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Comparison between mortality scoring systems in pediatric intensive care unit reliability and effectiveness

Çocuk yoğun bakım ünitesinde mortalite skorlama sistemlerinin güvenilirliği ve etkinliğinin karşılaştırılması

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Abstract

Purpose: In pediatric intensive care unit (PICU), high mortality risk is a significant issue. Risk adjustment tools are in place for early estimation of mortality risk. Pediatric Risk of Mortality (PRISM), Pediatric Index of Mortality (PIM), Pediatric Logistic Organ Dysfunction (PELOD) and Pediatric Sequential Organ Failure Assessment (PSOFA) are commonly used. The aim of this study was to evaluate the predictive performance of mortality using PRISM III, PIM3, PELOD-2, and PSOFA.

Materials and methods: This retrospective single-center study analysed patients aged between 1 month-18 years who were treated in PICU for various diseases between April and December 2021. Their electronic records were retrospectively examined for demographic characteristics, medical and clinical expectations, and morbidity/mortality.

Results: The study included 300 patients with a hospitalization period of 56.73±105.95 days. At the end of the study, 56 (18.7%) patients had died. All scoring systems and mortality correlations were statistically significant (p<0.0001). The predictive success rates for mortality, ranked from best to worst, were PRISM III, PELOD-2, PSOFA, and PIM 3, respectively, in terms of sensitivity and specificity.

Conclusion: The absence of any studies comparing these four mortality scoring systems adds to their importance for early recognition and rapid intervention in critically ill children. Based on our study, PRISM III data has been found to be more reliable in this heterogeneous population.

Key words: Mortality, pediatric, intensive care, reliability, effectiveness.

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Öz

Amaç: Çocuk yoğun bakım ünitesinde (ÇYBÜ) yüksek mortalite riski önemli bir sorundur. Mortalite riskinin erken ön görülmesi için çeşitli risk skorlama sistemleri vardır. Pediatric Risk of Mortality (PRISM), Pediatric Index of Mortality (PIM), Pediatric Logistic Organ Dysfunction (PELOD) ve Pediatric Sequential Organ Failure Assessment (PSOFA) yaygın olarak kullanılmaktadır. Çalışmamızın amacı, PRISM III, PIM3, PELOD-2 ve PSOFA' nın mortaliteyi öngörmedeki gücünün ve etkinliğinin değerlendirilmesidir.

Gereç ve yöntem: Tek merkezli retrospektif çalışmada Nisan-Aralık 2021 tarihleri arasında ÇYBÜ'de yatan 1 ay-18 yaş arası tüm hastalar incelendi. Elektronik kayıtlarından demografik özellikleri, klinik öyküleri ve morbidite/mortalite durumu araştırıldı.

Bulgular: Çalışmaya ÇYBÜ yatış süresi 56,73±105,95 gün olan 300 hasta dahil edildi. Çalışma sonunda 56 (%18,7) hasta vefat etmişti. Tüm skorlama sistemleri ve mortalite korelasyonları istatistiksel olarak anlamlı bulundu (p<0,0001). Mortaliteyi öngörmede başarı oranları, duyarlılık ve özgüllük açısından incelendiğinde başarılı olma oranı sırasıyla PRISM III, PELOD-2, PSOFA ve PIM 3 idi.

Sonuç: Dört mortalite skorlama sistemini karşılaştıran herhangi bir çalışmanın bulunmaması, kritik hastalığı olan çocuklarda erken tanı ve hızlı müdahale için skorlama sistemleri önemini artırmaktadır. Çalışmamıza dayanarak, PRISM III verilerinin heterojen hasta popülasyonumuzda mortalite ön gördürme için daha güvenilir olduğu bulunmuştur.

Anahtar kelimeler: Mortalite, pediatri, yoğun bakım, güvenilirlik, etkililik.

