVALHO PORTAL[1], PATRÍCIA DE PAULA MIGUEL[1], TÁRIK KASSEM SAIDAH[2]

ABSTRACT

Introduction: In neonatology, several disease severity scores have been developed to predict the risk of mortality and morbidity in neonates. Among the scores based on physiological changes, some are simpler, with few variables and are fast to apply; others are more complete, as they include more variables, but take longer to be applied. The most studied and most used scoring systems in newborns are the Clinical Risk Index for Babies (CRIB) and the Neonatal Acute Physiology Score (SNAP). These scores were validated and reapplied in different studies in different ones. The neonatal scoring system CRIB (clinical risk index for babies) uses birth weight, gestational age, maximum and minimum fraction of inspired oxygen and maximum excess of base in the first 12 hours and presence of congenital malformations

Objective: To determine the mortality rate of newborns with CRIB variations.

Results: Of the 283 hospitalized newborns, 62 met the inclusion criteria. The analyzed cohort had an average birth weight of 834.84g and a range of 500 to 1415 g. The average gestational age was 27 weeks, ranging from 23.3 to 31 weeks. The average CRIB score was 6.8 and ranged from 1 to 14. 29 newborns (46.7%) died. The analyzed cohort had an average birth weight of 834.84g and a range of 500 to 1415 g. The average gestational age was 27 weeks, ranging from 23.3 to 31 weeks. The mean CRIB score was 6.8 and ranged from 1 to 14. 29 newborns (46.7%) died, and the mortality rate was observed more frequently in newborns weighing less than 751g at 999 grams, gestational age less than 28 weeks and CRIB score above 6 to 10. The survival rate was observed most frequently in newborns weighing less than 751g at 999 grams, gestational age less than 28 weeks and CRIB score above from 0 to 5. Conclusions: The mean CRIB score was 6.8 and the range was 1 to 14. 29 newborns (46.7%) died. The mortality rate was observed more frequently in newborns weighing less than 751g at 999 grams, gestational age less than 28 weeks and CRIB score above 6 to 10. The survival rate was observed more frequently in newborns weighing less than 751g to 999 grams, gestational age less than 28 weeks and CRIB score above 0 to 5.

INTRODUCTION

Neonatal mortality (0 to 27 days of life) has become the main component of infant mortality in proportional terms since the late 1980s, and currently represents between 60% and 70% of infant mortality in all regions of Brazil . The perinatal period begins at 22 complete weeks (or 154 days) of gestation and ends at seven complete days after birth, that is, from 0 to 6 days of life (early neonatal period). Total births include live births and fetal deaths. For the purpose of international comparison, WHO / ICD-10 uses the late fetal mortality rate, which considers fetuses above 28 weeks of gestation.

Neonatal mortality is also linked to preventable causes, related to access and use of health services, in addition to the quality of prenatal care, childbirth and the newborn, so it is important to know them[1].

In recent years, with advances and improvements in neonatal care, the chance of survival for these children has increased, but, consequently, the risk of complications, including retinopathy of prematurity, hearing problems, neural tube defects and increased bacteremia. Considering the importance of these diseases and the need for their prevention, an instrument to identify critically ill infants on admission to help the treatment

1 – Hospital e Maternidade Dona Iris
2 – Unievangélica

team is highly necessary. More than a decade ago, "clinical risk scoring systems for babies" - that is, CRIB and CRIBII were used to assess health status and predict mortality in babies admitted to neonatal intensive care units (NICU) [2].

In neonatology, several disease severity scores have been developed to predict the risk of mortality and morbidity in neonates. Among the scores based on physiological changes, some are simpler, with few variables and are fast to apply; others are more complete, as they include more variables, but take longer to be applied. The most studied and most used scoring systems in newborns are the Clinical Risk Index for Babies (CRIB) and the Score for Neonatal Acute Physiology (SNAP). These scores have been validated and reapplied in different studies in different countries[3,4].

The neonatal scoring system CRIB (clinical risk index for babies) uses birth weight, gestational age, maximum and minimum fraction of inspired oxygen and maximum excess of base in the first 12 hours and presence of congenital malformations[5].

