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ORIGINAL RESEARCH

Predictive Value of Cardiac Troponin Combined with p-SOFA Score in Sepsis Children with PCIS ≥ 70

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Objective: To analyze the prediction value of cardiac troponin I (cTnI), cardiac troponin T (cTnT), and the pediatric Sequential Organ Failure Assessment (p-SOFA) score in children with severe sepsis.

Methods: 80 children with sepsis [Pediatric Critical Illness Score (PCIS) ≥70] were selected and categorized into severe sepsis group (PCIS score of 71–80, n=52) and non-severe sepsis group (PCIS score >80, n=28) according to the PCIS score, and 50 non-septic children admitted to our hospital during the same period were selected as non-sepsis group. The value of cTnT, cTnI, p-SOFA and their combination in predicting the occurrence of severe sepsis was analyzed. The relationship between the each indicator and poor prognosis of children with severe sepsis was analyzed.

Results: The plotted ROC curves revealed that the AUC values for predicting the occurrence of severe sepsis were as follows: cTnT: 0.897 (95% CI: 0.787–0.972), cTnI: 0.881 (95% CI: 0.788–0.975), p-SOFA: 0.795 (95% CI: 0.701–0.890), and their combination: 0.935 (95% CI: 0.883–0.988). Regression analysis showed that cTnT, cTnI, p-SOFA score, CRP and PCT levels were significantly associated with the poor prognosis of children with severe sepsis ($p < 0.01$).

Conclusion: cTnI, cTnT, and p-SOFA are closely related to the inflammatory response in children with severe sepsis, and the combination of the three indicators can effectively assess the severity of sepsis. The elevated levels of cTnI and cTnT and increased p-SOFA score are closely associated with the poor prognosis of children with severe sepsis.

Keywords: cardiac troponin I, cardiac troponin T, pediatric sequential organ failure assessment score, severe sepsis, prognosis

Introduction

Sepsis is caused by a dysregulated immune response to inflammatory factors, leading to organ system dysfunction and potentially progressing to septic shock or severe sepsis.[1,2] Epidemiologic investigations have found that sepsis is one of the leading causes of death in pediatric intensive care units, with about 181/100,000 new cases in China, with a case-fatality rate as high as 9%-35%, and 1.2 million new cases each year globally.[3] The disease is characterized by rapid onset, progression, and poor prognosis, and has become a public health burden worldwide. Therefore, early identification, diagnosis, and treatment are particularly critical to improve the prognosis of children with sepsis. According to the latest definition of sepsis 3.0,[4] the current diagnosis and treatment of sepsis is more focused on assessing organ function. The pediatric Sequential Organ Failure Assessment (p-SOFA) score reflects life-threatening organ dysfunction with due regard to the physiological age characteristics of children.[5]

It has been found that the immune inflammatory response and toxins produced by the invasion of pathogenic bacteria into the body cause nonspecific immune dysfunction, exacerbate immune deficiencies and infections, and induce renal impairment and hepatocellular necrosis.[6] Meanwhile, the inflammatory response can cause the release of creatine kinase isoenzyme (CM-MB) and cardiac troponin (cTn), which aggravate the degree of myocardial tissue injury. According to relevant literature, cardiovascular dysfunction is a critical characteristic of severe sepsis, and the proportion of sepsis deaths due to cardiovascular injury is as high as 30%-80%.[7] Therefore, the search for specific and sensitive cardiac-related markers has been widely emphasized in the diagnosis, prognosis, and assessment of sepsis. cTn belongs to

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a contractile protein filamentous structure composed of three subunits [cardiac troponin I (cTnI), cardiac troponin T (cTnT), and cardiac troponin C (cTnC)], which specifically reflects myocardial injury.[8] Previous studies have demonstrated that serum cTn concentration is a primary biomarker for the diagnosis of acute coronary syndrome and also plays an important role in risk stratification of patients with pulmonary embolism. In addition, serum cTn levels are regarded as a universal biomarker of myocardial injury, regardless of the underlying cause. Recent literature reviews have indicated that in patients with chronic cardiovascular diseases such as chronic coronary syndrome, chronic lower limb ischemia, and cerebrovascular disease, serum cTn concentrations are significantly higher than those in individuals without cardiovascular disease and are closely associated with multiple subclinical indicators of cardiovascular dysfunction, including carotid intima-media thickness, pulse wave velocity, ankle-brachial index, coronary artery calcification index (Agatston score), and flow-mediated vasodilation. These findings suggest that cTn not only reflects acute myocardial injury but may also serve as an important indicator for assessing subclinical cardiovascular damage.[9] However, its clinical significance across different disease states and populations requires further investigation.