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Introduction

In the pediatric intensive care unit (PICU), high mortality rates are a significant concern. Risk adjustment tools are currently in use at admission for the estimation of mortality risk [1]. The Pediatric Risk of Mortality (PRISM) score, Pediatric Index of Mortality (PIM), Pediatric Logistic Organ Dysfunction (PELOD), and Pediatric Sequential Organ Failure Assessment (PSOFA) scores are commonly used in pediatric intensive care units worldwide. All of these scoring systems give a measure of severity of illness. Depending on these systems, critically ill patients are identified at an earlier stage in the PICU and their treatment is managed with the aim of reducing the mortality rate [2]. The scoring systems were designed not only to assess the risk of individual patients, but also to evaluate the performance of PICUs in comparison to others, to measure outcomes, and/or to report mortality rates in clinical studies. PRISM III, PELOD ve PIM scores are frequently used for mortality prediction in pediatrics [3, 4]. PSOFA was developed, because of PELOD due to not covering a large population and not including heterogenous diseases [5]. Although it is difficult to clearly demonstrate the superiority of one scoring system over another, many studies are currently being conducted on them. The aim is to identify critical patients early and to determine the best system through comparisons, using a common criterion in national and international pediatric intensive care units. This will support both scientific studies and patient care.

The PRISM III, which is one of the most commonly used scoring systems of mortality in PICUs, was used when examining patient data. While calculating PRISM III, seventeen different parameters including mental status, vital signs, blood gas measurements, pupillary reflex, and biochemical values in the first day are used. High scores indicate there is a high risk of mortality [6].

PELOD scoring was developed in intensive care to detect multiple organ failures. PELOD includes six organ dysfunctions and twelve variables, each recorded daily for five days [7]. The PELOD-2 that included changes add mean arterial pressure and lactate elevation to cardiovascular dysfunction and subtract hepatic dysfunction [8].

Using data from first hour of PICU admission, the PIM score was adjusted using eight physiological changes [9]. The advantage of the PIM 3 score is that it eliminates the limitations of the treatment received before admission to the intensive care unit. In addition, patients were divided into not only low-risk but also low and high-risk, unlike PIM 2 [10].

PSOFA; PELODS and PELOD-2 are one of the scoring systems that show organ dysfunction in pediatric patients, and were developed because of their inadequacy in terms of inclusiveness and scaling [5]. The difference of PSOFA from PELOD-2 is that in addition to the paO2/fiO2 ratio, the saO2/fiO2 ratio is also used [11]. While creating the scoring system, the score obtained in the PELOD score was accepted as 1 point; Scores between 2 and 4 are adapted to adult SOFA criteria.

The study aimed to evaluate the performance and predictive ability of the PRISM III, PIM 3, PELOD-2, and PSOFA scores for mortality. Additionally, we investigated the relationship between observed mortality-survivor outcomes and the accuracy of the scoring systems. We also conducted a statistical comparison of the reliability and effectiveness of all four scoring systems.

Material and methods

A retrospective single-center study was conducted, including patients aged 1 month to 18 years who were treated in the PICU between April and December 2021. The hospital is a third-level facility with a 52-bed Pediatric Intensive Care Unit that admits approximately 400 patients every six months. This diverse population of admissions includes cases of sepsis, respiratory failure, trauma, status epilepticus, genetic disorders, metabolic diseases, post-cardiac arrest, drowning and more during their stay in the PICU. This study included patients who were treated for any diseases, but excluded those who had no PRISM III recorded in electronic data. Patients whose age was not between 1 month and 18 years were also excluded.

Demographics, medical history, co-morbidity, length of stay, use of mechanical ventilation, Glasgow Coma Scale (GCS), labs, history of arrest, use of catheter, enteral nutrition, organ failure and/or need for dialysis, morbidity, development of sequelae, and mortality are examined. In addition, need for ventilatory and/or nutritional support at discharge from PICUs was assessed. In addition, the study recorded the patients' PRISIM III, PELOD-2, PIM 3, and PSOFA scores.

In this study, the PRISM III was recorded in the patient's electronic file according to our hospital's quality standards. The study team recorded the PELOD-2, PIM 3, and PSOFA scores on data forms using the same scoring calculator.

During the examination of our patients' complete blood count, we evaluated the values of hemoglobin, leukocytes, lymphocytes, and thrombocytes based on Z scores according to age. The study investigated transaminases for hepatic involvement, serum urea and creatinine for renal involvement, and prothrombin time and activated thromboplastin time for bleeding disorders. Significant deterioration was defined as an increase of 2 times or more from the normal value for age. The patients' radiological imaging was interpreted according to widely accepted diagnostic criteria outlined in relevant guidelines.

