RESEARCH

A PROSPECTIVE STUDY TO ASSESS MORTALITY AND OUTCOMES IN A PEDIATRIC EMERGENCY DEPARTMENT OF A TERTIARY CARE HOSPITAL USING THE CLINICAL SCORING SYSTEM "TOPRS"

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Abstract

Background: In pediatric emergency care, scoring systems are essential for recognizing severely ill children and predicting their prognosis. These scoring systems should be feasible, effective, and time efficient. Such a scoring system exists in the form of the TOPRS score. TOPRS stands for Temperature, Oxygen saturation, Pulse rate, Respiratory rate, Seizure, and Sensorium. The objective of the study is designed to evaluate the use of the "TOPRS" scoring/grading system to predict outcomes and mortality in the pediatric emergency department of a tertiary care hospital. **Materials and Methods:** An observational prospective study was conducted in a hospital. The total number of participants enrolled in this study were 1002 inpatient children aged from 1 month to 12 years in the pediatric emergency department at Niloufer Hospital, Hyderabad. At the time of admission, baseline data and a TOPRS score were collected. The variables were categorized as normal and abnormal based on scores. Score 0 is considered normal and score 1 as abnormal. The total score was then computed and recorded. Cases were admitted, treated in accordance with standard protocol, and monitored until their outcome (discharged or death). Each variable score and TOPRS scores were correlated with the outcome. Predictive ability of the TOPRS score was analyzed using the ROC curve. **Result:** Of 1002 participants, 931 were discharged and 71 died. Overall, 47.01% were between ages 1-5 years, 24.15% were between 6-10 years, 21.46% were less than 1 year old, and 7.39% were older than 10 years. There was significant correlation between each variable of TOPRS score and outcome of the child. Predictive value of the score was 90.3% with P value of <0.001. **Conclusion:** TOPRS score is an easy-to-use clinical scoring system that may be used in pediatric emergency triage without the need for specialized training. The study demonstrates an evident relationship between TOPRS score and outcomes.

INTRODUCTION

Children who are critically ill may live longer if their disease condition is detected early. Most of the scoring system now in use for patients in emergency departments is not used at the time of admission. Therefore, they cannot be used to prioritize the care of sick children. In addition, the implementation of these scoring systems in emergency rooms is expensive and challenging due to their extensiveness, time requirements, and need for several physical and laboratory measurements.

In the current study, vital signs were used to predict the severity of illness and mortality in pediatric emergency rooms using a standardized scoring system termed TOPRS. The TOPRS score tool can be used in emergency rooms, especially in settings with few resources.[1] The purpose of the current study is to assess its applicability in predicting mortality in our population.

MATERIALS AND METHODS

Place of Study: The study was done at the Osmania Medical College-affiliated Department of Pediatrics at Niloufer Hospital, the largest tertiary care facility in Hyderabad, Telangana.
Study Design: Hospital-based prospective observational study.
Period of study: October 2019 to October 2021.
Study Participants: Infants and children between the ages 1 month and 12 years admitted to the pediatric emergency room and intensive care unit to the Niloufer Hospital, Telangana.
Size of Study Sample: 1002

Inclusion Criteria

- Infants and children aged 1 month to 12 years admitted in the pediatric emergency department/ intensive care unit, Niloufer hospital, Telangana and whose parents/guardians gave consent for the study.

Exclusion Criteria

- Neonates- children younger than one month.
- Patients who left the hospital against medical advice
- Children admitted to the surgical wards
- Children who died before arrival to the hospital
- Children with congenital defects such as the central nervous system (CNS) defects, congenital renal abnormalities, congenital heart disease etc.
- Parents or guardians who refused to provide informed consent

Procedure

After obtaining the parents' or guardians' written consent, all infants, and children between the ages 1 month and 12 years were admitted to the pediatric emergency department and intensive care unit at Niloufer Hospital, Telangana. All the above-mentioned patient populations who met inclusion were recruited in the study.

The data was recorded in the predesigned proforma after a thorough history and clinical assessment of the study population. The study population's temperature, oxygen saturation, heart rate, respiration rate, sensorium, and seizure activity were assessed at the time of admission and documented in the proforma. A digital thermometer was used to measure the axillary temperature, a pulse oximeter to measure oxygen saturation, a full one minute of heart rate and respiratory rate was taken, AVPU scale (Awake, Verbal, Pain, Unresponsive) to measure sensorium, and seizure activity was noted. These variables were categorized into normal and abnormal based on standard SIRS criteria and pediatric advanced life support criteria.[2,3] Score 0 is considered as normal and score 1 abnormal. Sensorium is categorized based on AVPU scale where only "alert" is considered as the normal. Operational definitions of the variables studied are provided in table 1. TOPRS score was calculated for each patient. The scores obtained were recorded and were not made aware to the treating doctors and nursing staff. The patients were managed as per standard treating protocols. The study participants were followed until they got discharged. The final results were recorded at the time of discharge or death and were compared with the variables and their combined value.