This study aims to determine the mortality rate of newborns with variations in the CRIB.

METHODOLOGY

Cross-sectional quantitative and retrospective study. The research was carried out at Hospital e Maternidade Dona Iris. The hospital is part of the Municipal Health Network in Goiânia, specializing in humanized care in low, medium and high risk gynecology, obstetrics and neonatology and aims to develop health care for women and children, exclusively for users of the Unified Health System (SUS). Each variable of the CRIB score has a pre-determined numerical value that varies according to severity (Table 1), and after obtaining the summed values of these items, patients are classified into 4 degrees: grade 1 for scores from 0 to 5 (6.6%), grade 2 from 6 to 10 (46.2%), grade 3 from 11 to 15 (85.7%), and grade 4 for scores greater than 15 (100%). The CRIB score was applied in the first 12 hours of life, based on medical evolution, having recorded the extreme values of FiO2, which were used, and the highest BE value obtained by arterial blood gases. FiO2 was considered appropriate when necessary to maintain hemoglobin oxygen saturation between 90 and 96% by pulse oximeter (Table 1) [6].

Table 1 - CRIB score

Variable Score	
Birth weight (g)	
> 1.350	0
851-1.350	1
701-850	4
≤ 700	7
Gestational Age (weeks)	
> 24	0
≤ 24	1
Congenital malformation	
Absent	0
No immediate risk of life	1
At immediate risk of life	3
Maximum BE in the first 12 hours of life (mmol / l)	
> -7,0	0
-7,0 a -9,9	1
-10,0 a -14,9	2
≤ -15,0	3
Minimum appropriate FIO2 in the first 12 hours of life	
≤ 0,40	0
0,41-0,60	2
0,61-0,90	3
0,91-1,00	4
Maximum appropriate FIO2 in the first 12h of life	
≤ 0,40	0
0,41-0,80	1
0,81-0,90	3
0,91-1,00	5

Newborns admitted to the ICU with gestational age <31 weeks and birth weight less than 1500g were considered from July/2019 to July/2020. Newborns with a gestational age greater than 31 weeks and those who were referred from other hospital units for admission to the ICU of Maternidade Dona Íris were excluded from the research.

RESULTS

Of the 283 hospitalized newborns, 62 met the inclusion criteria. The analyzed cohort had an average birth weight of 834.84g and a range of 500 to 1415 g. The average gestational age was 27 weeks, ranging from 23.3 to 31 weeks. The average CRIB score was 6.8 and ranged from 1 to 14. 29 newborns (46.7%) died.

VARIABLES	SURVIVAL		DEATH
	N (33)	%	N (29)
CRIB			
0 to 5	23	70	5
6 to 10	6	18	13
11 to 15	4	12	11
>15	0	0	0

Table 1 - Distribution of CRIB in relation to death and survival of neonates admitted to the Intensive Care Unit, Goiânia, 2019-2020.

VARIABLES	SURVIVAL		DEATH
	N (33)	%	N (29)
Weight			
<750	5	15	10
751 to 999	18	55	18
1000 to 1500	10	30	1

Table 2 - Weight distribution in relation to death and survival of neonates admitted to the Intensive Care Unit, Goiânia, 2019-2020

VARIABLES	SURVIVAL		DEATH
	N (33)	%	N (29)
Gestational age			
22 to 28	27	82	22
29 to 39	6	18	7

Table 3 - Distribution of gestational age in relation to death and survival of neonates admitted to the Intensive Care Unit, Goiânia, 2019-2020.

DISCUSSION

Predicting the outcome of critical neonatal patients is still difficult. The multiple factors of maternal health status (infections, diabetes, etc.), the placental situation (premature rupture of the membranes), as well as the multiple factors of the baby (small for gestational age, low Apgar score, low birth infections, mechanical ventilation, hypoglycemia (hyperglycemia) make the treatment approach for each patient and the outcome uncertain, several approaches and scales are developed to assess the risk of mortality in these very complicated situations.[7] We use the CRIB-II scale to assess the risk of mortality in 62 patients who gave birth in a large tertiary hospital with more than 4,000 births annually.

