Title of the article: Evaluation of Survival ability of Extramural neonates by TOPS scoring in Tertiary care hospital

Dr Shivaraja A[1], Dr Beeregowda YC[2], Dr Sanjana J[3]

1 Assistant professor, Department of Pediatrics, SDUMC, Kolar

2 Consultant Pediatrician, SNR Hospital, Kolar

3 Senior resident, Department of Pediatrics, BMCRI, Bangalore

ABSTRACT:

INTRODUCTION: Transport of neonates from peripheral health centres to advanced neonatal intensive care units which are concentrated in urban areas is a necessity in India. The transport of newborn baby by a skilled and organised team reduces neonatal mortality and morbidity. Among the various pretransport and posttransport neonatal assessment scores, TOPS score, a bedside score to assess acute physiological parameters was chosen for the study.

AIMS: To study the correlation of TOPS Score with survival rate among referred neonates.

MATERIALS AND METHODS : TOPS score was assessed for 101 outborn neonates referred to tertiary teaching hospital during the study period.

RESULTS :

Among the study population, 67% were male, 57% were term, 60% had normal birth weight. At time of admission, 38% neonates had hypoxia, 12% had hypoperfusion, 10% had hypothermia, 2% had hypoglycaemia. TOPS score <2 was associated with survival and >2 was associated with significant mortality.

CONCLUSION : TOPS score is a simple, bedside test to determine prognosis of referred neonates. It also helps to monitor care received by the neonates during transport. Appropriate care during transport is essential to decrease neonatal mortality

Key-words: Neonatal Transport, TOPS Score, Hypoglycemia, Hypothermia, Hypoperfusion, Hypoxia

Introduction:

Although Neonatal intensive care units(NICU) are increasing in India, majority are concentrated in urban areas, due to resource limitation and need to cater for larger population. Thus arises a situation, where a neonate delivered at peripheral rural areas, need to be shifted to these centres for advanced treatment. In most of these newborn babies the ineffective transport results in hypoglycemia, hypothermia, cyanosis and other complications. These complications further increase the morbidity and mortality among these sick neonates. [1]The transport of newborn baby by a skilled organised team reduces neonatal mortality and morbidity.[1] Panwar et al have discussed the various aspects of neonatal transport including indications, modes, various government programmes, medicolegal aspects and role of TOPS scoring.[2] There are various pretransport and posttransport assessment scores like TRIPS(Transport Risk Index of Physiological Stability), CRIB (Clinical Risk Index for Babies), SNAPPE II (Score for Neonatal Acute Physiology-PerinatalExtension), MINT(The Mortality Index for Neonatal Transport), hermansen score, neonatal stabilisation score, predictive score,sick neonatal score, TOPS-Temperature, Oxygen saturation, Perfusion, Sugar.[3] Most of these assessment scores contains some lab parameters which may not be feasible to do in emergencies. Mathur et al has shown that TOPS has an equally good prediction for mortality as SNAP II and can be used as a simple and useful method of assessment of risk of fatality that can be assessed immediately, at admission.[4] TOPS scoring is a simple, practical score consisting of acute physiological parameters, which can be evaluated bedside and brings about objectivity to communication of neonatal condition before and during transport on neonate. [5] Various studies done in validation of TOPS score has shown its utility in predicting mortality, hence this study is done to validate TOPS score in our population.

Materials and Methods:

A prospective observational study was done at Neonatal Intensive care unit(NICU) of a tertiary teaching hospital from April 2020 to March 2021. With the estimated prevalence of 50%, desired confidence interval 95%, degree of freedom 10%, using the calculation for descriptive studies, sample size required was 95. Subjects were recruited using simple purposive sampling.

INCLUSION CRITERIA: All outborn neonates >1kg admitted to NICU during the study period

EXCLUSION CRITERIA

1. Presence of Major congenital anamolies
2. Surgical abnormalities like Congenital diaphragmatic hernia, neural tube defects
3. Discharged/Referred/Left against medical advice within 24 hours
4. Refusal to give informed written consent

PROCEDURE

Study was started after receiving Institutional ethical committee permission vide SDUMC/KLR/IEC/226/2019-20 on 31/12/2019. Informed written consents were obtained from the parents of enrolled neonates, after explaining them the purpose of study in their own language. Sociodemographic details, clinical details and TOPS parameters shall be recorded in predesigned proforma at the time of admission. Neonates were treated for their clinical condition as per unit policy and outcome parameters are recorded at the time of discharge/death.

The temperature was assessed using a digital thermometer kept in the axilla of the baby for 3 min. Oxygenation was assessed by measuring oxygen saturation (SpO_2) by pulse oximeter . Capillary refilling time (CRT) shall be measured at the sternum of the baby by pressing from thumb for 5 sec and releasing to assess perfusion. Blood glucose level shall be obtained by glucometer. Hypothermia, hypoxia, prolonged CRT, and hypoglycemia are defined as the temperature <36.5°C, oxygen saturation <87%, CRT more than 3s, and blood sugar <45 mg/dl, respectively. Each parameter is assigned a score of "1" if abnormal and "0" if normal. Total TOPS score (an aggregate score of all four parameters) for each baby shall be calculated at the time of admission. Individual and aggregate TOPS score were correlated with the outcome.