Based on the above background, this study conducted a comparative analysis of cTnI, cTnT, and p-SOFA scores among children with non-severe sepsis, severe sepsis, and non-sepsis, aiming to explore the correlation between cTn levels and disease severity as well as prognosis in children with sepsis. The findings may provide reference evidence for the early assessment of myocardial injury and prognostic evaluation in children with sepsis.

Materials and Methods

General Data

This study utilized a retrospective analysis method, selecting clinical data from 80 pediatric sepsis cases treated in our hospital between June 2020 and July 2022, which were categorized as the sepsis group. All children in the sepsis group met the following criteria: Pediatric Critical Illness Score (PCIS) ≥70, first-episode sepsis, and met the diagnostic criteria for sepsis jointly released by the American College of Critical Care Medicine (ACCM) and the European Society of Intensive Care Medicine (ESICM).[10] In the sepsis group, there were 43 males and 37 females, aged 1–12 years, with a mean of (7.0±1.4) years. The sites of infection were as follows: 11 cases in respiratory system, 24 cases in urinary system, 22 cases of hematogenous infection, 6 cases in central nervous system, 6 cases in digestive system, and 11 cases in other sites. Additionally, medical records of 50 non-septic children admitted to our hospital during the same period were selected as the control group. The selection of the non-sepsis group was based on the same timeframe and similar admission criteria. Although randomization and matching were not applied during the selection process, cases were chosen to be relatively matched with the sepsis group in terms of basic characteristics such as age and sex. In the non-sepsis group, there were 26 males and 24 females, aged 1–12 years, with a mean of (7.2±1.5) years.

Eligibility Criteria

(1) Inclusion criteria: children aged ≤12 years; diagnostic criteria were based on the Surviving sepsis campaign: international guidelines for the management of severe and septic shock 2012[11] and the Expert Consensus on the Diagnosis and Treatment of Septic Shock (Infectious Shock) in Children (2015 edition);[12] severe sepsis was defined as uncontrolled host response to infection leading to life-threatening organ failure,[13] PCIS[10] ≤90; first-episode sepsis; the children's family voluntarily signed informed consent form. This study was approved by the Ethics Committee of Shu Yang Hospital of TCM (approval number: 20221104–009) and adhered to the Declaration of Helsinki.

(2) Exclusion criteria: malignant tumor; death within 24 h after enrollment; concomitant chronic liver disease, chronic kidney disease, inflammatory intestinal disease, hypoglycemia, malnutrition, primary cardiomyopathy, primary immune deficiency and other diseases; history of severe drug allergy; coagulation dysfunction; major surgical treatment before enrollment; hormones, immunosuppressants, antibiotics, and other drugs that might affect the research results before enrollment; concomitant jaundice, connective tissue disease, congenital malformation, and chromosome disease.

Methods

The Severity of Sepsis

The PCIS scale consists of 11 items (respiratory rate, hemoglobin, blood pressure, heart rate, gastrointestinal system symptoms, etc)., with higher scores indicating milder conditions; ≤70 points are classified as very critical, 71–80 points as critical, and >80 points as non-critical. In this study, children with excessively severe conditions or poor clinical prognoses (≤70 points) were excluded to ensure that the study focused on a representative group of pediatric sepsis cases, those with 71–80 points were included in the severe sepsis group, and those with >80 points were included in the non-severe sepsis group.

Serum Laboratory Tests

5 mL of venous blood was collected within 24 h after admission and centrifuged at low temperature (speed of 3000 r/min, radius of 6 cm) for 10 min. The supernatant was taken and placed in the refrigerator at −80 °C for further use. The white blood cell (WBC) counts were determined using a hematology analyzer (Shanghai Huanxi Medical Co., Ltd)., and the levels of procalcitonin (PCT) and C-reactive protein (CRP) were determined by radioimmunoassay (kit provided by Shanghai Xinyu Biotechnology Co., Ltd). The levels of cTnI and cTnT were determined using a fully automated chemiluminescent immunoassay analyzer (Beckman Coulter), and the detection assay was chemiluminescence, and the kits were also provided by Beckman Coulter.

p-SOFA Score

The p-SOFA score was assessed within 24 h after admission using the age-adjusted Sequential Organ Failure Assessment (SOFA) score scale modified by Matics[14] et al. The p-SOFA scale includes a total of six system or organ functions (neurological, circulatory, hepatic, coagulation, respiratory, and renal), with a score of 0–4 for each, with a high score representing a serious condition, and score of ≥2 for each representing organ or system dysfunction.