Analysis and Data Entry

Data entry made using Microsoft Excel 2010. Epi Info 7.2.0 and Microsoft Excel 2010 were both used for the data analysis. The statistical methods utilized in the current investigation include both descriptive and inferential. The continuous measurements results expressed as a Mean±SD (Min-Max) and categorical measurements results expressed as a Number (%). Significance was assessed at 5% level of significance. For continuous variables, student t-test is used to compare between-group variation.

Ethical Clearance

The study design was approved by the Institutional Ethical Committee of Osmania Medical College, Hyderabad.

RESULTS

The 1-5 years age group made up 47.01% of the study population, while those between 6-10 years made up 24.15%. Of the population, 21.46% were infants (<1 year) and 7.39% over the age of 10. [Table 2].

The total number of participants enrolled in this study were 1002, out of which 535 (53.39%) were males and 467 (46.61%) were females. Among the study population, temperature was normal in 812 children (81.04%) and abnormal in 190 (18.96 %); SpO2 (oxygen saturation) was normal in 878 (87.62 %) and abnormal in 124 (12.38%); heart rate was normal in 911 (90.92 %) and abnormal in 91 (9.08 %); respiratory rate was normal in 797 (79.54%) and abnormal in 205 (20.46%); sensorium was normal in 881 (87.92%) and abnormal in 121 (12.08%); seizures were absent in 911 (90.92%) and present in 91 (9.08%).

Based on above parameters, 54.59% of study participants obtained a score 0, 24.25% obtained a score 1, 12.77% obtained a score 2, 3.79% obtained a score 3, 2.50% obtained a score 4, 1.30% obtained a score 5, and 0.80% obtained a score 6 [Table 3].

Among the study population, 92.91% were discharged and 7.08% was the mortality [Table 4].

Total scores were correlated with outcome [Table 5]. With a P value of 0.001, statistically significant correlation existed between the total score and the outcome.

The relationship between each variable in this study and the outcome (discharge or death) is shown in

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[Table 6]. All the variables of TOPRS- temperature, oxygen saturation, pulse rate, respiratory rate, sensorium, and seizures were significantly related with outcome (p<0.001).

Receiver Operating Characteristic (ROC) curve analysis shown in [Figure 1], 0.903 is the area under the curve, i.e., predictive value of the score is 90.3% with P value of <0.001.

Table 1: Operational definitions of the variables in the study

Variables	Normal range	
Temperature	96.8 to 100.4 F	
Oxygen saturation	>94%	
Pulse rate (beats/min)	Infant: (1 month to 1 year)	100-180
	Toddler: (1 to 3 years)	98-140
	Pre-school: (3 to 6 years)	80-120
	School age child: (6 to 12 years)	75-118
	Adolescent: (12 to 18 years)	60-100
Respiratory rate (beats/min)	Infant: (1 month to 1 year)	30-50
	Toddler: (1 to 3 years)	22-40
	Pre-school: (3 to 6 years)	20-28
	School age child: (6 to 12 years)	18-25
	Adolescent: (12 to 18 years)	12-20
Sensorium	Alert in AVPU scale	
Seizures	Absent	

Table 2: Age Distribution

Age in years	Frequency	Percentage
<1 year	215	21.46
1-5 years	471	47.01
6-10 years	242	24.15
>10 years	74	7.39
Total	1002	100.00

Table 3: Number of children with individual TOPRS scores (0 to 6)

Total score (TOPRS)	Frequency	Percentage
0	547	54.59
1	243	24.25
2	128	12.77
3	38	3.79
4	25	2.50
5	13	1.30
6	8	0.80
Grand Total	1002	100.00

Table 4: The outcomes of study population

Outcome	Frequency	Percentage
Death	71	7.08
Discharge	931	92.91
Grand Total	1002	100.00

Table 5: The outcomes of the study population at different scores

Total score	Death	Discharge	Grand Total	P value
0	0(0%)	547(100%)	547(100%)	Chi square value:583.1 Degree of freedom:6 P value: <0.001(Statistically significant)
1	19(7.81%)	224(92.1%)	243(100%)	
2	7(5.4%)	121(94.5%)	128(100%)	
3	15(39.47%)	23(60.52%)	38(100%)	
4	9(36%)	16(64%)	25(100%)	
5	13(100%)	0(0%)	13(100%)	
6	8(100%)	0(0%)	8(100%)	
Grand Total	71(7.08%)	931(92.91%)	1002(100%)	

Table 6: Association of the study variables of TOPRS with outcome.

