

## Validation of "TOPRS" Score to Predict Outcome in Paediatric Patients in a Tertiary Care Hospital of Pakistan

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### ABSTRACT

**Objective:** To validate a clinical scoring system for defining the severity of ailment that will assist in developing strategies for management prioritisation.

**Study Design:** Cross-sectional analytical study.

**Place and Duration of Study:** Paediatric Department, Combined Military Hospital Lahore, Pakistan, from Jan 2020 to Jul 2021.

**Methodology:** The paediatric patients who reported to the Medical Reception Centre and were admitted to an Inpatient Facility were enrolled. Demographic profile, temperature, oxygen saturation, pulse, respiratory rate, seizures, and sensorium labelled as "TOPRS" score was recorded with "0 - Normal" and "1 - Abnormal" and scores calculated for each patient with the incorporation of systemic inflammatory response and advanced paediatric life support criteria.

**Results:** A total of 300 paediatric patients with an age range of 1-18 years (mean:  $3.86 \pm 5.43$ ) were included. Of 300 patients, 237(79%) were discharged after improvement, and the mortality rate was 63(21%). A significant association with the mortality rate was deciphered with temperature, oxygen saturation, and respiratory rate variables. In contrast, pulse rate, sensorium, and seizures were concluded to have an insignificant association. Score "0" mortality was associated with the 4.4% mortality, whereas score "5" enumerated an 80% death rate.

**Conclusion:** The TOPRS clinical scoring system has significant value in the diagnosis of mortality and morbidity of paediatric patients and, hence, can assist in early recognition and triage of patients, consequently aiding in the provision of prioritisation protocols and management in a befitting manner.

**Keywords:** Paediatrics, Pulse, Saturation, Temperature, "TOPRS" score, Vitals.

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## INTRODUCTION

Evaluation and estimation of patient prognosis is vital to patient management protocols as it will lead to early recognition and triage of critical patients presenting at the emergency desk. It will also provide an opportunity to answer patients' and attendants' concerns effectively; thus, counselling will be done accordingly.<sup>1</sup> A focused approach to patient management will ensure reduced mortality and morbidity of patients, in particular paediatric patients, because of limited compensatory physiological responses.<sup>2,3</sup>

Due to limited medical and human resources in developing countries like Pakistan, a simple, executable, quick clinical scoring system is desired to address all aspects of patient management. Simplified guidelines will prevent the exhaustion of resources and early execution of management. Various scoring

systems had been proposed, but validation with the outcome and terminal point still needed to be ensured. Systemic inflammatory response syndrome is complicated with a surge of unidentified inflammatory markers.<sup>4,5</sup> 53% of systemic inflammatory syndrome cases are attributable to infection, with a reported incidence of 21.7% in the paediatric population.<sup>6</sup>

Systemic inflammatory response syndrome has indistinct aetiology with presumed association with ischemia, infection, or trauma. Certain triggers such as infections (respiratory, urological, genital, dermal, etc.), immune states secondary to carcinomas, and hormonal or radiation therapy can result in a surge of cytokines and vasodilators, consequently leading to the emergence of symptoms like increased heart rate and respiratory rate, decreased mean arterial pressure, increased or decreased body temperature, increased or decreased white blood cells count.<sup>6,7</sup> Spectrum of events leads to tissue damage, metabolic alterations, and hemodynamic instabilities followed by organ failure and dysfunction. Therefore, the development of

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a reliable and convenient scoring system was inevitable for the timely scrutiny of patients.<sup>8</sup>

Various scores, such as the Physiology Stability Index (PSI) evaluating 34 parameters and the Paediatric Risk of Mortality Score (PRISM), constituting 14 factors, including physical examination and biochemical parameters and Paediatric Index Mortality (PIM), were developed. Nevertheless, the paucity of resources favours a scoring system that will take less time to establish any prognosis.<sup>9,10</sup> The rationale of the current study was to devise a basic scoring system, "TOPRS", to diagnose, define the severity of illness and predict the prognosis of paediatric patients at an emergency department.

**METHODOLOGY**

The cross-sectional analytical study was conducted at the Paediatrics department of CMH Lahore after approval of the Ethical Review Board (ERB Number 336/2021) from January 2020 to July 2021. The sample size calculated with 81.7% predicted accuracy of TOPRS score as reported by previous study.<sup>11</sup>

**Inclusion Criteria:** Patients of age range one to eighteen years who were attending the Emergency Reception Centre of hospital were included in the study after informed consent.

