

Research Article



INTERNATIONAL RESEARCH JOURNAL OF PHARMACY

www.irjponline.com

ISSN 2230-8407 [LINKING]

SNAPPE 2 SCORES USED TO ASSESS THE RISK OF NEONATAL MORTALITY IN THE NICU FOR MODERATE TO LATE PRETERM INFANTS

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How to cite: Choudhuri T. SNAPPE 2 scores used to assess the risk of neonatal mortality in the NICU for moderate to late preterm infants. International Research Journal of Pharmacy. 2021;12:6:95-98.

Doi:10.7897/2230-8407.1206152

ABSTRACT

Background: The score for newborn acute physiology, or SNAP, was developed in 1993 and included 34 characteristics for predicting neonatal morbidity and mortality. It was rebranded as SNAP-2 and converted into a 9-parameter tool for added simplicity. Additionally, a perinatal extension known as SNAPPE-2 (SNAP Perinatal Extension, Version 2) was created for widespread use.

Aim: The purpose of this study was to evaluate the accuracy of SNAPPE-2 in predicting death outcomes in preterm newborns at a gestational age of 32–36 weeks in an Indian medical facility.

Methods: Using a random sample technique, the study evaluated 276 patients admitted to the institute's NICU. Newborns with gestational ages between 32 and 36 weeks met the inclusion criteria, and data was collected in pre-made, organized proforma within 48 hours of birth. The study assessed the relationship between SNAPPE 2 and fatality rate in neonates admitted to the NICU.

Results: According to the Youden index value of 0.3972, the study's findings indicate that SNAPPE-2 scores demonstrate a moderate efficacy in distinguishing between newborns who will survive and those who will die, as well as a moderate diagnostic accuracy. Newborns are more likely to die if their SNAPPE-2 score is more than 57.

Conclusion: The current study suggests that SNAPPE-2 scores are useful criteria that can be used to predict neonatal mortality rates in moderately to late preterm neonates delivered between 32- and 36-weeks gestation.

Keywords: SNAPPE-2 Introduction, preterm infants, neonatal intensive care units, mortality

INTRODUCTION

Over the past few decades, there has been a noticeable improvement in NICUs (neonatal intensive care units), with claims of steadily rising survival rates. But further developments are still required to improve neonatal critical care procedures, especially in poor countries like India.

Gender, gestational age, and birth weight—all commonly used risk indicators—may not accurately reflect these variances and do not fully convey the dimensions of the severity of illness. Various prognostication score methods have been used to address these issues in pediatric NICUs and ICUs. Neonatologists can monitor the severity of the condition and evaluate the risk during the patient's stay by using disease severity scores to enable the right intervention.¹

The SNAP (score for newborn acute physiology) score was created in 1993 to evaluate the clinical severity of patients admitted to the NICU. SNAP uses 34 factors related to vital signs and laboratory test findings. SNAP 2, a validated second-generation

SNAP, was established in 1998 since evaluating 34 factors was difficult for clinicians. In order to reduce the impact of early treatment, the original SNAP was streamlined by reducing the number of questions to six and changing the length to the first 12 hours after ICU admission. SNAP-2 only provided the parameters that were essential for monitoring. Later, SNAPPE-2 (SNAP Perinatal Extension, Version 2), which included a total of nine variables, was created by adding additional possible factors to SNAP-2, such as small gestational age, Apgar scores, and birth weight.^{2,3} Richardson et al. created the SNAPPE-2 scoring system, which was a streamlined and altered SNAP score.

Gestational age, Apgar scores, birth weight, urine output, multiple seizures, serum pH, lowest temperature in degrees Celsius, PO₂/FiO₂, and mean/average blood pressure were the nine criteria used in SNAPPE-2.⁴ The purpose of the current study was to evaluate the accuracy of SNAPPE-2 in predicting death outcomes in preterm newborns at a gestational age of 32–36 weeks in an Indian medical facility.

MATERIALS AND METHODS

In an Indian healthcare facility, the current prospective clinical study sought to evaluate the accuracy of SNAPPE-2 in predicting mortality outcomes for preterm infants at a gestational age of 32–36 weeks. The Institute's Department of Pediatrics provided the study participants. Prior to their involvement in the study, all participants provided written and verbal informed consent.