The data collected was recorded as patient data. For the study, the ethics committee approval was obtained from the Harran University Clinical Research Ethics Committee prior to the study's commencement. Family consent was not obtained for the patients included, as this was a retrospective study.

Statistical analysis

Statistical analyses were conducted using IBM® SPSS® 26 (SPSS Inc., Chicago, IL, USA) software. The normal distribution of variables was assessed using analytical methods (Kolmogorov-Smirnov test). Descriptive analyses were presented as mean±standard deviation for continuous data. The study presented descriptive statistics by providing frequency and percentage values for categorical variables related to sociodemographic and clinical information. To compare the scores of risk assessment parameters between the mortality/survival groups Mann Whitney U test was used for nonparametric parameters. For comparing categorical variables, either Pearson's Chi Square or Fisher's Exact Chi Square test was used. The study evaluated the effectiveness of four risk assessment parameters (PRISM, PELOD-2, PSOFA, and PIM 3) in determining mortality through Receiver Operating Characteristics (ROC) analysis, and determined cut-off value with youden index. For each parameter, the area under the curve (AUC) and cut-off values were calculated. Only results with a *p*-value below 0.05 were considered statistically significant.

Results

This study included 300 patients over a period of 6 months, of whom 174 (58%) were male and 126 (42%) were female, with a mean age of 48.60±67.21 months and a mean hospital stay of 56.73±105.95 days. Pneumonia was the most frequent diagnosis among hospitalized patients, accounting for 30% (n=90) of cases. Of the 300 patients studied, 156 (52%) had comorbidities. At the time of hospitalization, 144 (48%) patients had a Glasgow Coma Scale (GCS) score of less than 8, and 58 (19.3%) had a history of cardiac arrest before admission. Upon admission, 46.3% (n=139) of these patients required intubation and respiratory support via mechanical ventilation. Among our patients, 56 (18.7%) died. Table 1 shows the descriptive analysis of the patients enrolled in our study.

The laboratory test results of the patients revealed the following: 137 (45.7%) had leukocytosis, 39 (13%) had leukopenia, 72 (24%) had anemia, 18 (6%) had thrombocytopenia, 104 (34.7%) had respiratory acidosis, and 60 (20%) had metabolic acidosis. Transaminase elevation was observed in 39 (13%) patients, renal dysfunction in 33 (11%), and bleeding disorders in 13 (4.3%) patients. Upon examination of the posteroanterior chest radiographs, 119 (39.7%) cases of pneumonic infiltration, 19 (6.3%) cases of pulmonary edema, 16 (5.3%) cases of increased aeration consistent with acute bronchiolitis, and 4 (1.3%) cases of pneumothorax were observed.

Table 1. Characteristics of 300 critically Ill children admitted to PIC

Characteristics	Patients
Age (mean (±SD))	48.60±67.21 months
Gender (patient/%)	Male (174/58%) Female (126/42%)
Lenght of PICU days	56.73±105.95
Diagnosis of Hospitalization (patient/%)	Pneumonia (90/30%) Respiratory Failure (45/15%) Trauma (35/11.7%) Sepsis (25/8.3%) Acute Bronchiolitis (22/7.3%) Status Epilepticus (14/4.7%) Heart Failure (13/4.3%) Chronic Renal Failure (11/3.7%) Postoperative Surgery (10/3.3%) Drowning (10/3.3%) Congenital Metabolic Diseases (6/2%) Supraventricular Tachycardia (5/1.7%) Insect Bite (3/1%) Hemolytic Uremic Syndrome (3/1%) Encephalitis (2/0.7%) Gastrointestinal System Bleeding (2/0.7%) Diabetic Ketoacidosis (2/0.7%) Hanging (2/0.7%)
Comobidities (patient/%)	Yes (156/52%) No (144/48%)
Glascow Coma Scale (patient/%)	<8 (144/48%) >8 (156/52%)
Cardiac Arrest History (patient/%)	Yes (58/19.3%) No (242/80.7%)
First Admission Center (patient/%)	Emergency Department (200/66.7%) General Pediatrics Clinic (64/21.3%) Other Hospitals (30/10%) Postoperatively (6/2%)
First Respiratory Support (patient/%)	Intubation (139/46.3%) Bilevel Positive Pressure (73/24.3%) Oxygen Mask Support (38/12.7%) High Flow Nasal Cannulas (34/11.3%) Room Air (16/5.3%)
Current Status of Patients (patient/%)	Transferred to Clinics (148/49.3%) Still in PICU (29/9.7%) Transferred to Other Clinics/Home (67/22.3%) Exitus (56/18.7%)
Mortality (patient/%)	Alive (244/81.3%) Exitus (56/18.7%)

