Original Article
DOI: https://doi.org/10.70749/ijbr.v3i5.2955

INDUS JOURNAL OF BIOSCIENCE RESEARCH
https://ijbr.com.pk
ISSN: 2960-2793/ 2960-2807

Diagnostic Accuracy of CRIB II Scoring in Predicting Neonatal Mortality in Preterm Neonates

Muhammad Matiullah[1], Amina Mobeen[1], Eisha Khalid[1], Roshaan Bashir[2], Amna Masood[3], Muhammad Sohaib[4]

[1]Department of Pediatric Medicine / Neonatology, Federal Government Polyclinic Hospital, Islamabad, Pakistan.
[2]Department of Pediatrics, Al-Nafees Medical College & Hospital, Isra University, Islamabad Campus, Pakistan.
[3]Department of Pediatric Medicine, Combined Military Hospital (CMH), Lahore, Punjab, Pakistan.
[4]Department of Pediatrics, Federal Government Polyclinic Hospital, Islamabad / Children Hospital, Lahore, Punjab, Pakistan.

ARTICLE INFO

Keywords: CRIB II Score, Neonatal Mortality, Preterm Neonates, Diagnostic Accuracy, NICU.

Correspondence to: Muhammad Matiullah,
Department of Pediatric Medicine, Federal Government Polyclinic Hospital, Islamabad, Pakistan.
Email: matiullahawan96@gmail.com

Declaration
Authors' Contribution
All authors equally contributed to the study and approved the final manuscript

Conflict of Interest: No conflict of interest.

Funding: No funding received by the authors.

Article History
Received: 04-03-2025 Revised: 16-05-2025
Accepted: 23-05-2025 Published: 30-05-2025

ABSTRACT

Background: Preterm birth remains one of the leading causes of infant mortality in the world and mostly in settings where resources are limited. High-risk infants need to be identified at an early age to be intervened upon and achieve improved outcomes. One of the most common and easy to use ways of predicting the early death of preterm babies is the Clinical Risk Index of Babies II (CRIB II) score. **Objective:** The objective of the study is to determine the predictive value of CRIB II grading system in predicting the newborn mortality in preterm babies. **Methods:** This prospective observational cohort study was conducted in a tertiary care NICU. There were 120 preterm neonates (≤32 weeks gestation) who were hospitalized in less than 24 hours. CRIB II scores were created using gestational age, birth weight, sex, admission temperature and base excess. Babies were kept track of until they got away or died. Diagnostic accuracy was evaluated by the receiver operating characteristic (ROC) curve analysis that entails sensitivity, specificity, and the area under the curve (AUC). **Findings:** 31.7% of people died. The mean CRIB II score (10.2 +- 2.1 vs. 5.8 +- 1.9, $p < 0.001$) of the non-survivors was significantly higher than that of the survivors. The CRIB II score had good predictive ability with an AUC of 0.86 (95% CI: 0.79-0.92). The cut-off value of >7 gave a sensitivity of 73.7% and specificity of 85.4%. **Conclusion:** The routine use of CRIB II in NICU settings for early risk stratification is supported by the tool's strong diagnostic accuracy and dependability in predicting neonatal mortality in preterm neonates.

INTRODUCTION

Preterm birth being the leading cause of infant mortality in the world has remained a major health concern in countries around the world given that it contributes about one million deaths each year.[1] Although neonatal intensive care is improved and neonatal units have high levels of morbidity and mortality, preterm infants continue to face high levels of morbidity and mortality, in particular, in low- and middle-income countries (LMICs) where such specialized care is limited.[2,3] Therefore, timely identification of the high-risk infants is extremely important to guide timely therapies, optimize resources and improve their survival rates.