The analyzed cohort had an average birth weight of 834.84g and a range of 500 to 1415 g. The average gestational age was 27 weeks, ranging from 23.3 to 31 weeks. The average CRIB score was 6.8 and ranged from 1 to 14. 29 newborns (46.7%) died.

The mortality rate was observed more frequently in newborns weighing between 751g and 999 grams, gestational age between 22 to 28 weeks and CRIB score above 6 to 10.

The survival rate was observed more frequently in newborns weighing between 751g and 999 grams, gestational age between 22 to 28 weeks and CRIB score above 0 to 5.

Zardo and Procianoy (2003) evaluated 494 newborns admitted to a neonatal intensive care unit (NICU) of a general hospital in Porto Alegre, RS, shortly after birth, between March 1997 and June 1998, 44 died (8.9% mortality). Of the 102 newborns weighing up to 1,500 g, 32 (31.3%) died[8].

Brito et al. (2003) evaluated 284 newborns. The average birth weight was 1,148 ± 248 g (median = 1,180 g); the mean gestational age was 30.2 ± 2.4 weeks (median = 30.0) and the mean CRIB was 3.8 ± 4.4 (median = 2.0). Neonatal mortality was 23.2%, differing according

to weight <750 g (72.7%), GA<29 weeks (57.1%) and CRIB>10 (79.4%) concluding that newborns with weight birth <750 g, gestational age <29 weeks and CRIB score> 10 had higher mortality rates[4].

Breuel and Segre (2007) studied 71 cases and the average gestational age was 27.30 ± 2.61 weeks; average weight 1,032.61 ± 280.62 g[9].

Najeeb et al., (2020) included 254 newborns with birth weight between 500-1500 grams and gestational age less than 35 weeks. The CRIB score was calculated in all neonates, 54.3% (n = 138) patients were male and 45.7% (n = 116) female. The mean gestational age was 33.3 weeks ± 1.04 SD and the average birth weight of the study population was 1129.9 grams ± 210.6 SD. The average CRIB score among the study population was 6.3 ± 3.1 SD and the overall mortality was 54.7% (n = 139). The average CRIB score found was 8.27 ± 2.1 SD between the mortality group and 3.87 ± 3.4 SD among the newborns who were discharged (p <0.05). Mortality was present in 4.3% (n = 4) of neonates with CRIB scores between 1 to 5, 87.1% (n = 121) who had CRIB scores between 6 to 10 and 100% (n = 14) of neonates with CRIB score level 11-15 (p <0.05), therefore, a significantly higher mortality percentage was observed among neonates with higher CRIB scores different from the research where this index showed an increase between CRIB level 6-10 with 45% [10].

Marete and Otieno (2011) carried out a research at the Kenyatta National Hospital (KNH) with a total sample of 135 babies with low birth weight who were followed from admission to discharge, 28th day of life or death, whichever came first. Birth weight ranged from 600 to 2,500 g, with a median of 1600 g. The total CRIB score ranged from 1-15, with a median of 5.5. Gestational age ranged from 26 to 38 weeks. Total mortality was 45.9% [11].

Ezz-Eldin et al., (2015) in research at the pediatric tertiary hospital Kasr El-Aini, Cairo, Egypt studied through a prospective cohort 113 neonates, admitted in the first 24 hours to the NICU from November 2013 to May 2014, gestational age ranged from 25-32 weeks, birth weight ranged from 700-1500 g with an average of 1134.5 (± 202). The CRIB score ranged from 1-19 with a mean of 9.9 (± 4.0). The total mortality in the included cohort was 34.5% (31/113), considering the CRIB score as a valid initial risk assessment tool, predicting the result more accurately than birth weight or gestational age alone, which is easy to apply and should replace traditional models as a predictor of neonatal outcome[12].