Variable	Normal/ Abnormal	Survived	Percentage	Dead	Percentage	P value
Temperature	Normal	788	97.04	24	2.96	<0.001
	Abnormal	143	75.27	47	24.73	
Oxygen saturation	Normal	866	98.63	12	1.37	<0.001
	Abnormal	65	52.42	59	47.58	
Pulse rate	Normal	894	98.13	17	1.87	<0.001
	Abnormal	37	40.66	54	59.34	
Respiratory rate	Normal	791	99.25	6	0.75	<0.001
	Abnormal	140	68.29	65	31.71	

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Sensorium	Normal	865	98.18	16	1.82	<0.001
	Abnormal	66	54.55	55	45.45	
Seizures	Normal	857	94.07	54	5.93	<0.001
	Abnormal	74	81.32	17	18.68	

Table 7: Showing percentages of results (normal and abnormal) of each variable in the present study and compared with other studies

Variable	Present study		Study done by HS Bains and RK Soni,[1]		Study done by Krithika AP et al.[7]	
	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal
Temperature	81.04%	18.96%	89.58%	10.42%	74.70%	25.30%
Saturation (SpO2)	87.62%	12.38%	93.31%	6.69%	91.80%	8.20%
Heart rate	90.92%	9.08%	83.78%	16.22%	78.30%	21.70%
Respiratory rate	79.54%	20.46%	74.77%	25.23%	86.80%	13.20%
Sensorium	87.92%	12.08%	88.93%	11.07%	93.20%	6.80%
Seizures	90.92%	9.08%	89.19%	10.81%	93.80%	6.20%

Table 8: Compares the outcomes of the current study to other similar studies

TOPRS Scores	Current study			Study done by HS Bains and RK Soni,[1]			Study done by Krithika AP et al,[7]		
	%of the total study population (1002)	Survived	Died	%of the total study population (777)	Survived	Died	%of the total study population (600)	Survived	Died
0	54.59%	100%	0%	55.73%	95.61%	4.39%	53.83%	100%	0%
1	24.25%	92.09%	7.81%	19.56%	87.50%	12.5%	27.67%	96.39%	3.61%
2	12.77%	94.50%	5.50%	16.86%	61.83%	38.17%	10.50%	95.24%	4.76%
3	3.79%	60.52%	39.47%	5.15%	40.00%	60.00%	3.17%	36.84%	63.16%
4	2.50%	64%	36%	1.93%	33.33%	66.67%	2.00%	0%	100%
5	1.30%	0%	100%	0.64%	20.00%	80.00%	1.67%	0%	100%
6	0.80%	0%	100%	0.13%	0%	100%	1.17%	0%	100%
Total	100%			100%			100%		

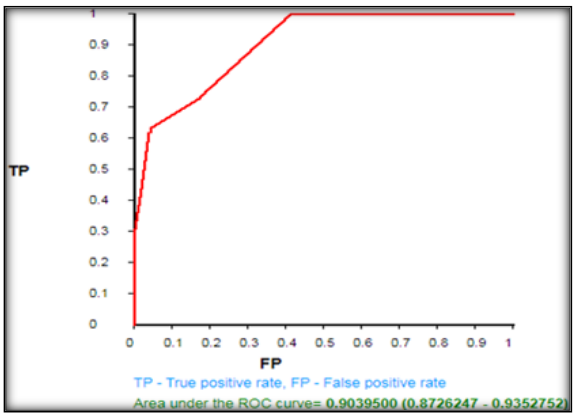

Figure 1: The Receiver Operating Characteristic Curve for TOPRS score and outcome.

DISCUSSION

Early diagnosis of sick children visiting the pediatric emergency room can minimize the mortality rate by providing for the earliest possible appropriate management. The most crucial part of triaging is treating children according to the severity of their illnesses. There have been many different scoring systems developed, such as the Physiology Stability Index (PSI), which uses 34 variables from 7 key physiologic systems to evaluate the severity of abnormalities to determine scores. PSI however is time consuming.[4] Later, PRISM (Pediatric Risk of Mortality) was developed from PSI to reduce the number of variables from 34 to 14 and the number of ranges from 75 to 23, but it cannot be used in emergency departments as it necessitates a significant amount of time and encompasses both physical and laboratory components.[5] In comparison to PRISM score, TOPRS score is easy to use, less time consuming and even can be used in resource poor settings, so that the patient can be referred at the earliest to higher referral centers.