To address this need, many neonatal risk scoring systems have been developed to predict death and adverse outcomes. Due to the convenience of operation, reliability, and timeliness, the Clinical Risk Index for Babies II (CRIB II) score has been universally adopted.[4] The CRIB II score is composed of five easily obtained clinical parameters namely gestational age, birth weight, sex, entrance temperature, and base excess. Unlike the old systems of scoring, CRIB II offers a more objective assessment of the severity of illness immediately after delivery by omitting those factors that are influenced by treatment interventions.[5]

Recent data shows that CRIB II has good to excellent prediction accuracy with reported area under the receiver operating characteristic (ROC) curve (AUC) values of 0.79 to 0.96 across a number of different populations.[6-8] Also, comparative studies have revealed that CRIB II, particularly in infants with very low birth weight and extremely preterm, is as effective (or more so) than other scoring systems such as the Score for Neonatal Acute Physiology II (SNAP-II) and SNAPPE-II.[9] It should be locally validated, however, because variations in its predictive capability have been observed according to clinical practices, healthcare settings, and population issues.[10]

The simple and clear scoring system such as CRIB II is particularly useful in the low-resource setting when the complex diagnostic tools may be unavailable easily. It assists in clinical decision-making, early risk classification and prognosis counseling to families. Therefore, the aim of the study would be to determine the effectiveness of the CRIB II scoring system in the prediction of infant death among preemies in the tertiary care unit.

METHODOLOGY

The study was a prospective observational cohort study that will be conducted in the Neonatal Intensive Care Unit (NICU) of the pediatrics department of Federal Government Polyclinic Hospital Islamabad between August 29, 2024 and February 28, 2025. The sample size was calculated using a standard formula of testing diagnostic tests according to a perceived sensitivity: The lowest sample size was also calculated to be approximately 49 neonates assuming an expected sensitivity of 85% with the CRIB II score according to previous literature and a tolerance of 10%. Nevertheless, the sample size was increased to 100-120 neonates to increase the power of the study, increase the reliability, and consider possible variation. This methodology complies with the existing research methodological principles which specify that a research on diagnostic accuracy requires a large enough sample size in order to give valid sensitivity and specificity values.[11]

The study included preterm babies that had been hospitalized in the first 24 hours of life and those with a gestational age below 32 weeks old. This research did not involve newborns with serious congenital abnormalities, chromosomal anomalies or lack of clinical data. Parents or legal guardians gave informed written consent before enrollment and the institutional review board approved the ethical approval.

At admission, clinical and laboratory parameters which were required to compute the Clinical Risk Index of Babies II (CRIB II) score were taken. These were the temperature of admission (o C), sex, birth weight (gms), gestational age (in completed weeks), and base excess (mmol/l) as measured by the arterial blood gas analysis. The CRIB II score was calculated at the first hour of entrance into the NICU by using the known criteria. The primary outcome measure was in-hospital newborn mortality and all the neonates who were enrolled were followed up with the same until they are discharged or die.

The analysis of the data was performed using the Statistical Package of the Social Sciences (SPSS) version 25.0. The frequencies and percentages illustrating the categorical variables, while the mean and the standard deviation illustrating the continuous variables were presented respectively. The diagnostic accuracy of CRIB II score was assessed by receiver operating characteristic (ROC) curves analysis. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were calculated at various cut-off values. The area under the ROC curve (AUC) was used to measure the discriminative power of the scoring system. The p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 120 preterm infants that met the inclusion criteria were used in the study. The mean weight at birth was 1100 ± 200 grams, and the mean gestational age was 29 2 weeks. 82 (68.3%) of the study population survived to the discharge date, 38 (31.7%) died. (Table I).

Mean CRIB II score among non-survivors (10.2 ± 2.1) was significantly higher than that of survivors (5.8 ± 1.9), which implies that there is a strong relationship between mortality and increasing CRIB II scores ($p < 0.001$). Also, non-survivors had low admission temperatures, larger base deficits, less gestational age, and lower birth weights than survivors.

The mortality increased continuously with increased scores when stratified by the categories of CRIB II scores. The likelihood of death was extremely high among neonates with CRIB II score of 11 or higher, but was very low among those with a CRIB II score of 5 or lower.