Prognosis

All children received standardized basic disease treatment, complication prevention and treatment after admission, and the death of the children within 28 d after admission was counted, and the dead children were included in the death group.

Statistical Analysis

All data analyses were conducted using the SPSS 26.0 statistical software. Quantitative data were assessed for normality using the Shapiro–Wilk test. Normally distributed data were expressed as mean ± standard deviation (mean ± SD) and compared between groups using the independent samples *t*-test. Non-normally distributed data were expressed as the median and interquartile range [median (IQR)] and analyzed between groups using the Brunner-Munzel test for data with heterogeneity of variance or dissimilar distributions, or the Kruskal–Wallis *H*-test for multiple group comparisons. Categorical variables were presented as absolute frequencies and percentages [n (%)], with intergroup comparisons conducted using the chi-square test or Fisher's exact test (when expected frequencies were <5). For multiple comparisons, the Bonferroni correction method was applied. Correlation analysis was conducted using Pearson correlation coefficient for normal distributions or Spearman's rank correlation coefficient for non-normal distributions. Linear regression analysis was employed to examine the association of cTnT, cTnI, and p-SOFA scores with clinical characteristics. $p < 0.05$ was considered statistically detectable (two-tailed test).

This study primarily used univariate analysis to evaluate the predictive abilities of cTnI, cTnT, and p-SOFA score. Additionally, the combined predictive efficacy of these variables for critical sepsis was assessed through ROC curve analysis. Given the relatively small sample size and the study's focus on the independent predictive value of each variable, multivariable regression analysis was not conducted. In future research, the sample size will be expanded to further explore the interactions among variables and their integrated predictive performance.

Results

Baseline Characteristics of the Study Population

This study included 80 children with sepsis (PCIS ≥ 70) and 50 non-septic children. Baseline characteristics, including sex, age, body weight, height, and sites of infection, did not differ significantly among the three groups ($p > 0.05$), indicating comparability (Table 1).

To reduce the influence of potential confounding factors, children with chronic liver disease, chronic kidney disease, primary cardiomyopathy, primary immunodeficiency, malignancy, and other severe chronic underlying conditions were excluded at enrollment. In addition, patients who had received hormones, immunosuppressants, and other medications that might affect cardiac biomarker levels prior to enrollment were also excluded. All included children were born at term; preterm infants were not included. As the study population consisted of children with sepsis and the research focus did not involve perinatal assessment, Apgar scores at birth were not collected.

Comparison of Levels of Serum Laboratory Indicators and p-SOFA Scores Among the Three Groups

The levels of cTnT and cTnI and p-SOFA scores in severe sepsis group were higher than those in non-severe sepsis group and non-sepsis group ($p < 0.001$). The levels of cTnT and cTnI and p-SOFA scores in non-severe sepsis group were higher than those in non-sepsis group, exhibiting statistically detectable difference ($p < 0.001$) (Figure 1A–C). There was no difference in WBC among the three groups ($p > 0.05$). The levels of CRP and PCT in severe sepsis group were higher than those in non-severe sepsis and non-sepsis groups. The non-severe sepsis group exhibited higher CRP and PCT levels compared to the non-sepsis group, with statistically detectable differences ($p < 0.001$) (Figure 1D–F).

Correlation Between cTnT, cTnI, p-SOFA and Inflammatory Indicators

Pearson correlation analysis showed that cTnT ($r = 0.51$, $p < 0.01$), cTnI ($r = 0.47$, $p < 0.01$), and p-SOFA ($r = 0.42$, $p < 0.01$) were significantly positively correlated with CRP. In addition, cTnT ($r = 0.55$, $p < 0.01$), cTnI ($r = 0.52$, $p < 0.01$), and p-SOFA ($r = 0.56$, $p < 0.01$) were significantly positively correlated with PCT (Table 2 and Figure 2A–F).

The Value of cTnT, cTnI, p-SOFA and Their Combination in Predicting Severe Sepsis

Using the occurrence of severe sepsis (1=yes, 0=no) as the state change, and cTnT, cTnI, p-SOFA as the test variables, ROC curves were plotted. The results showed that the AUC values of cTnT, cTnI, p-SOFA, and their combination for predicting the occurrence of severe sepsis were 0.897 (95% CI: 0.787–0.972), 0.881 (95% CI: 0.788–0.975), 0.795 (95% CI: 0.701–0.890), and 0.935 (95% CI: 0.883–0.988), respectively, demonstrating strong predictive ability (Figure 3).