**Exclusion Criteria:** Patients admitted for a day only and quit medical plans were excluded.

With non-probability consecutive sampling, a total of 300 participants were included. Six clinical parameters (temperature, Oxygen saturation, Pulse and Respiratory rate, Sensorium, and Seizures) were endorsed. Core body temperature with a tympanic thermometer and SpO<sub>2</sub> with a standard pulse oximeter were recorded. Baseline values are determined as shown in (Table-I).<sup>12</sup>

**Table-I: Scoring of abnormal clinical variables 12**

Variables	Values
Temperature	>38 0C or<360C
Oxygen saturation	<90%
Heart rate	>150/min
Respiratory rate	>50/min
Sensorium	Sensorium Loss
Seizures	Present

The normal parameter was the score "0", whereas abnormal was regarded as a score of "1" based on guidelines provided by pediatric advanced life support for systemic inflammatory response syndrome. A total score was summed up for each participant. Treating paediatricians in respective intensive care or inpatient

facilities was blinded from the initial score to eliminate bias. The outcome of the patient (discharged or mortality) was correlated with initial scores after management as per standard protocols.

Statistical Package for Social Sciences (SPSS) version 25.0 was used for the data analysis. Quantitative variables were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages. Chi-square test was applied to explore the inferential statistics. The *p*-value lower than or up to 0.05 was considered as significant.

**RESULTS**

Three hundred paediatric patients aged 1-18 (Mean:3.86±5.43) years were included in the study. 176(58.71%) participants were males whereas 124 (41.23%) were females. Of 300 patients, 237(79%) were discharged after improvement, and the mortality rate was 63(21%). Among male patients, 42(24.21%) and 134(75.78%) died and were discharged with improvement, respectively. In contrast, in the case of female patients, the death rate was 21(16.66%) and 103 (83.33%) discharged with improvement (*p*-value 0.17), as elaborated in Table-II. The significant association with the mortality rate was deciphered with variables (Temperature, oxygen saturation, respiratory rate, pulse rate, sensorium, and seizures) (Table-III).

**Table-II: Association between gender and outcome (n=300)**

Gender	Died	Discharged	<i>p</i> -value
Male	42(24.21%)	134(75.78%)	0.17*
Female	21(16.66%)	103(83.33%)	

**Table-III: Association of abnormal parameters and outcome (n=300)**

Variables	Discharged	Died	<i>p</i> -value
Temperature		43(68.71%)	<0.001*
Oxygen Saturation	27(11.54%)	56(88.46%)	
Pulse Rate	83(34.92%)	43(68.92%)	
Respiratory Rate	87(36.63%)	34(54.37%)	
Sensorium	77(32.44%)	36(57.56%)	
Seizures	54(22.62%)	36(57.56%)	

**DISCUSSION**

Triage is considered a mandatory component of emergency bay management for prioritising patient management and prognosis assessment. General physical examination and clinical assessment are integral to patient management and a cost-effective modality for patient triage and scrutiny. A score that is easy to remember, convenient to apply, and less consuming is desired.<sup>13</sup> Among primitive clinical scoring systems for paediatric patients was the "Physiology Stability

Index," which aimed to calculate 34 variables upon arrival at the PICU. Later, for ease of execution and implementation, PRISM scores evolved, which incorporated,<sup>14</sup> parameters. The pediatric index of mortality was exclusively designed for PICU patients. Hence, the above-mentioned scoring protocols determined for intensive care management or required evaluation of haematological and biochemical markers, therefore, had limitations of application at the emergency reception bay.<sup>14</sup>

World Health Organization established "Emergency triage, assessment & treatment guidelines" for implementation in developing countries. Nevertheless, the necessity and condition of formal training of the medical staff constrained its utility and applicability.<sup>15</sup> Thompson et al. employed vital signs to segregate paediatric patients with critical or less critical infections upon admission to the paediatric care unit.<sup>16</sup>

Hence, in this study, we assumed that mere clinical markers based on systemic inflammatory response syndrome criteria could give visibility to the outcome. Therefore, we excluded laboratory parameters and compared clinical markers with the outcome to assess the significance of establishing the patient's prognosis. Additionally, the TOPRS score has the benefit that it does not require specialised training or equipment.<sup>16</sup>

Bains *et al.* enumerated the predictive value of the TOPRS score and concluded it to be 81.7% with a sensitivity of 79.6 and specificity of 74.43.<sup>17</sup> Ganda *et al.* studied the predictive potential of the TOPRS score in conjunction with nutritional status and the patient's outcome. The well-nourished group represented 11.92% mortality, and the undernourished group

represented 34% mortality (*p*-value 0.003).<sup>18</sup> Results of our study concluded that two or more impaired clinical variables indicate that patients should be admitted to an inpatient facility and close surveillance should be ensured.<sup>19</sup>

## CONCLUSION

TOPRS clinical scoring system has significant value in the diagnosis of mortality and morbidity of paediatric patients; hence, it can assist in the early recognition and triage of patients, consequently aiding in the provision of prioritisation protocols and management in a befitting manner.

**Conflict of Interest:** None.

## Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

AAA & MTN: Conception, study design, drafting the manuscript, approval of the final version to be published.

BB & AI: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

AW & AQ: Data acquisition, drafting the manuscript, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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