Diagnostic CRIB II score predicts infants mortality, which when analyzed using Receiver Operating Characteristic (ROC) curve, analyzes the diagnostic accuracy. The area under the curve (AUC) was the measure of good discriminative capacity and was 0.86% (95% CI: 0.79). The CRIB II score was found to have a sensitivity of 73.7%, specificity of 85.4%, positive predictive value (PPV) of 70.0% and negative predictive value (NPV) of 87.8% at an ideal cut off score of >7. (Table II)

Specificity was also greater and sensitivity reduced with larger cut-offs (>11) suggesting larger cut-offs are more useful in confirming high-risk cases and lower cut-offs are more useful in screening. The diagnostic efficiency of the CRIB II score in the prediction of neonatal death is presented by the ROC curve. There is a high level of discriminative capacity in the curve since it is in good position above the reference diagonal line. The CRIB II score is a good predictor of the presence or absence of survival with an area under the curve (AUC) of approximately 0.86 indicating that it has good predictive ability.

Table I

Baseline Characteristics of Study Population (n=120)

Variable	Survivors (n=82)	Non-survivors (n=38)	p-value
Gestational age (weeks)	30.1 ± 1.5	27.5 ± 1.8	<0.001
Birth weight (g)	1200 ± 180	900 ± 150	<0.001
Male sex (%)	48 (58.5%)	24 (63.2%)	0.62
Admission temperature (°C)	36.5 ± 0.5	35.8 ± 0.6	<0.001
Base excess (mmol/L)	-4.2 ± 2.1	-8.5 ± 2.8	<0.001
CRIB II score	5.8 ± 1.9	10.2 ± 2.1	<0.001

Table II

Diagnostic Performance of CRIB II Score

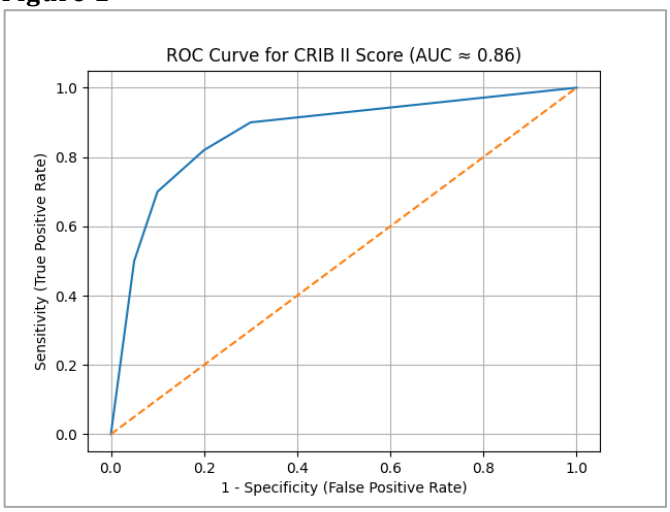
Cut-off Value	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
>7	73.7	85.4	70.0	87.8
≥9	84.2	78.0	65.3	90.1
≥11	92.1	68.3	60.3	94.5

Table III

ROC Curve Analysis

Parameter	Value
AUC	0.86
95% Confidence Interval	0.79 – 0.92
Standard Error	0.03
p-value	<0.001

Figure 1



DISCUSSION

The current research proved that the CRIB II score is a good diagnostic tool in predicting neonatal mortality in preterm babies, with an AUC of 0.86 (95% CI: 0.79-0.92). When the cut-off value was set at the optimal level of >7, the sensitivity of the score was 73.7% and specificity of 85.4% and the score was able to correctly identify and differentiate high-risk and low-risk neonates. These findings are correlated with the growing body of literature that suggests that CRIB II is an effective and reliable instrument to forecast early mortality in the neonatal critical care units.