*PICU: Pediatric intensive care unit

In 45.6% of all patients, a central venous catheter was used for treatment, with the jugular vein being the most common insertion site (86.8%), followed by the femoral vein (9.5%) and subclavian vein (3.6%). Throughout the study period, 106 (35.3%) patients did not exhibit any secondary organ involvement. Of those who did, 88 (29.3%) had renal involvement, 29 (9.7%) had pulmonary involvement, 15 (5%) had cardiac involvement, and 10 (3.3%) had liver involvement. Furthermore, 18 (6%) patients had multiple affected organs. As a result, 16 (5.3%) underwent hemodialysis and 9 (3%) underwent peritoneal dialysis. Upon re-examination of patients transferred from the PICU after treatment, sequelae were evaluated. Of the patients, 29% were fed through a nasogastric tube and 0.7% through a gastrostomy. Additionally, 17% had a tracheostomy, 23% required oxygen support through a basic oxygen mask, and 9% showed clinical neurological involvement in the central nervous system.

The results of our study demonstrated a statistically significant relationship between all four scoring systems and mortality (Table 2). We also determined the most sensitive scoring system. The susceptibility levels and success rates of demonstrating mortality were listed, and the ROC analysis was used to evaluate the predictive success rate of mortality scoring systems in terms of sensitivity and specificity. The best to worst systems were PRISM III, PELOD-2, PSOFA, and PIM 3, as determined by the area under the curve (AUC) of the ROC curve. Figure 1 shows the ROC curve and area under the curve. Table 3 provides a detailed summary of the effectiveness of mortality scoring systems in terms of specificity and sensitivity.

Table 2. The relationship between all four scoring systems and mortality

Variables	General	Alive	Exitus	*p* value	*Z* values
PRISM III (median (IQR))	20 (20)	16 (15.2)	35 (17)	**<0.0001**	-9.042
PELOD-2 (median (IQR))	6 (10)	3 (9)	12 (14)	**<0.0001**	-6.925
PSOFA (median (IQR))	6 (10)	5 (10)	12 (14)	**<0.0001**	-6.160
PIM 3 (median (IQR))	3 (3)	3 (2)	5 (2)	**<0.0001**	-6.099

*PRISM III: The Pediatric Risk of Mortality Score III, PELOD-2: Pediatric Logistic Organ Dysfunction 2, IQR: Interquartil Range
PSOFA: Pediatric Sequential Organ Failure Assessment, *Mann Whitney U analysis was used to compare the groups
PIM 3: Pediatric Index of Mortality 3