The critical values and clinimetrics indicators are as follows: the cut-off values were 0.152 ng/mL for cTnT, 0.251 ng/mL for cTnI, and 3 points for p-SOFA. The corresponding sensitivity and specificity were 0.750 and 0.808 for cTnT,

Table 1 Comparison of General Data Among the Three Groups (n, Mean ± SD)

General Data	Non-Sepsis Group (n=50)	Non-Severe Sepsis Group (n=28)	Severe Sepsis Group (n=52)	*p*
Sex (male/female)	26/24	15/13	28/24	0.981
Age (years)	7.2±1.5	7.1±1.2	6.9±1.5	0.569
BMI (kg/m^2)	15.29±1.55	14.60±1.61	14.84±1.41	0.12
Sites of infection				
Respiratory system	-	4	7	0.72
Urinary system	-	9	15	
Hematogenous infection	-	8	14	
Central nervous system	-	2	4	
Digestive system	-	2	4	
Other sites	-	3	8	

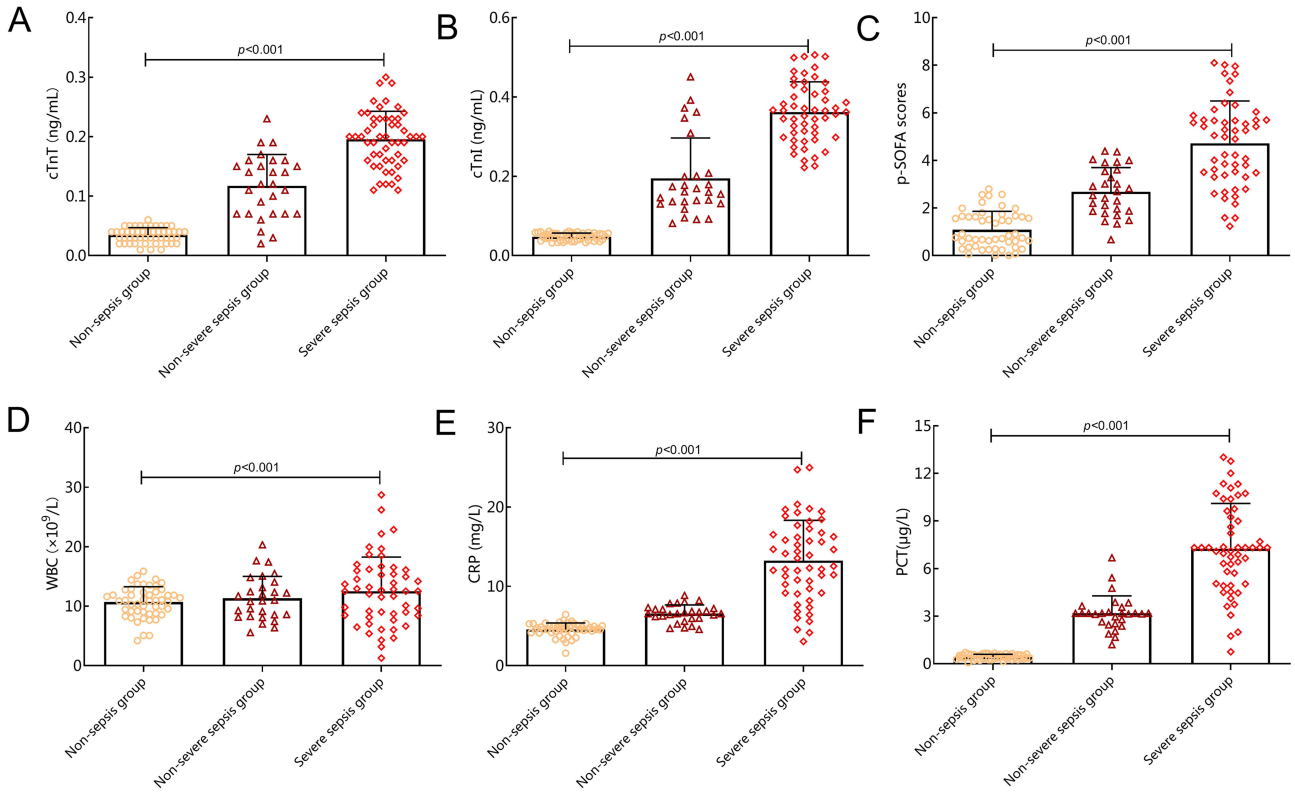

Figure 1 Comparison of levels of cTnT, cTnI, p-SOFA scores, and inflammatory makers among the three groups. (**A**) cTnT; (**B**) cTnI; (**C**) p-SOFA; (**D**) WBC; (**E**) CRP; (**F**) PCT.