The meta-analysis and systematic review by van Beek et al. highlighted a variety of studies on prognostic models in preterm neonates with regard to performance; furthermore, CRIB II has been one of the most clinical applicable tools because of its simplicity and the early accessibility of variables required.[12] Equally, Chellani and Arya emphasized that CRIB II remains very popular in the practice of neonatal, particularly in the resource-deprived context, since it provides a means of a quick bedside evaluation without the need to carry out complicated tests.[13] Such results justify the applicability of our results, especially when it comes to setting the risk hierarchy in such a way that it is timely.

Our estimated AUC of 0.86 is very similar to several other recent cohort studies. The study by Madabhushi et al. indicated an AUC of 0.909, which is excellent in predicting mortality as well as morbidity in preterm babies, and the study concluded that CRIB II is better than SNAP-II in the prediction of deaths and morbidity in preemies.[14] Vardhelli et al. in another prospective multicentric study have noted that CRIB-II had an AUC of 0.795 which is marginally less than our results although still within the acceptable range of clinical prediction tools.[15] The difference between studies can be explained by the differences in patient populations, inclusion criteria, and settings.

The 2023 network meta-analysis by Zeng et al. compared various neonatal scoring systems, and based on the results, original CRIB score was the highest-ranked mortality predictor in some studies, but CRIB II was one of the most reliable and validated instruments.[16] Equally, Zhang et al. came up with a new predictive algorithm of extremely preterm patients, but the performance of this algorithm did not significantly improve over known scores such as CRIB II, which supports the clinical relevance of CRIB II to this day.[17]

Our results can be also compared to some recent articles published in 2024 and 2025. The AUC of 0.622 described by Kumar et al. has a lower relative value and indicates moderately predictive ability, which is not the same as ours.[18] This variation could be attributed to the variation in study design, severity of illnesses among the included neonates or sample size. Hao et al., on the other hand, found the AUC of CRIB II of 0.79, which presented decent predictive performance but lower than the more recent scores such as nSOFA.[19] These scores demonstrate that CRIB II remains a powerful and reliable predictor despite the appearance of newer scoring systems.

In the case of CRIB II only, Alshafei et al. achieved a value of 0.85 (95% CI: 0.79-0.91), which is almost similar to our finding of 0.86.[20] They further found that CRIB II in combination with other biomarkers enhanced prediction accuracy, which indicated that CRIB II may be used as a potent baseline method that could be enhanced with complementary parameters. In a recent systematic review and meta-analysis, Veloso et al. found out that SNAPPE-II can be slightly more accurate in pooled application, but CRIB II is still one of the practical and most widespread scoring systems because of its simplicity and timely application in some circumstances.[21]

Bayen et al. reported that CRIB II has an AUC of 0.862 (95% CI: 0.745-0.939), nearly the same value as ours, and that also indicates the consistency of CRIB II in the performance across various populations.[22] This standardization confirms the hypothesis that CRIB II is a good instrument of mortality prediction despite geographic or clinical heterogeneity.

Other studies have also indicated a higher accuracy of a diagnosis as compared to our study. According to Awan et al., the AUC was 0.962 (95% CI: 0.933-0.990), and it is excellent predictive performance.[23] They also had a better sensitivity of 98.8 but the specificity was slightly lower as compared to our study. On the same note, Akhila et al. also applied an AUC of 0.91, sensitivity and specificity of 85.2% and 96.4, respectively.[24] These increased rates could be due to differences in patient selection, including inclusion of very premature born infants or more at risk groups.

Ozalkaya et al. also had a similar AUC of 0.86 as us with sensitivity and specificity of 79% and 82, respectively.[25] Their research also emphasized the fact that CRIB II is effective even when compared to newer scoring systems that also use cardiovascular parameters. Moreover, Lubis et al. showed that CRIB II retained high predictive validity (AUC 0.835) in neonates with sepsis and indicates that its use is not limited to the general NICU population but to a high-risk sub-population.[26]

The difference in the sensitivity and specificity across studies may be due to variations in the cut-off values to score CRIB II. A cut-off of more than 7 gave the best compromise of sensitivity and specificity in our study. Other studies, however, have employed cut-offs higher (e.g., >10 or >12), which are more likely to make a study more specific but less sensitive.[23-26] This shows the

significance of establishing the right cut-off values, according to the clinical goals- either this is aimed at early screening or risk total identification.