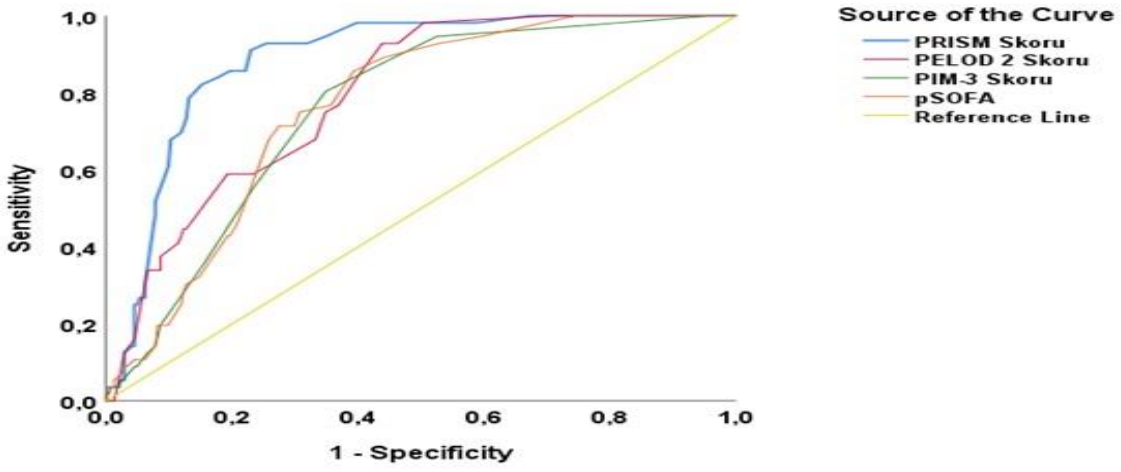

Figure 1. PICU scoring systems: evaluating their effectiveness with ROC analysis
(PRISM III: The Pediatric Risk of Mortality Score III; PELOD-2: Pediatric Logistic Organ Dysfunction 2; PSOFA: Pediatric Sequential Organ Failure Assessment; PIM 3: Pediatric Index of Mortality 3). The area under the curve values were evaluated based on the ROC analysis and compared to the reference line. Figure 1 shows the predictive success rate of mortality scoring systems in terms of sensitivity and specificity

Table 3. PICU scoring systems and their effectiveness evaluation

Variables	AUC	Standard error	*p* value	95% CI		Sensitivity (%)	Spesifity (%)	Cut-Off value	Predicted success order number*
				Lower limit	Upper limit				
PRISM III	0.887	0.020	**<0.0001**	0.847	0.927	83.9	82.4	27.5	1
PELOD-2	0.795	0.028	**<0.0001**	0.741	0.850	67.9	66.8	9.5	2
PSOFA	0.763	0.029	**<0.0001**	0.706	0.821	71.4	72.5	10.5	3
PIM 3	0.758	0.031	**<0.0001**	0.698	0.818	80.4	65.2	3.5	4

ROC analysis was performed and $p<0.05$ was statistically significant, AUC: Area Under Curve, PIM 3: Pediatric Index of Mortality 3
*Mortality Prediction Success Ranking by AUC Value, *PRISM III: The Pediatric Risk of Mortality Score III, CI: Confidence Interval
PELOD-2: Pediatric Logistic Organ Dysfunction 2, PSOFA: Pediatric Sequential Organ Failure Assessment

No statistical difference was found between mortality and age, length of stay in the PICU, or comorbidity, or first admission center ($p>0.05$). However, a significant relationship was found between mortality and lower GCS, type of diagnosis, first respiratory support, and cardiac arrest history ($p<0.0001$). In laboratories, there was no association between complete blood count, urea/creatinine, and coagulopathy ($p>0.05$). However, we did detect a significant association between blood gas samples and transaminases ($p<0.0001$). Although our study found no relationship between the use of central venous catheters, dialysis, and mortality ($p>0.05$), a statistically significant relationship was observed between organ failure ($p<0.0001$) and mortality. The statistical relationship between mortality and clinical and laboratory data, along with the corresponding point *p*-values, are presented in Table 4.

Table 4. The statistical relationship and distributions for mortality

		Alive	Exitus	*p* values	*Z/X²* values
Clinical/ laboratory data	**Age (month) (median (IQR))**	14 (68)	23 (84)	0.336	-0.420 z
	Length of stay in the PICU (day) (median (IQR))	19 (54.5)	14 (27)	0.462	-1.589 z
	Presence of comorbidity (n/%)	122 (49.8)	34 (61.8)	0.148	2.095 X^2
	First admission center (n/%)	142 (65.7)	38 (76)	0.462	2.577 X^2
	GCS < 8 (n/%)	79 (36.6)	42 (84)	**<0.0001**	35.609 X^2
	Respiratory support (n/%)	83 (38.4)	41 (82)	**<0.0001**	34.376 X^2
	Cardiac arrest history (n/%)	19 (8.8)	23 (46)	**<0.0001**	30.601 X^2
	Complete blood count abnormality n/%)	216 (88.5)	50 (89.2)	0.379	3.082 X^2
	Anormal urea/creatinine (n/%)	24 (11.1)	9 (18)	0.207	1.595 X^2
	Coagulopathy (n/%)	9 (4.2)	4 (8)	0.276	1.186 X^2
	Anormal blood gas tests (n/%)	123 (56.9)	41 (82)	**<0.0001**	24.078 X^2
	High transaminases (n/%)	26 (12)	13 (26)	**0.015**	5.913 X^2
	Central venous catheter using (n/%)	108 (50)	29 (58)	0.114	5.948 X^2
	Dialysis using (n/%)	20 (9.3)	5 (10)	0.444	1.625 X^2
	Organ failure (n/%)	121 (56)	38 (76)	**<0.0001**	79.831 X^2