0.786 and 0.788 for cTnI, and 0.714 and 0.731 for p-SOFA. The combined model exhibited a sensitivity of 0.750, a specificity of 0.865, and an AUC of 0.935, demonstrating superior predictive value. It was worth noting that the sensitivity and specificity of the p-SOFA score were approximately 70%, which is generally considered moderate. Nonetheless, these indicators retain clinical significance, particularly in the early screening and risk assessment of severe sepsis, where they provide valuable auxiliary support.

Comparison of Clinical Data of Children with Different Prognosis in Severe Sepsis Group

The 28-d case fatality rate of severe sepsis group was 46.15% (24/52). The sex, site of infection, age, body weight, height, and WBC of the death group were not statistically detectable compared with those of the survival group ($p > 0.05$). cTnT, cTnI, p-SOFA, CRP, and PCT of the death group were higher than those of the survival group, and the difference was statistically detectable (all $p < 0.01$). The use of vasopressors in the death group was significantly higher

Table 2 Correlation Analysis of cTnT, cTnI, and p-SOFA with Inflammatory Markers

Indicators	*r*	*p*	95% CI
CRP and cTnT	0.51	<0.01	0.33–0.66
CRP and cTnI	0.47	<0.01	0.28–0.63
CRP and p-SOFA	0.42	<0.01	0.22–0.58
PCT and cTnT	0.55	<0.01	0.37–0.68
PCT and cTnI	0.52	<0.01	0.34–0.67
PCT and p-SOFA	0.56	<0.01	0.38–0.69

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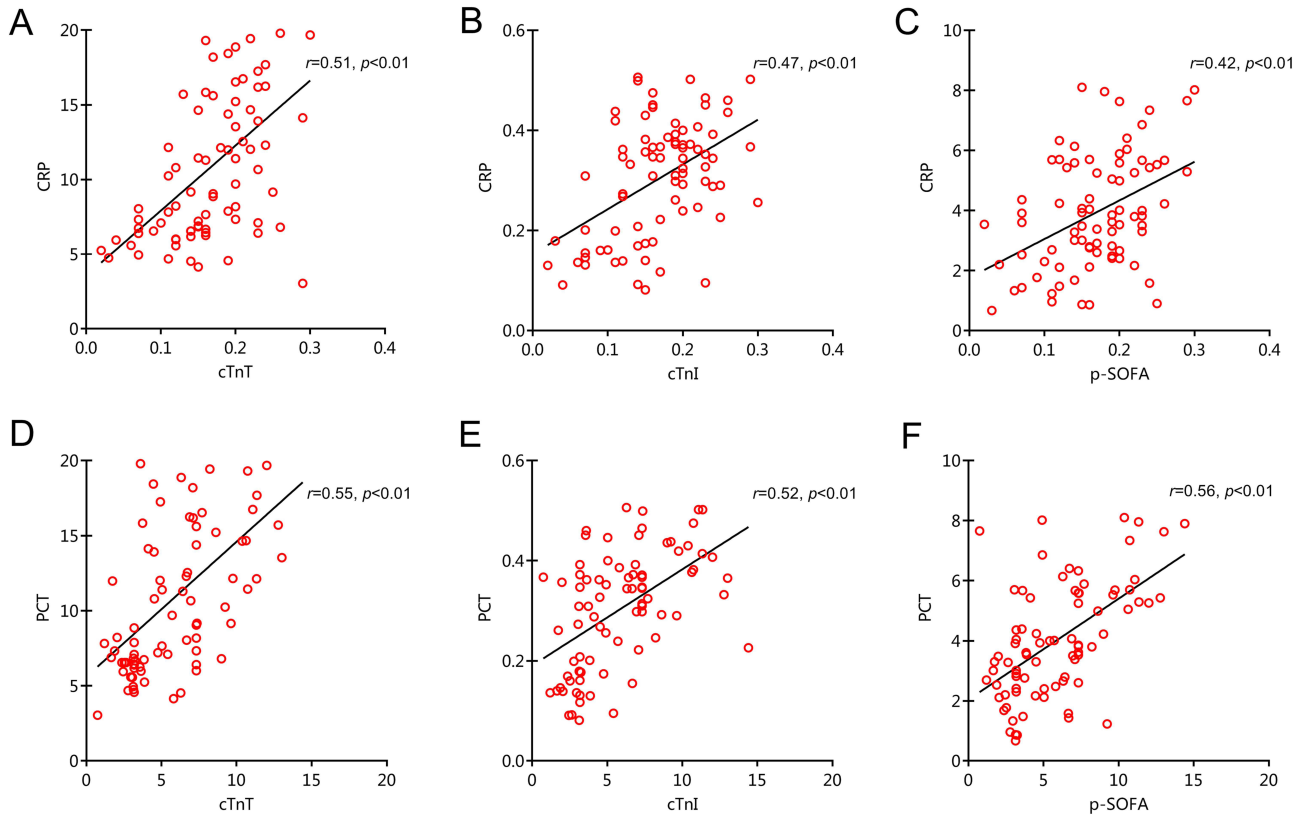