STATISTICAL ANALYSIS

Data entry was done in MS excel and analysed by SPSS software. Quantitative variables were studied by mean, standard deviation, percentage. Sensitivity, specificity, positive and negative predicted values, area under the ROC curve were calculated for validation of TOPS score. For predictors of mortality p value < 0.05 was considered significant

Results:

Table 1 represents the sociodemographic features of all the neonates enrolled in the study. Among the study population, 67% were male, 57% were term, 60% had normal birth weight. 54% of neonates were born by vaginal delivery, 46% were born at government hospitals.

SL . NO	CHARACTERISTICS	NO. OF PATIENTS	FREQUENCY
1	**Total patients**	101	100%
2	**Sex**		
	Male	67	66.4%
	Female	34	33.6%
3	**Gestational age**		
	Term	58	57.43%
	Pre term	42	41.58%
	Post term	1	0.99%
4	**Birth weight**		
	2-2.5kg	40	39.6%:
	2.5kg- 3.5kg	61	60.40%
5	**Place of delivery**		
	Government	47	46.53%
	Private hospital	54	53.47%
6	**Socioeconomic status (Kuppuswamy classification)**		
	2	25	24.75%
	3	46	45.54%
	4	29	28.71%
	5	1	0.99%
7	**Mode of delivery**		
	Vaginal	55	54.46%
	Forceps assisted vaginal	2	1.98%
	LSCS	44	43.56%

Table 1 : Sociodemographic factors

Table 2 represents the correlation of TOPS Score with survival of neonates. At time of admission, 38% neonates had hypoxia, 12% had hypoperfusion, 10% had hypothermia, 2% had hypoglycaemia.

Parameter		No of patients		
		Total	Survived	Death
Temperature	0(>36.5)	62	57	5
	1 (<36.5)	39	37	2
Oxygenation	0 (>87)	91	89	2
	1 (<87)	10	5	5
Perfusion	0 (<3sec)	91	90	1
	1 (>3sec)	10	2	8
Sugar	0(>45)	99	93	6
	1(<45)	2	1	1
Total TOPS Score	<2	99	94	5
	>2	2	0	2

Table 2: Distribution of TOPS score with outcome

Table 3 represents the validity of different parameters of TOPS score in predicting mortality. Although TOPS score has high specificity, it is not sensitive. Among all the parameters, CRT has significant sensitivity and specificity.

	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
Temperature	28.57%	59.38%	7.17%	88.32%
Oxygenation	71.43%	94.68%	89.41%	84.05%
Perfusion	88.89%	97.83%	84.64%	98.5%
Sugar	14.28%	98.94%	21.51%	98.26%
TOPS score	28.57%	100%	100%	98.56%

Table 3: Validity of TOPS score in predicting mortality

Diagonal segments are produced by ties.
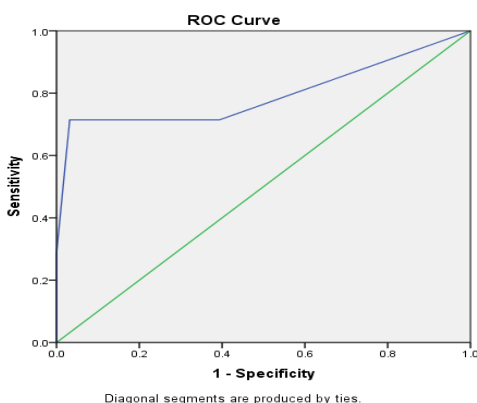
Area	Std. Error[a]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
.794	.123	.010	.552	1.000

Figure1: ROC curve of TOPS Score

Figure 1 represents the ROC curve to detect the critical value of TOPS Score. As per the figure, TOPS score of >2 has a good correlation for predicting mortality, however shape of the curve signifies presence of bias. **Discussion:**

This study was a prospective study done in a tertiary teaching hospital to identify the transport related factors affecting the neonatal mortality amon g the referred neonates. Most of the referred neonates were male, term and had normal birth weight. Neonates were referred almost equally from both government and private hospitals.