Another noteworthy point is that CRIB II uses the parameters, which can be obtained during the initial few hours of life, and therefore, it is especially effective when it comes to making decisions during the initial stages. Unlike the more complex scoring systems that require extensive research in the laboratory, CRIB II is easy to implement in settings with limited resources. This is of great relevance in developing countries, where access to the advanced diagnostic methods might be limited in time.

In spite of the appearance of more recent scoring systems like nSOFA, the recent research indicates that CRIB II can be considered very competitive in terms of its predictive performance.[19] It is a handy tool when working in the regular clinical setting due to its simplicity, easy calculation, and applicability in the early stages. Adding CRIB II to other biomarkers or other clinical factors, however, could contribute to further predictive accuracy, as some studies demonstrate.[20]

Altogether, the results of the given study comply with the recent literature and supports the idea that CRIB II is a valid predictor of neonatal death among preterm infants. Although there are differences in the performance of various studies, the general evidence is in favor of its further application in NICUs to stratify risks early and make a clinical decision.

Limitations

In the assessment of the results, the numerous limitations of this study should be considered. As a single-centre study, the findings might not be generalizable in other health care settings with a diverse patient population, clinical practice, and resource availability. The sample size used was relatively small and could not have provided enough statistical power and accuracy to the estimated measures of diagnostic accuracy. Also, the selection bias in the study could be caused by the inclusion of NICU-admitted preterm neonates as not all preterm births are included in this group, especially those that are not handled in tertiary care institutions. The research also failed to compare the CRIB II scoring with newer or emerging scoring systems like nSOFA that could give more information on relative performance. Moreover, it was restricted to in-hospital mortality as the outcome assessment did not cover the long-term outcomes, including neurodevelopmental status. Finally, there might have been measurement variability in the measurement of clinical parameters, specifically the admission temperature and base excess which could have affected the calculated CRIB II scores and the overall accuracy of the results.

CONCLUSION

CRIB II score has good discriminative ability, bedside practicability, and diagnostic accuracy in newborn death among preterm newborns. It can also be helpful in risk stratification of NICUs, particularly low-resource settings, since it is based on simple, early, and readily available clinical information. The findings confirm the frequent use of CRIB II to identify high-risk infants at an early stage to provide timely interventions and improve clinical judgments.

Suggestions

It is recommended, based on the findings of the present study, that CRIB II score should be regularly used in NICU to take early risks in preemies due to the fact that this is a simple tool that is reliable and can be used even during the first few hours of their life. To be able to improve survival rates, clinicians are to apply CRIB II to detect high-risk newborns as soon as possible and prioritize intensive monitoring and immediate treatments. It is suggested that larger and multicentric researches should be established in future to validate these findings and enhance external validity. Comparative studies with more more current scoring systems such as nSOFA are also recommended to find out the best predictive models. The future research must examine how it is possible to consider combining CRIB II with other biomarkers or other clinical factors in order to enhance its prediction power.