Figure 2 Correlation analyses of cTnT, cTnI, and p-SOFA with inflammatory markers. (**A**) Correlation analysis of CRP and cTnT; (**B**) Correlation analysis of CRP and cTnI; (**C**) Correlation analysis of CRP and p-SOFA; (**D**) Correlation analysis of PCT and cTnT; (**E**) Correlation analysis of PCT and cTnI; (**F**) Correlation analysis of PCT and p-SOFA.

than that in the survival group (62.5% vs 28.6%, $p = 0.04$), and the use of inotropes also increased markedly (75% vs 32.1%, $p = 0.03$). Moreover, elevated levels of cTnT, cTnI, and p-SOFA scores were closely associated with adverse clinical outcomes, such as mortality, suggesting that these indicators not only reflect the severity of the patients' conditions but also hold significant predictive value in determining the necessity for vasopressors or inotropes (Table 3).

Linear Regression Analysis

Linear regression analysis showed that cTnT level ($\beta = 3.447$, 95% CI: 1.628–5.265, $p < 0.001$), cTnI level ($\beta = 1.272$, 95% CI: 0.181–2.364, $p = 0.023$), p-SOFA score ($\beta = 0.092$, 95% CI: 0.053–0.130, $p < 0.001$), CRP level ($\beta = 0.035$, 95% CI: 0.018–0.052, $p < 0.001$), and PCT level ($\beta = 0.061$, 95% CI: 0.016–0.105, $p = 0.009$) were independent influencing factors for poor prognosis of children with severe sepsis (Table 4).

Discussion

Sepsis triggers cascade amplification and activation of inflammatory signaling pathways, which disrupts the balance between anti-inflammatory and pro-inflammatory factors and leads to impaired immune function of the body.[15,16] A survey in the United States found that the incidence of sepsis increased from 56/100,000 to 89/100,000 between 1995 and 2005.[17] Compared with adult patients, sepsis in children has the characteristics of high short-term mortality and rapid progression of the disease,[18] and most of the deaths in children occur within 3–7 d after admission. A research in China found that children with sepsis had a 71.7% risk of death within 3 d of hospitalization in a pediatric intensive care unit.[19] Several surveys in the United States have found that the mortality rate of children with septic shock and severe sepsis is 25–55% within 24 h of admission, and 65% and 76% within 3 d and 7 d of admission.[20,21] The results of this study showed that the 28-d case fatality rate of severe sepsis group was 46.15% (24/52), which was lower than the above findings, and the possible reason was related to the exclusion of very critical sepsis and septic shock cases in this study,

