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ORIGINAL ARTICLE

Validity of Clinical Risk Index for Babies (CRIB) Score in Predicting the Neonatal Mortality

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ABSTRACT

Objective: To determine the validity of Clinical Risk Index for Babies (CRIB) score in predicting the neonatal mortality in very preterm neonates.

Methodology: The 145 patients enrolled in this study were registered from NICU of Children Hosp, Lahore, they were preterm neonates with gestational age of ≤ 32 weeks. We determined six parameters of CRIB score; gestational age, birth weight, any congenital malformation, minimum and maximum FiO2 requirementduring 1st 12 hours of life and maximum base excess during 1st 12 hours of life. All parameters were recorded and assigned an individual score base upon CRIB scoring chart. Total CRIB score was determined by adding individual score of each parameter. We reviewed thebabiesdaily in NICU till discharge or death.

Results: Out of 145 patients, 52.4%(n=76)male and female were 47.59%(n=69). Congenital malformations were present in 6.21% (n=9), mortality in 36.55%(n=53). Mean gestational age was 29.90±1.70weeks, mean birth weight1147.52±190.21grams, mean maximum base excess during first 12h of life-8.04±3.92mmol/L, mean minimum appropriate FiO2 in first 12h34.38±13.02 %, mean maximum appropriate FiO2 in first 12h69.17±21.11 % and mean CRIB Score was 4.63±3.67. AUR curve was 0.816 and std. error was recorded as =0.039;p=0.000.

Conclusion: Mortality in very preterm neonates can be accurately predicted by using CRIB score.

Keywords: Very Preterm Babies, Neonatal Mortality, CRIB Score, Validity

INTRODUCTION

Preterm deliveries and neonates are at higher risk of developing severe morbidity and mortality worldwide especially in low income countries[1,2]. Similarly,very low birth weight neonates are considered high risk population for mortality in first 28 days of life particularly in the low and middle income countries[3]. It is established fact that prematurity and low birth weight(LBW) are high risk variables for neonatal mortality[4,5]. Preterm birth rate varies significantlyaround the globe; it has been estimated that rate of preterm birth in Europe is 5% whilein Africa it has been estimated to be around 18.2% [6]. Pakistan is at the 4th place among the top ten countries with highest preterm birth rate[7].

Since prematurity and very low birth weight are associated with high neonatal mortality, early determination of risk assessment and prediction of prognosis based upon gestational age and birth weight would help clinicians to intervene and decide for further management plan[8,9]. In adult and pediatric intensive care units, prognostic scoring systems have been used for risk assessment and to predict outcomes of patients admitted in intensive care units.Very few such prognostic scores have been developed for NICUs. Role of birthweight is an important measure for evaluation of neonatal risk on initial level however, it alone neglects other factors that may contribute to initial disease severity.Prognostic Scores not only provides initial risk assessment and predict outcome but also allow comparison of performance among different hospital settings by adjusting differences in initial risks. However, validity of a prognostic score is very difficult to test in a high-risk population of neonates admitted in NICU.Moreover, it takes significant long time before it can be applied clinically.A prognostic score is developed, validated, and applied in three stages. First, it is developed by examining clinical data retrospectively, then its validity is checked in similar cohort groups. Lasty, it is applied in clinical settings where it may show poorer performance.CRIB score was published in 1993 by the international neonatal network after its initial validation. It includes six variables that are collected in first 12 hours of life[10,11] Pregnancy and birth weight are among the two of these factors, as well as the maximum and lowest proportion of inspired oxygen during the first 12 hours as well as a presence of congenital abnormalities.

Since its origin, CRIB score has been validated all around the world over time until recently[9,11,12]. However, before applying a prognostic score clinically in a local population, its validity must be checkedbecause differences has been reported in different populations. These differences can be explained by local mortality rate and its contributing factors. Moreover, with advancement in NICUs and treatment like surfactant therapy has decreased the overall mortality rate in NICUs over time and hence the predicting ability of a prognostic score may be changed with change of mortality rate. So,it is logical to test the validity of prognostic score over time especially when new treatment modalities have been adopted that may alter the mortality rate.

The Children's Hospital and Institute of Child Health, Lahore is unique in the sense that it is one the largest children's hospitals of Pakistan but ithas no Obstetric Unit and all neonates are either home delivered or referred from other hospitals. Rationale of this study was to check the validity of CRIB score in this unique setting.

METHODOLOGY

A total of 145 cases of preterm neonates were enrolled with gestational age of 23 to 32 weeks, admitted in NICU within first 12 hours of their birth. Whereas all preterm neonates with Birth weight <500 grams, Admission after 12 hours of birth, died in first 12h of life and surgical emergencieswere excluded from the study. After informed consent obstetric history was taken to determine the gestational age from the first day of the last menstrual period (LMP). Gestational age was determined using New Ballard scoring chart in case of undefined LMP. Weight was calculated in grams using an electronic scale. Minimum and maximum FiO2 requirement and maximum base excess during firsttwelve hours of life was noted. CRIB score calculated by collected data. The babies were reviewed daily in NICU thereafter until discharge or death.