*PICU: Pediatric Intensive Care Unit, z: Mann Whitney U analysis and X^2 : *Chi Square test* was used to compare the groups
GCS: Glasgow Coma Scale, IQR: Interquartil Range

Discussion

The PICU is capable of treating many critical and dynamic diseases. During this period, children may experience additional problems in addition to their serious illness. During this crucial period, it is important for paediatric intensive care physicians to maintain treatment that minimises pain, anxiety, and complications for their patients. Additionally, establishing healthy communication with the patient's family is essential [12, 13]. The factors that affect mortalities and morbidities include the number of patients, the number of intensive care specialists and nurses per patient, the criteria for admission to the intensive care unit, the diagnosis, underlying diseases, and invasive procedures applied. It is important to consider all of these factors when evaluating patient outcomes [14]. The hospital is a third-level facility with a 52-bed PICU that admits approximately 400 patients every six months. The patients admitted to the PICU have a variety of conditions, including sepsis, respiratory failure, trauma, status epilepticus, genetic disorders, metabolic diseases, post-cardiac arrests, and drownings. During their stay in the PICU, patients receive specialised care. This study includes patients who were treated for any disease. The hospital is located in the southeastern region of Türkiye, where the local population has lower sociocultural and socioeconomic status. These factors contribute to higher patient mortality rates. Multi-parameter studies are essential for evaluating a large number of patients and determining the feasibility and effectiveness of mortality predictive scoring systems. Early recognition of critical and high-risk patients can decrease mortality rates, and identifying the most effective system is crucial for some PICUs, including ours.

In a study carried out in our country, it was found that among patients admitted to the PICU, respiratory diseases were the most common reason for having to go to the PICU [15-19]. In our study, pneumonia was found to be the most common reason for hospitalization, affecting 90 patients (30%). This was followed by respiratory failure, which affected 45 patients (15%). The patient group that most frequently requires PICU care consists of those with chronic diseases and ongoing care needs. With the advancement of medicine, it is now possible to treat and save many children who are born prematurely and have underlying neurological, genetic, metabolic, and cardiological issues. In studies conducted in our country, Konca et al. [18] reported comorbidities in 25.5% of cases, Oz et al. [16] in 41.8%, and Tekerek et al. [12] in 47.2%. Contrary to the literature, 156 (52%) of the patients included in our study had comorbidities. This situation is linked to the sociocultural and socioeconomic status of our hospital's region, which has a high rate of consanguineous marriage and malnutrition. Studies conducted in our country have reported rates of intubation need and mechanical ventilation support in the PICU ranging from 24.1% to 41.9% Khilnani et al. [20] reported that 20.68% of their patients required mechanical ventilators, while Goncalves et al. [21] reported 68.5% [12, 15-17]. It is suggested that the patient population in need of a PICU is related to the clinic. Out of the total patients, 200 (66.7%) were admitted to PICU from our hospital's emergency service. Of these patients, 139 (46.3%) required intubation and respiratory support with a mechanical ventilator upon admission.

It is widely accepted that higher mortality scores are associated with longer PICU stays and higher mortality rates. According to this hypothesis, a review of the literature reveals that in a 24-month study of 556 critically ill patients in the PICU from 2011-2012, 29 (5.2%) died, and a length of stay ranging from 0 to 155 days was reported [21]. In our country, PICU mortality rates range from 2.4 to 27.6% [12, 15-19]. The study detected a mortality rate of 18.7% and an average length of stay of 56.73±105.95 days. The study included 300 pediatric patients with diverse and complex diseases, which may have influenced mortality and hospitalization rates. Therefore, the results reflect the actual progression of critically ill patients in the PICU.