REFERENCES

1. Chawanpaiboon, S., Vogel, J. P., Moller, A.-B., Lumbiganon, P., Petzold, M., Hogan, D., Landoulsi, S., Jampathong, N., Kongwattanakul, K., Laopaiboon, M., Lewis, C., Rattanakanokchai, S., Teng, D. N., Thinkhamrop, J., Watananirun, K., Zhang, J., Zhou, W., & Gülmezoglu, A. M. (2019). Global, regional, and national estimates of levels of preterm birth in 2014: a systematic review and modelling analysis. *The Lancet Global Health*, *7*(1), e37–e46. https://doi.org/10.1016/s2214-109x(18)30451-0
2. Liu L, Oza S, Hogan D, Chu Y, Perin J, Zhu J, et al. Global causes of neonatal mortality. Lancet. 2021;398(10299):946–958. doi:10.1016/S0140-6736(21)01221-0
3. Seale AC, Blencowe H, Manu AA, Nair H, Bahl R, Qazi SA, et al. Estimates of neonatal mortality. Lancet Glob Health. 2020;8(1):e45–e54. doi:10.1016/S2214-109X(19)30434-3
4. Parry G, Tucker J, Tarnow-Mordi W. CRIB II score development. Arch Dis Child Fetal Neonatal Ed. 2003;88:F489–F494. doi:10.1136/fn.88.6.F489
5. Dorling JS, Field DJ, Manktelow B. Neonatal risk scoring systems. Arch Dis Child Fetal Neonatal Ed. 2020;105(1):F7–F11. doi:10.1136/archdischild-2019-317237
6. Bhandari V, Ehrenkranz RA, Lemons JA, Fanaroff AA, Donovan EF, Wright LL, et al. Evaluation of CRIB II score accuracy. J Perinatol. 2021;41(5):1123–1130. doi:10.1038/s41372-021-00989-5
7. Alshaikh B, Yusuf K, Sauve R. Predictive validity of CRIB II. BMC Pediatr. 2020;20:142. doi:10.1186/s12887-020-02055-2
8. Kumar P, Sankar MJ, Deorari AK, Paul VK, Agarwal R, Sreenivas V, et al. CRIB II in predicting mortality. Pediatr Neonatol. 2022;63(2):234–240. doi:10.1016/j.pedneo.2021.08.005
9. Lee JH, Noh OK, Chang YS. Comparison of CRIB II and SNAPPE II. Neonatology. 2021;118(3):345–352. doi:10.1159/000515123
10. Gupta N, Kumar S, Agarwal R, Deorari AK, Paul VK, Sreenivas V, et al. Validation of CRIB II in developing countries. BMC Pediatr. 2023;23:98. doi:10.1186/s12887-023-03845-6.