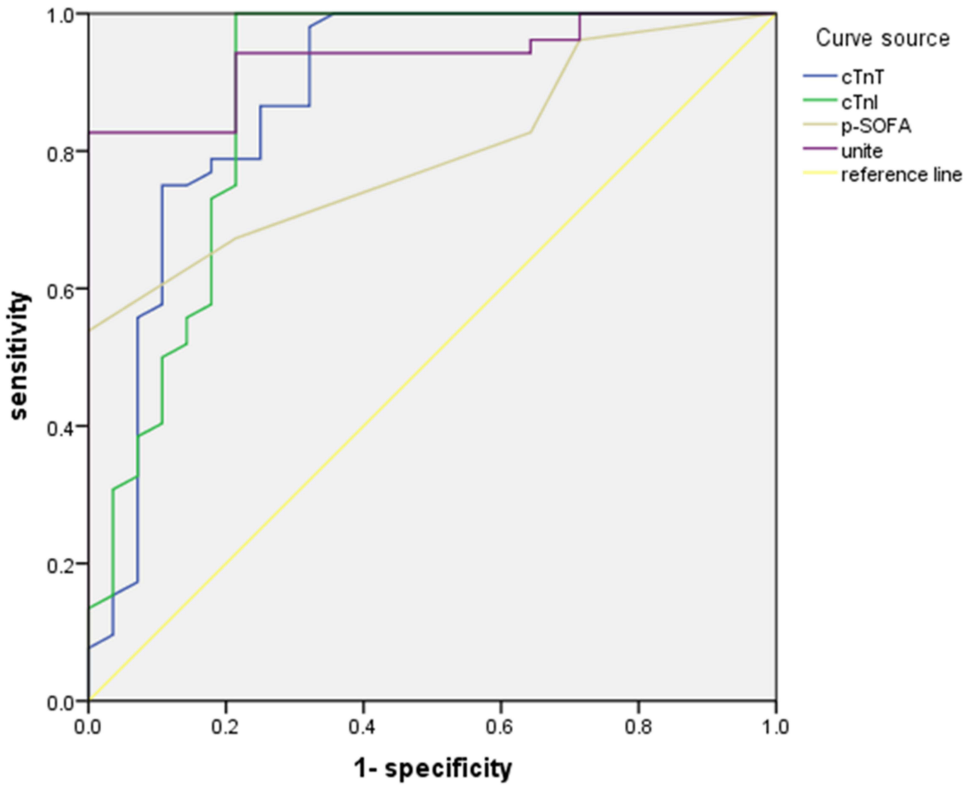

Figure 3 ROC plot of cTnT, cTnI, p-SOFA, and their combination in predicting the occurrence of severe sepsis.

but the results of this study showed that the 28-d case fatality rate of children with severe sepsis was still more than 25%, so the research on how to diagnose severe sepsis early and seek for predictive indicators of prognosis was a focus of intensive care physicians.It has been noted that cardiac dysfunction, which is dominated by impaired fiber breaks and vacuolar degeneration of cardiomyocytes, can increase the risk of poor prognosis in patients with sepsis.[22,23] Because early cardiac compensation in children with sepsis prompts a lack of specificity in the manifestation of their organic lesions, coupled with the low sensitivity of echocardiography to ventricular diastolic function and the susceptibility of the results of clinical judgment to cardiac rhythm disturbances and other factors, the search for a cardiac biomarker with high sensitivity and specificity has become a focus of research. When cardiomyocytes are damaged or myocardial cell membranes are ruptured, large amounts of cTnI and cTnT are released into the bloodstream, so serum levels of cTnI and cTnT can determine cardiac function and the degree of myocardial damage.[24,25] Forner et al[26] collected blood samples on the day of onset (1 d), 2 d, and 3 d of sepsis patients, and found that the AUC of serum cTnI level on the 1 d to predict all-cause mortality in sepsis was 0.658, and the AUC on the 3 d was 0.885, which had higher diagnostic value than N-terminal pro-brain natriuretic peptide (NT-proBNP), indicating that cTnI is a reliable tool for diagnosing the short-term prognosis of sepsis patients. Jiang et al[27] included 85 patients with sepsis and 72 healthy subjects, and the experimental results showed that serum cTnT levels had a high predictive value for sepsis patients and were closely related to the prognosis of patients. In this study, it was found that cTnT and cTnI levels were independent influencing factors for the poor prognosis of children with severe sepsis, which was similar to the findings of the above domestic and international studies, suggesting that the changes in serum cTnT and cTnI levels of children with severe sepsis should be followed up closely, and the clinical regimen should be adjusted or optimized to improve the prognosis of the children. Moreover, this study found no detectable differences in the effects of infection sites on cTnI, cTnT, and p-SOFA scores, which may be related to the limited sample size and uneven distribution of infection sites. This suggests that under current research conditions, the impact of infection sites on prognosis is limited, warranting further exploration in larger, multi-center studies in the future.

Table 3 Comparison of Clinical Data of Children with Different Prognosis in Severe Sepsis Group (n, Mean ± SD)

Factors		Death Group (n=24)	Survival Group (n=28)	*p*
Sex	Male (n=28)	14	14	0.55
	Female (n=24)	10	14	
Sites of infection	Respiratory system (n=7)	3	4	0.89
	Urinary system (n=15)	7	8	
	Hematogenous infection (n=14)	8	6	
	Central nervous system (n=4)	1	3	
	Digestive system (n=4)	2	2	
	Other sites (n=8)	3	5	
Age (years)		6.8±1.4	7.0±1.5	0.62
Body weight (kg)		21.26±3.65	21.85±2.84	0.52
Height (cm)		119.56±5.85	120.58±6.12	0.54
cTnT (ng/mL)		0.234±0.040	0.163±0.031	<0.001
cTnI (ng/mL)		0.408±0.066	0.323±0.062	<0.001
p-SOFA (points)		5.58±1.67	3.79±1.75	<0.001
WBC ($\times 10^9$/L)		12.69±3.54	12.02±3.76	0.51
CRP (mg/L)		16.50±4.46	10.41±3.79	<0.001
PCT (μg/L)		8.48±2.88	6.33±2.77	0.01
Use of vasopressors (%)		15 (62.5%)	8 (28.6%)	0.01
Use of inotropes (%)		18 (75%)	9 (32.1%)	<0.001