In a study conducted by Gonzalez Luis et al. [22], the mean PRISM score for deceased patients in the PICU was 26.6, with a 54% probability of death. Surviving patients in the PICU without neurological dysfunction had a mean PRISM of 10.8 and a mean probability of death of 9.1%. At PICU admission, the average PRISM III score of our patients was 22.13±16.87, regardless of neurologic dysfunction. 52% of the included patients had comorbidities. However, our study found a lower average PRISM III score.

The study conducted by van Keulen et al. [2] on the reliability of PRISM and PIM scoring revealed that despite having fewer variables, the inter-observer variability in PIM scoring was higher than that of PRISM scoring. In a 2009 study evaluating prognosis and prognostic research in clinical practice, it was found that the PELOD-2 scoring system was less reliable than PRISM III in detecting mortality. PRISM III is a predictive mortality scoring system that has been shown to be more sensitive in certain populations. There is no universally accepted scoring system, therefore, it is necessary to conduct population validation studies before applying it in a different setting [23]. Currently, mortality scoring systems are widely studied, examining both commonalities and differences. Some groups attempt to adapt and enhance adult scoring systems for use with pediatric patients. PSOFA was developed to address the inadequate scaling of PELODS and PELOD-2 for children [5]. The main difference between PSOFA and PELOD-2 is that, in addition to the paO2/fiO2 ratio, the saO2/fiO2 ratio is also used. This allows for a more sensitive understanding of the pathology of pediatric pulmonary systems [11]. When creating the scoring system, we accepted the score obtained in the PELOD score as 1 point. Scores between 2 and 4 are adapted to adult SOFA criteria. The parameters are calculated every 24 hours, and the worst values are used as a basis. PSOFA, PRISM, and PIM 2 were found to be reliable for mortality based on the ROC curve. In the Egypt study conducted in the PICU, it was found that SOFA score was significantly higher in nonsurvivors [24]. In our heterogeneous population, we aimed to examine which scoring system is the most sensitive for predicting mortality based on these studies. Additionally, susceptibility levels were listed and mortality was demonstrated successfully through ROC analysis. In ROC curve analysis based on AUC, the predictive success rates of mortality scoring systems in terms of sensitivity and specificity were ranked from best to worst as follows: PRISM III, PELOD-2, PSOFA and PIM 3.

The study was retrospective and did not include patients with haematological oncology, patients with immunodeficiency or patients who had undergone surgery for congenital heart disease due to physical and equipment deficiencies in our hospital. These patient groups have a high risk of mortality, so they score highly. In contrast, it is noted that the facility accommodated a diverse group of 300 patients within a brief six-month period, and serves as an indicator of a tertiary hospital that houses the sole pediatric intensive care unit in a densely populated city with socio-economic challenges. The importance of these four scoring systems in comparison to other mortality scoring systems is further highlighted by the lack of studies that have compared them. Based on this study, multicenter prospective studies in which diseases are classified separately for the type of the disease are evaluated instead of heterogeneous groups can be planned in the future to investigate scoring systems.

In the management of critically ill patients with a high risk of mortality, it is essential to be able to predict the risk of death on admission and to act with caution. The aim is generally to reduce mortality by using a scoring system that is more suitable for the patient population. There is no universally accepted standard for the mortality scoring system. Therefore, it is necessary to conduct population validation and review studies before applying it in a different setting. In our study of a large and diverse pediatric population, we evaluated the predictive success rates of various mortality scoring systems in terms of sensitivity and specificity. The results showed that PRISM III had the highest success rate, followed by PELOD-2, PSOFA, and PIM 3 in descending order.

Based on our study, we conclude that the PRISM III scoring system is primarily successful and suitable for predicting PICU mortality. However, further multicenter, prospective studies are needed for clearer data as there is no gold standard among mortality predictive systems according to current studies.

Conflict of interest: No conflict of interest was declared by the authors.

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Authors' contributions to the article

H.F.A. conceived the idea. H.F.A., S.R., M.C.S. and M.A.T. were involved in clinical care/following of the patients. S.R., M.A.T., and H.F.A. collected data. M.C.S. performed statistical analyzes of the data. H.F.A. wrote the first draft of the manuscript which was critically revised by all the authors. All authors read and approved the final version of the manuscript.