276 newborns admitted to the Institute's NICU were evaluated for the study. They evaluated participants who were providing critical care for infants, particularly those with gestational ages between 32 and 36 weeks. Subjects who were not eligible for the SNAPPE 2 evaluation or whose parents were unwilling to provide informed consent were excluded from the study. Subjects with congenital defects and pre-existing conditions that could substantially impact the study's results were also excluded.

Following the study subjects' final inclusion, a thorough clinical evaluation was conducted after each subject's complete medical history was documented. Preformed structured proforma were used to collect data for the study. Gestational age, APGAR score, birth weight, urine output, number of seizures, serum pH, lowest temperature, PaO₂/FiO₂ ratio, and mean blood pressure were all measured using the pre-made structured proforma.

Using SPSS (Statistical Package for the Social Sciences) software version 24.0 (IBM Corp., Armonk, NY, USA), the collected data was statistically analyzed using the Chi-square test, multiple logistic regression, Kaplan-Meier survival analysis, and assessment of descriptive measures. The mean, standard deviation, frequency, and percentages were used to express the results. A p-value of less than 0.05 was deemed statistically significant.

RESULTS

In an Indian healthcare facility, the current prospective clinical study sought to evaluate the accuracy of SNAPPE-2 in predicting mortality outcomes for preterm infants at a gestational age of 32–36 weeks. 276 patients admitted to the institute's NICU were evaluated for the study using a random selection technique. The overall mean age was 33±2 weeks, which was non-significant with p=0.43. The mean gestational age for both living and deceased subjects was 33±2 and 33±0.7 weeks, respectively. The urine output of living subjects was 1.21±0.49, which was substantially higher than that of dead subjects (p=0.001). Temperature and birth weight showed a non-significant difference between research subjects who were alive and those who were dead (p=0.16 and 0.26, respectively). With p=0.001, 0.02, and 0.03, respectively, the lowest serum pH, APGAR1, and APGAR 2 scores were substantially higher in living participants than in deceased ones (Table 1).

Multiple seizures were observed in 67.30% (n=148) of the subjects who were alive, 71.40% (n=40) of the subjects who were dead, and a total of 68.10% (n=188) of the subjects. 32.70% (n=72) of the living study participants, 28.60% (n=16) of the deceased study participants, and 31.90% (n=88) of the total study participants did not have a history of multiple seizures. With p=0.954, the difference was not statistically significant (Table 2).

According to the study's findings, the mean PaO₂/FiO₂ ratio was 2.24±0.98 for living participants, 1.16±0.93 for dead subjects, and 2.03±1.06 for all subjects, which was substantially higher in living subjects (p=0.001). The mean blood pressure of living individuals was 40.71±10.14 mmHg, which was substantially higher than that of deceased individuals (31.71±11.43 mmHg, p=0.001) (Table 3).

The average SNAPPE-2 score for living patients was 46±14, which was considerably lower than the score for dead subjects, which was 62±18. The mean SNAPPE-2 score for all research participants was 49±16, with p=0.001 (Table 4).

A test's diagnostic accuracy was evaluated using the J or Youden Index, and a value of 0.3972 indicates moderate diagnostic accuracy. Newborns with a score of >57 are more likely to die, according to the corresponding criterion for the SNAPPE 2 score. The test's sensitivity was 64.27%, meaning that newborns who died had scores more than 57, and its specificity was 75.43%, meaning that the percentage of newborns who survived had scores lower than 57.

DISCUSSION

276 patients admitted to the institute's NICU were evaluated for this study using a random sampling technique. The overall mean age was 33 ± 2 weeks, which was non-significant with $p=0.43$. The mean gestational age for both living and deceased subjects was 33 ± 2 and 33 ± 0.7 weeks, respectively.

The urine output of living subjects was 1.21 ± 0.49 , which was substantially higher than that of dead subjects ($p=0.001$). Temperature and birth weight showed a non-significant difference between research subjects who were alive and those who were dead ($p=0.16$ and 0.26 , respectively). Alive subjects had significantly higher lowest serum pH, APGAR1, and APGAR2 scores than deceased subjects ($p=0.001$, 0.02 , and 0.03 , respectively). These findings were similar to those of studies conducted in 2015 by et al.5 and in 2019 by Muktan D et al.6, in which the authors evaluated patients admitted to the NICU and used similar demographic and illness data.