Research[28] has indicated that p-SOFA effectively reflects the severity of disease of critically ill children in the intensive care unit and predicts the prognosis of children. This study revealed that when the optimal cut-off value of the p-SOFA score was 3, its specificity and sensitivity for predicting severe sepsis were 0.731 and 0.714, respectively. Although these indicators demonstrate moderate levels of sensitivity and specificity, changes in the p-SOFA score remain reflective of the severity of illness and adverse prognosis in pediatric sepsis patients. Therefore, the p-SOFA score serves as a valuable tool for assessing the severity of illness and prognostic risk in pediatric patients with sepsis. This study further revealed through ROC curve analysis that the combined prediction of severe sepsis using cTnT, cTnI, and p-SOFA yielded an AUC of 0.935 (95% CI: 0.883–0.988). This suggests that in clinical practice, monitoring the dynamic changes of these three indicators can more effectively monitor disease progression in pediatric patients, enabling more targeted interventions to reduce case fatality rates.

Limitations

This study has some limitations. First, this study did not perform multivariable logistic regression analysis, despite its potential to provide a more comprehensive evaluation of the independent predictive effects of various variables on sepsis occurrence. Multivariable analysis offers the relative risk (OR) for each variable along with its 95% CI, enabling a more precise identification of risk or protective factors for severe sepsis. However, given the relatively small sample size of this study, employing multivariable regression analysis may lead to model overfitting, thereby affecting the robustness and reliability of the results. Therefore, in this study, we did not perform multivariable regression analysis but instead utilized univariate ROC curve analysis to assess the predictive ability of various indicators. In future research, increased

Table 4 Analysis of Factors Influencing the Prognosis of Pediatric Patients with Severe Sepsis

Independent Variable	*β*	Standard Error	Standardized Coefficients	*t*	*p*	95% CI
cTnT	3.447	0.903	0.344	3.815	<0.001	1.628–5.265
cTnI	1.272	0.542	0.192	2.347	0.023	0.181–2.364
p-SOFA	0.092	0.019	0.350	4.749	<0.001	0.053–0.130
CRP	0.035	0.008	0.354	4.216	<0.001	0.018–0.052
PCT	0.061	0.022	0.360	2.729	0.009	0.016–0.105
Constant	−1.709	0.192	-	−8.894	<0.001	−2.096–1.322

sample size and appropriate statistical methods (eg multivariable logistic regression analysis) will be considered to further explore the combined role of these variables in predicting severe sepsis. Moreover, while the ROC curve was employed to evaluate the predictive performance of variables, relying solely on the AUC value is insufficient to comprehensively reflect the model's goodness of fit. AUC measures only the model's discriminative ability, failing to assess its overall fit. Therefore, additional goodness-of-fit indicators, such as pseudo-R^2 values, will be supplemented in future studies to provide a more thorough evaluation of the model's predictive performance and adaptability.

Multivariable analysis was not used in this study mainly based on the following reasons: First, the aim of this study was to evaluate the independent predictive value of cTnI, cTnT, and p-SOFA scores, as well as their combined efficacy, rather than exploring interactions among them. Second, the limited sample size could render the model unstable if multivariable analysis was performed. Nevertheless, this study has several strengths. The study population was limited to sepsis children with PCIS scores ≥70, excluding the confounding effects of critically ill cases and thereby enhancing the specificity and clinical applicability of the findings. In addition, this study jointly analyzed cTnI, cTnT, and p-SOFA and evaluated their individual and combined predictive values using ROC curves, providing a more comprehensive assessment than previous studies that focused on a single marker. Future research should validate the findings of this study through multicenter, large-sample prospective studies and integrate dynamic monitoring at multi-time points to further explore the interaction mechanisms among these markers and their predictive value for the long-term prognosis of children with sepsis.

Conclusions

In conclusion, the levels of cTnI and cTnT and p-SOFA scores were closely associated with the occurrence and prognosis of sepsis, particularly demonstrating high sensitivity and specificity in predicting the onset and prognosis of severe sepsis. The combined use of these indicators could significantly enhance predictive accuracy, aiding in early diagnosis and the optimization of treatment strategies.

Data Sharing Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethics Approval and Informed Consent

The children's family voluntarily signed informed consent form. This study was approved by the Ethics Committee of Shu Yang Hospital of TCM.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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