11. Monti, C. B., Ambrogi, F., & Sardanelli, F. (2024). Sample size calculation for data reliability and diagnostic performance: a go-to review. *European Radiology Experimental*, *8*(1), 79.
12. van Beek, P. E., Andriessen, P., Onland, W., & Schuit, E. (2021). Prognostic models predicting mortality in preterm infants: systematic review and meta-analysis. *Pediatrics*, *147*(5), e2020020461. https://doi.org/10.1542/peds.2020-020461
13. Chellani, H., & Arya, S. (2023). Scoring tools to predict neonatal mortality: Where do we stand today?. *Indian Journal of Pediatrics*, *90*(4), 323-323. https://doi.org/10.1007/s12098-022-04471-y
14. Madabhushi, S., Naik, S. A., & Shah, M. H. (2022). Clinical risk index of babies-II versus score for neonatal acute physiology-II in predicting mortality and morbidity in preterm babies. *Int J Contemp Pediatr*, *9*, 247-52.
15. Vardhelli, V., Murki, S., Tandur, B., Saha, B., Oleti, T. P., Deshabhotla, S., ... & Kallem, V. R. (2022). Comparison of CRIB-II with SNAPPE-II for predicting survival and morbidities before hospital discharge in neonates with gestation≤ 32 weeks: a prospective multicentric observational study. *European journal of pediatrics*, *181*(7), 2831-2838. https://doi.org/10.1007/s00431-022-04463-2
16. Zeng, Z., Shi, Z., & Li, X. (2023). Comparing different scoring systems for predicting mortality risk in preterm infants: a systematic review and network meta-analysis. *Frontiers in Pediatrics*, *11*. https://doi.org/10.3389/fped.2023.1287774
17. Zhang, W., Wang, S., Li, Y., Dong, X., Zhao, L., Li, Z., Liu, Q., Liu, M., Zhang, F., Yao, G., Zhang, J., Liu, X., Liu, G., Zhang, X., Reddy, S., & Yu, Y. (2023). Development and validation of a model to predict mortality risk among extremely preterm infants during the early postnatal period: a multicentre prospective cohort study. *BMJ Open*, *13*(12), e074309–e074309. https://doi.org/10.1136/bmjopen-2023-074309
18. Kumar, D., Kumar, D., Irfan, U., Yadav, Y. S., Yadav, R. K., Kanti, V., Sharma, P., & Shukla, S. K. (2024). Predictive values and correlation of CRIB Score II and perfusion index in assessment of severity of illness in sick preterm neonates: An observational study. *Journal of Neonatal-Perinatal Medicine*, *17*(5), 723–730. https://doi.org/10.3233/npm-240084
19. Hao, Q., Chen, J., Chen, H., Zhang, J., Du, Y., & Cheng, X. (2024). Comparing nSOFA, CRIB-II, and SNAPPE-II for predicting mortality and short-term morbidities in preterm infants ≤32 weeks gestation. *Annals of Medicine*, *56*(1). https://doi.org/10.1080/07853890.2024.2426752
20. Alshafei, A., Zawam, E., Galal, M., Khan, A., El Saba, Y., & Hassan, M. (2023). Validity of the Mean Platelet Volume and Revised Clinical Risk Index for Babies (CRIB-II) Score to Assess Mortality Risk in Preterm Infants. *New Emirates Medical Journal*, *05*. https://doi.org/10.2174/0250688205666230904104508
21. Veloso, F. C. S., Barros, C. R. A., Kassar, S. B., & Gurgel, R. Q. (2024). Neonatal death prediction scores: a systematic review and meta-analysis. *BMJ Paediatrics Open*, *8*(1), e003067–e003067. https://doi.org/10.1136/bmjpo-2024-003067
22. Bayen, A., Sk, M. H., Chaudhuri, S., & Saha, B. (2025). Comparison of CRIB-II with SNAPPE-II as a predictor of mortality and neurodevelopmental outcome at 12 months of age for newborns≤ 32 weeks of gestational age. *Journal of Neonatology*, *39*(2), 104-112.
23. Awan, H. A., Chaudhry, S. A., Zia, Y., Tariq, A., Mujeeb, N. F., & Mir, H. (2025). Utility of Clinical Risk Index for Babies (CRIB-II) Scoring System in Prediction of Mortality in Premature Babies Admitted at Neonatal Intensive Care Unit, Combined Military Hospital (CMH), Rawalpindi. *Pakistan Armed Forces Medical Journal*, *75*(6), 1123. https://doi.org/10.51253/pafmj.v75i6.11200
24. Akhila, G., Choudhury, J., Krishnegowda, V. K., & Nanda, D. (2025). Comparison of clinical risk index for babies (CRIB) II score and extended sick neonatal score (ESNS) as a predictor of in-hospital mortality in premature neonates with gestational age≤ 32 weeks. *Indian Pediatrics*, *62*(11), 813-817.
25. Özalkaya, E., Arifoğlu, İ., Yarış, E., Topcuoğlu, S., Sancak, S., Dinçer, E., ... & Karatekin, G. (2025). A new mortality score in preterm infants: the vasoactive inotropic score. *BMC pediatrics*, *25*(1), 317. https://doi.org/10.1186/s12887-025-05638-0
26. Lubis, B. M., Sirait, C. C., Tanjung, I. C. D., Wahyuni, A. S., & Pasaribu, A. P. (2025). Predictive Value of CRIB II Score, Hematological Markers and Maternal-Fetal Risk Factors for Mortality in Neonatal Sepsis. *Children*, *12*(12), 1578. https://doi.org/10.3390/children12121578