RESULTS

Out of 145 patients, 52.4%(n=76)male and female were 47.59%(n=69). Congenital malformations were present in 6.21% (n=9). Mortality in 36.55%(n=53)(Table No.1). Mean gestational age was 29.90±1.70weeks, mean birth weight1147.52±190.21grams, mean maximum base excess during

first 12h of life-8.04±3.92mmol/L, mean minimum appropriate FiO2 in first 12h34.38±13.02 %, mean maximum appropriate FiO2 in first 12h69.17±21.11 % and mean CRIB Score was 4.63±3.67 (Table No. 2). On (ROC) curve, area under the curve (AUC) was 0.816 (std. error =0.039; p value =0.000).

Table 1: Frequency Distribution

	Frequency	Percent
Male	76	52.41
Female	69	47.59
Total	145	100.00
Congenital malformation	9	6.21
No Congenital malformation	136	93.79
Total	145	100.0
Actual Mortality	53	36.55
Actual No Mortality	92	63.45
Total	145	100.00

Table 2: Descriptive Statistics

	Minimum	Maximum	Mean	Std. Deviation
GestationAge (weeks)	26	32	29.90	1.70
Weight (g)	700	1450	1171.31	192.16
Maximum Base Excess during first 12h of life (mmol/l)	-20	8	-8.04	3.92
Minimum Appropriate FiO2 in first 12h (%)	21	60	34.38	13.02
Maximum Appropriate FiO2 in first 12h (%)	40	100	69.17	21.11
CRIB Score	0	14	4.63	3.67

DISCUSSION

Clinical risk index for babies (CRIB) scoreis simple clinical score to predict neonatal mortality depending upon 6 simple parameters collected in first 12h of life. It was first published by international neonatal network in 1993 after its initially validations. Since then, it has been validated in different populations worldwide. However, with medical advancements in NICU and improved level of care, mortality rate has significantly decreased in recent days compared to those when CRIB score was first developed. We performed this study in our local population to check the validity of CRIB score.

In our study, 52.4%(n=76)male and female were 47.59%(n=69) with 36.55% mortality. Mean gestational age was 29.90±1.70weeks, mean birth weight1147.52±190.21grams, mean maximum base excess during first 12h of life-8.04±3.92mmol/L, mean minimum appropriate FiO2 in first 12h34.38±13.02 %, mean maximum appropriate FiO2 in first 12h69.17±21.11 % and mean CRIB Score was 4.63±3.67. On (ROC) curve, area under the curve (AUC) was 0.816 (std.error=0.039; p0.000).

Our data is close with international neonatal network[11] that published score first time after its initial validations. On ROC curve, area under the curve was 0.90(std. error =0.04; p value =0.03)with CRIB. While for birthweight it was 0.78 indicating that CRIB score was better than birthweight in predicting mortality. In our study, Area under the ROC curve was 0.816 (std. error =0.039; p value =0.000) that accords with this earlier study. Another study, published in 2002[12], described gender distribution as 55%(n=55) females and 45% (n=45) males, mean birthweight was 1,078 ±0.277g and mean gestational age was 29.2 ± 2.8 weeks. AUR was 0.877.Except gender distribution, results were consistent with our study.

Recently a local study[9] showed gender distribution in consistent with our study i.e. 54.3% for male subjects and 45.7% for female participants. Their g.age was 33.3±1.07 weeks that is higher than our study. Mean birthweight of 1129.9 ± 210.6 grams almost similar to our study. Mean CRIB score was 6.3 ± 3.1 higher than our study. Overall mortality was found to be 54.7% compared to 36.55% in our study. This difference in mortality rate can be explained by difference of patient management. In another study[15], mean birthweight was 1,148±248g and mean CRIB scorewas 3.8±4.4 with 23.2% mortality rate. AUR curve for CRIBscore, birth weight andgestational age were 0.88, 0.76 and 0.81 respectively.The optimal cut offpoint based on the ROC curve for the CRIB score was 4. Our study is having almost similar mean birthweight and area under the ROC curve. However, we found that in our population optimal cut off point would be 5 (Table No.3).Mortality rate was higher in our study.CRIB score is better than both gestational age and birthweight in predicting neonatal mortality[13,14]. CRIB, on the other hand, has been shown to be superior to birth weight and gestational age alone clarified by Lago et al[15].

Table 3: Coordinates of the Curve

Cut off	Sensitivity	1 - Specificity
-1.00	1.000	1.000
.50	1.000	.859
1.50	1.000	.804
2.50	.792	.478
3.50	.774	.380
4.50	.717	.207
5.50	.717	.152
6.50	.566	.076
7.50	.472	.022
8.50	.377	.011
9.50	.321	.011
10.50	.302	.011
11.50	.170	.011
12.50	.113	.000
13.50	.075	.000
15.00	.019	.000

In summary, CRIB score provides a quantitative index ofinitial neonatalrisk and is a useful tool in predicting risk of mortality.However, we would strongly discourage its use as a justification for withdrawing intensive care in an individual severely ill infant. Our study had some limitations as well. It was a single center study having no Obstetric Unit so our findings cannot be generalized. We recommend to check local validation before applying in clinical practice.

CONCLUSION

Mortality in very preterm neonates can be accurately predicted by using CRIB score.

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