In the current research, 47.01% of the study population were among the ages 1 to 5 years, while 24.15% were within 6 to 10 years. The percentage of infants was 21.46 %, 7.39 % was over the age of 10. In the study done by Reddy TS et al, 60% of those who participated in the study were in the age range of 1 to 5 years, 30% were in the 6 to 14 years group and 10% of the population were infants.[6]

In the current study, males accounted for 53.39% and females for 46.61% when compared to the study done by Reddy TS et al, males were 68% and females were 32%.[6] In a study done by HS Bains and RK Soni in Ludhiana, India, males were 71.5% and females were 28.5%.[1]

Table 7 compares the percentages of normal and abnormal variables from the current study with those from studies done by HS Bains & RK Soni et al. and Krithika AP et al.[1,7] In the current study, abnormal respiratory rate was the commonest presentation seen in 20.46% of the children. Similar results were observed in the HS Bains and RK Soni study, where respiratory rates were abnormal accounting 25.23%.[1] In the multicentric study by Krithika AP et al., temperature was the most

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frequently observed abnormal variable and it was found in 25.30% of children.[7]

In the current study, of the 1002 children participated, 91.32% were discharged, while 8.68% died. Similar results were seen in the study done by Krithika AP et al in South India with a total of 600 study participants**,** 91.67% were discharged and 8.33% died.[7] In a HS Bains and RK Soni study conducted in North India with a total of 777 study participants, 83.65% were discharged and 16.35% died.[1] In Reddy TS et al study with a total of 100 children participating**,** 92% were discharged and 8% died.[6] Outcome of the current study correlating with each individual TOPRS score (1-6) is shown in table 8.

In the current study, children with TOPRS score of 5 and 6 did not survive (100%). Similar results were seen in the study done by Krithika AP et al where mortality in children with TOPRS score of 5 and 6 was 100%, whereas HS Bains and RK Soni study, mortality in children with TOPRS score of 6 was 100% and with TOPRS score of 5 was 80%.[1,7] The TOPRS score was an excellent indicator of the severity of the patient's illness at admission, and the relationship between the total score and outcome in the current study was statistically significant with a P value of < 0.0000001. The association between the total score and the outcome in the HS Bains and RK Soni study was statistically significant with a P value of < 0.05.[1] The predictive value of the score was found to be 90.3% in the current study, compared to 96% and 81.7% in the studies by Krithika AP et al., HS Bains & RK Soni et al., respectively.[1,7]

In the current study, abnormality in all six variables (TOPRS) was significantly related to mortality ($p< 0.001$). Similar results were obtained in the study done by Krithika et al, whereas in the study done by HS Bains and RK Soni, only some of the parameters such as temperature, oxygen saturation, respiratory rate were found to be significantly associated with mortality.[1,7]

With an increasing number of abnormal variables i.e. with increasing TOPRS score, mortality increases. As every disease has manifestations in the form of some or all of the variables of TOPRS score, it can be said that severity of the disease can be predicted by knowing TOPRS score, hence can be used as a prognostic tool at the time of admission.

CONCLUSION

TOPRS score is a simple and easy score when used at the time of admission, aids in a quick evaluation of the child's clinical status, allowing for the prompt administration of medical care as well as the prediction of the child's prognosis.

REFERENCES

1. Bains HS, Soni RK. A Simple Clinical Score “TOPRS” to Predict Outcome in Pediatric Emergency Department in a Teaching Hospital in India, Ir J Paedia. 2012;22(1):97-101.
2. Sun D, Aikawa N. The natural history of the systemic inflammatory response syndrome and the evaluation of SIRS criteria as a predictor of severity in patients hospitalized through emergency services. Keio J Med. 1999;48(1):28-37. doi: 10.2302/kjm.48.28.
3. Asayama K, Aikawa N. Evaluation of systemic inflammatory response syndrome criteria as a predictor of mortality in emergency patients transported by ambulance. Keio J Med. 1998;47(1):19-27. doi: 10.2302/kjm.47.19.
4. Yeh TS, Pollack MM, Ruttimann UE, Holbrook PR, Fields AI. Validation of a physiologic stability index for use in critically ill infants and children. Pediatr Res. 1984;18(5):445-51. doi: 10.1203/00006450-198405000-00011.
5. Pollack MM, Ruttimann UE, Getson PR. Pediatric risk of mortality (PRISM) score. Crit Care Med. 1988;16(11):1110-6. doi: 10.1097/00003246-198811000-00006.
6. Reddy ST, Raja DV. TOPRSS: a simple clinical score to predict outcome and mortality in paediatric emergency department. Int J Contemp Pediatr. 2021;8(5):814-817
7. Krithika AP, Sasikumar BR, Senthil Kumar M, Sundari S. Effectiveness of admission TOPRS score in predicting the outcome in pediatric inpatients - A prospective observational multicentric study. Curr Pediatr Res. 2022;26(6):1388-1395.

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