According to the study's findings, multiple seizures were observed in 67.30% ($n=148$) of the living individuals, 71.40% ($n=40$) of the deceased subjects, and a total of 68.10% ($n=188$) of the participants. 32.70% ($n=72$) of the living study participants, 28.60% ($n=16$) of the deceased study participants, and 31.90% ($n=88$) of the total study participants did not have a history of multiple seizures. With $p=0.954$, the difference was not statistically significant. These findings were in line with those of Babaei H et al. (2012) and Nakwan N et al. (2017), who compared numerous seizures in living and dead people in their separate investigations.

The mean $\text{PaO}_2/\text{FiO}_2$ ratio was found to be 2.24 ± 0.98 in living subjects, 1.16 ± 0.93 in deceased subjects, and 2.03 ± 1.06 in all subjects, which was substantially higher in living subjects with $p=0.001$. The mean blood pressure of living individuals was 40.71 ± 10.14 mmHg, which was substantially higher than that of dead individuals (31.71 ± 11.43 mmHg, $p=0.001$). These results were consistent with those of Ucar S et al. (2014) and Ramirez MN et al. (2014), whose authors likewise observed considerably higher mean blood pressure and $\text{PaO}_2/\text{FiO}_2$ ratio in living participants, just like in the current investigation.

The study's findings also revealed that the mean SNAPPE-2 score for living individuals was 46 ± 14 , which was considerably lower than that of dead subjects, which was 62 ± 18 . The mean SNAPPE-2 score for all study participants was 49 ± 16 with $p=0.001$ (Table 4). A test's diagnostic accuracy was evaluated using the J or Youden Index, and a value of 0.3972 indicates moderate diagnostic accuracy. Newborns with a score of >57 are more likely to die, according to the corresponding criterion for the SNAPPE 2 score. The test's sensitivity was 64.27%, indicating that newborns who died had scores more than 57, and its specificity was 75.43%, indicating that the percentage of newborns who survived had scores lower than 57.

These findings were consistent with research by Ashrafzadeh M et al. (2019) and Annegowda DD et al. (2020), whose authors similarly observed significantly higher mean SNAPPE-2 scores in living participants comparable to the current study.

CONCLUSIONS

The present study, within its limitations, concludes that SNAPPE-2 scores are efficacious criteria and can be utilized for the prediction of neonatal mortality rates in neonates that are moderate to late preterm born from the gestational age of 32 weeks to 36 weeks. Further multi-institutional studies with larger neonates from varying geographical areas might help in further exploration of the issue.

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S. No	Parameters	Outcomes			p-value
		Alive	Diseased	Total	
1.	Urine output (ml/kg/h)	1.21±0.49	1.06±0.4	1.17±0.51	0.001
2.	Temperature (°C)	36.85±0.44	35.90±1.55	36.66±0.7	0.16
3.	Lowest serum pH	7.77±6.22	7.20±0.54	7.65±5.56	0.001
4.	Birth weight	1.973±0.45	1.455±1.860	1.85±0.93	0.26
5.	APGAR 1	7±2	5±1	6±2	0.02
6.	APGAR 5	8±2	4±2	7±2	0.03
7.	Gestational age	33±2	33±0.7	33±2	0.43

Table 1: Demographic and disease data in study subjects

S. No	Multiple seizures	Outcomes						p-value
		Alive		Diseased		Total		
		n	%	n	%	N	%	
1.	Yes	148	67.30	40	71.40	188	68.10	0.954
2.	No	72	32.70	16	28.60	88	31.90	

Table 2: Multiple seizures comparison in dead and alive subjects

S. No	Parameters	Outcomes			p-value
		Alive	Diseased	Total	
1.	PaO ₂ /FiO ₂ ratio	2.24±0.98	1.16±0.93	2.03±1.06	0.001
2.	Mean blood pressure (mmHg)	40.71±10.14	31.71±11.43	38.93±11.02	0.001

Table 3: Comparison of different parameters in different groups of study subjects

S. No	Parameters	Outcomes			p-value
		Alive	Diseased	Total	
1.	SNAPPE 2 scores	46±14	62±18	49±16	0.001

Table 4: Total SNAPPE 2 scores in alive and dead study subjects