In the present study , we found that TOPS score >2 is helpful in predicting the mortality similar to observations found by Verma and colleagues in 2017. [6] Begum in the study of 500 transported babies in 2015 at Hyderabad observed mortality of 22.8% among transported babies and concluded that two or more deranged parameters in TOPS had a significant prediction of mortality. [7]

We found 38% neonates had hypoxia, 12% had hypoperfusion, 10% had hypothermia, 2% had hypoglycaemia at time of admission. In 2018, Mehta and colleagues in the study of 513 neonates found that 48.73% newborns were hypothermic, 33.91% had poor perfusion, 28.46% were hypoxemic, and 22.22% were hypoglycemic. [8] Verma and colleagues in 2017, in a study of 390 neonates in Jodhpur observed hypothermia in 46.67%, hypoxia in 39.23%, hypoglycaemia in 21.28% and poor perfusion in 14.61% in transported neonates.[6] In a study of 101 neonates at Chandigarh by Behera et al, found that 14.8% of babies were hypothermic, 10.8% were hypoxic, 4.9% were hypoglycemic and 14.8% were in shock at time of admission. [9] Meshrem et al found that among 300 neonates in Nagpur, incidence of Hypothermia, hypoxemia, hypoperfusion and hypoglycemia were 37%, 30%, 32% and 13.33% respectively. [10] Similarly pathak and colleagues in a study of 460 neonates in Ahmedabad observed 47.8% had hypothermia, 33.9% had poor perfusion, 27.8% had hypoxemia, and 22% had hypoglycemia.[11] We have found low prevalence of hypoperfusion, hypothermia and hypoglycaemia probably due to low sample size, selection bias as suggested in ROC curve. Comparison of other transport associated factors would be necessary to determine the reason for differences in the studies.

Our study suggested highest specificity for Hypoglycemia (98%) and Hypoperfusion (97%) and highest sensitivity for Hypoperfusion (88%).   As per study done by Verma and colleagues , Hypoxemia and hypoglycemia had the highest sensitivity (93.39% and 80.18%, respectively) while hypoglycemia had the highest specificity (92.87%) in predicting mortality of transported neonates.[4]   Many studies have also found that the mortality increases with the increasing TOPS scrore. [7,12]

Limitations of our study include low sample size and presence of bias. Study was done during the presence of coronavirus induced pandemic, which would have an adverse effects on mode of transport and available health care personals for neonatal transport. This would also probably explain the presence of bias in the present study.

Conclusion

Safe transport of a sick neonate along with well organised team and stabilisation during transport is essential in decreasing neonatal mortality. TOPS score which recognises derangements in acute physiological parameters and can be done bedside gives a valuable information for determining the prognosis of referred neonates. As many studies have already determined the validity of TOPS scores, acceptance of this score for regular monitoring of referred neonates should be prioritised by the policy makers.

References:

1. Hapani P, Berwal A, Dave H. Application of Tops Score in Sick Neonates Received At Level 3 Nicu and Its Impact on the Outcome of the Neonate. IOSR Journal of Dental and Medical Sciences. 2019;18(3):11-15.
2. Panwar A, Damke S. Neonatal Transport - Review Article. Indian Journal of Forensic Medicine & Toxicology. 2021;15(2):603-607
3. Venkateswaran VS, Kumutha J. Application of clinical score in sick neonates received at our emergency unit and its impact on the outcome of the neonate and to compare the effect of trained personnel accompanying the child [M.D Pediatrics]. The TamilnaduDr.M.G.R Medical University; 2015.
4. Mathur NB Arora D. Role of TOPS (a simplified assessment of neonatal acute physiology) in predicting mortality in transported neonates. ActaPediatr 2007, 96: 172-175
5. Chheda A, Khadse S, Valvi C, Kulkarni R, Hiremath A. Importance of Temperature, Oxygen Saturation, Perfusion, Sugar (TOPS) Parameters and the concept of TOPS score for Neonatal Transport in India - A pilot Project. Pediatric Oncall. 2018;15(3):69-72.
6. Kumar Verma S, PrakashNagaura C, Kumar Goyal V, Kumar Raheja K, Singh A, Sharma P et al. Status of Transported Neonates and Evaluation of TOPS as a Survival Score. Indian Journal of Neonatal Medicine and Research. 2017;5(2):1-5.
7. Begum A, Ashwani N, Kumar C. TOPS: a reliable and simplified tool for predicting mortality in transported neonates. IOSR Journal of Dental and Medical Sciences. 2016;15(2):53-58.

8. Mehta N, Sharma MK. Correlation of acute physiological parameters with immediate outcomes among neonates transported to special care newborn unit: A prospective study. Indian J Child Health. 2018; 5(4):280-283

9. Behera B, Meena B. Outcomes of Sick Neonates Transported to a Tertiary Care Hospital by a Trained Team, in Northern India. INDIAN JOURNAL OF NEONATAL MEDICINE AND RESEARCH. 2021;9(1):010-015.

10. Meshram, R., Chatnalkar, R. Correlation of TOPS score with short term outcome of transported neonates: an experiences from resources limited setting: a prospective observational study.. *Iranian Journal of Neonatology IJN*, 2022; (): -. doi: 10.22038/ijn.2022.63741.222

11. Pathak GH, Chauhan AV, Patel PB. Correlation of TOPS scoring with immediate outcome among neonates transported to special newborn care unit: a prospective study. Int J Contemp Pediatr 2019;6:2394-7.

12. Sheth NM, Pandya N. Evaluation of TOPS score as predictor for outcome in sick newborns. Int J Contemp Pediatr 2020;7:1249-55.