CRIB provides a recalibrated and simplified scoring system that avoids the potential problems of early treatment bias. A valid and simple risk adjustment method for neonatal intensive care is important to ensure an accurate assessment of the quality of care. During this study, it was found that the CRIB score was easy to apply. It was a practical score, as it used variables that

were part of the routine of care for premature newborns, being obtained quickly. Due to its simplicity, the CRIB score was also considered to be easy to reproduce, giving no scope for interpretation errors due to individual subjectivity[6,13].

CONCLUSION

The average CRIB score was 6.8 and ranged from 1 to 14. 29 newborns (46.7%) died.

The mortality rate was observed more frequently in newborns weighing between 751g and 999 grams, gestational age between 22 to 28 weeks and CRIB score above 6 to 10.

The survival rate was observed more frequently in newborns weighing between 751g and 999 grams, gestational age between 22 to 28 weeks and CRIB score above 0 to 5.

REFERENCES

1. Brasil. Ministério da Saúde (BR). Manual de vigilância do óbito infantil e fetal e do comitê de prevenção do óbito infantil e fetal. Brasília (DF): Ministério da Saúde; 2009.
2. Motlagh AJ. et al. Evaluation of Clinical Risk Index for Babies to Predict Mortality and Morbidity in Neonates Admitted to Neonatal Intensive Care Unit. Electron J Gen Med, 2020; 17(5).
3. Jašić M et al. CRIB II score versus gestational age and birth weight in preterm infant mortality prediction: who will win the bet? Signa Vitae, 2016;11(1):172-81.
4. Brito AS, Matsuo T, Gonzalez MR, de Carvalho AB, Ferrari LS. Escore CRIB, peso ao nascer e idade gestacional na avaliação do risco de mortalidade neonatal [CRIB score, birth weight and gestational age in neonatal mortality risk evaluation]. Rev Saude Publica. 2003 Oct;37(5):597-602.
5. The CRIB (clinical risk index for babies) score: a tool for assessing initial neonatal risk and comparing performance of neonatal intensive care units. The International Neonatal Network. Lancet. 1993 Jul 24;342(8865):193-8. Erratum in: Lancet 1993 Sep 4;342(8871):626.
6. Sarquis ALF, Miyaki M, Cat MNL. Aplicação do escore CRIB para avaliar o risco de mortalidade neonatal. J. Pediatr. (Rio J.), 2002;78(3):225-229.
7. Stomnaroska O, Danilovski D. The CRIB II (Clinical Risk Index for Babies II) Score in Prediction of Neonatal Mortality. Pril (Makedon Akad Nauk Umet Odd Med Nauki). 2020 Dec 8;41(3):59-64.
8. Zardo MS, Procianoy R S. Comparação entre diferentes escores de risco de mortalidade em unidade de tratamento intensivo neonatal. Rev Saúde Pública, 2003; 37(5):591-6.
9. Breuel PA, Segre CAM. Avaliação do índice de risco clínico em recém-nascidos de muito baixo peso em maternidade pública terciária da cidade de São Paulo. Einstein, 2007;5(4):326-332.
10. Najeeb S, Ejaz E, Raza MA, Sarwar S, Gillani S, Afridi RU, Ali H, Khan IM. Importance Of Clinical Risk Index For Babies Score For Predicting Mortality Among Neonates. J Ayub Med Coll Abbottabad. 2020 Oct-Dec;32(4):502-506.
11. Marete IK, Wasunna AO, Otieno PA. Clinical risk index for babies (CRIB) II score as a predictor of neonatal mortality among low birth weight babies at Kenyatta National Hospital. East Afr Med J. 2011 Jan;88(1):18-23.
12. Ezz-Eldin ZM, Hamid TA, Youssef MR, Nabil Hel-D. Clinical Risk Index for Babies (CRIB II) Scoring System in Prediction of Mortality in Premature Babies. J Clin Diagn Res. 2015 Jun;9(6):SC08-11.
13. Parry G, Tucker J, Tarnow-Mordi W; UK Neonatal Staffing Study Collaborative Group. CRIB II: an update of the clinical risk index for babies score. Lancet. 2003 May 24;361(9371):1789-91.