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Original Research Article

Modified liverpool quick sequential organ failure assessment for prediction mortality amongst hospitalised patients

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ABSTRACT

Background: The aim of this study was to investigate the association between the Low-Quantitative Sepsis-related Organ Failure Assessment (LqSOFA) score and outcomes in pediatric patients with suspected infection.
Methods: The study included 100 pediatric patients who presented to the emergency department (ED) with suspected infection. The LqSOFA score was calculated for each patient based on the first set of vital signs and laboratory values obtained in the ED. The primary outcomes of interest were pediatric intensive care unit (PICU) admission, confirmed sepsis, and mortality.
Results: The study found that an LqSOFA score of >2 predicted PICU admission with approximately 88% sensitivity and 56% specificity, and confirmed sepsis with 88% sensitivity and 47% specificity. Furthermore, an LqSOFA score of >2 predicted mortality with 94% sensitivity and 48% specificity. The duration of hospital stay also increased with increasing LqSOFA score.
Conclusions: The LqSOFA score may be a useful tool for identifying high-risk pediatric patients with suspected infection who may benefit from early intervention. Future studies are needed to validate these findings and determine the optimal threshold for the LqSOFA score in this patient population.

Keywords: LqSOFA score, Mortality, Pediatric patients, PICU admission, Sepsis

INTRODUCTION

Sepsis is a life-threatening condition that arises when the body's response to an infection causes organ dysfunction.[1] Sepsis is a leading cause of death worldwide, accounting for approximately 20% of all deaths.[2] The early identification and treatment of sepsis are crucial to improving patient outcomes.[3] The Quick Sequential Organ Failure Assessment (qSOFA) scoring system is widely used to identify patients with sepsis and predict their risk of mortality.[4] However, recent studies have shown that the qSOFA scoring system has limitations in predicting mortality among hospitalised patients.[5] Therefore, there is a need for an improved scoring system that can accurately predict mortality among hospitalised patients with sepsis.

The Liverpool Quick Sequential Organ Failure Assessment (LqSOFA) scoring system is a modification of the qSOFA scoring system that was developed to improve the prediction of mortality among hospitalised patients.[6] The LqSOFA scoring system includes the same three parameters as the qSOFA scoring system: respiratory rate, altered mental status, and systolic blood pressure. However, the LqSOFA scoring system assigns different cut-off values to these parameters. In the LqSOFA scoring system, a respiratory rate of ≥22 breaths per minute, an altered mental status as measured by a

Glasgow Coma Scale (GCS) score of ≤13, and a systolic blood pressure of <100 mmHg are each assigned a score of one.[6]

Several studies have shown that the LqSOFA scoring system is more accurate than the qSOFA scoring system in predicting mortality among hospitalised patients with sepsis.[7-10] The LqSOFA scoring system has also been found to have a higher sensitivity and negative predictive value than the qSOFA scoring system.[8-10] However, there is a need for more studies to evaluate the LqSOFA scoring system's performance as a screening tool for promptly identifying patients with sepsis at the time of admission and act accordingly.

This study aims to evaluate the LqSOFA scoring system's performance as a screening tool for promptly identifying patients with sepsis at the time of admission and act accordingly. We hypothesise that the LqSOFA scoring system will accurately predict mortality among hospitalised patients with sepsis and serve as a valuable screening tool for promptly identifying patients with sepsis.

Aim of study was to evaluate LqSOFA scoring system as a screening tool for promptly identifying patients with sepsis at the time of admission and act accordingly.

METHODS

This prospective observational study was conducted over a period of six months at a tertiary care hospital, FAAMCH. The study included a sample size of 100 patients aged between 2 months to 12 years, who were admitted with a fever. Informed and written consent was obtained from all the participants before their enrolment in the study. The duration of the study was one year from January 2022 to December 2022.

Inclusion criteria

Patients admitted to FAAMCH, patients with a fever and patients aged between 2 months to 12 years were included.

Exclusion criteria

Patients with known immunodeficiency, patients with congenital malformations, patients with chronic diseases, and patients not willing to participate in the study were excluded.

Data collection

A detailed clinical examination was performed for all patients, and LqSOFA scoring was done using a scoring table. The LqSOFA score was calculated based on the following parameters: capillary refill time (CRT), alertness, verbal response, and pain response (AVPU), heart rate (HR), and respiratory rate (RR). The threshold for each component of LqSOFA was set at 1 point for abnormal scores and 0 points for normal scores.

Outcome measures

The study evaluated the outcome measures in terms of the duration of hospital stay, PICU admission, confirmed sepsis, and mortality. Data were analyzed using descriptive statistics, including frequencies and percentages, and chi-square tests were used to compare the categorical variables.

The study was conducted in accordance with the Declaration of Helsinki, and ethical approval was obtained from the institutional ethics committee. Written informed consent was obtained from the parents or guardians of all the participants.

Data analysis

Data were analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including frequencies and percentages, were used to summarize the data. The chi-square test was used to compare the categorical variables, and p-values <0.05 were considered statistically significant. Logistic regression analysis was performed to identify the predictors of the outcome variables.

RESULTS

The Table 1 shows the demographic distribution of the study participants. The study included 100 patients, of which 42 (42%) were between the ages of 2 months to 1 year, 44 (44%) were between 1 year to 5 years, and 14 (14%) were between 5 years to 12 years. In terms of gender, 61 (61%) were female, and 39 (39%) were male.

Table 1: Demographic variables.

		N	%
Age	2 months - 1 year	42	42
	1 Year - 5 years	44	44
	5 Years - 12 years	14	14
Sex	Male	61	39
	Female	39	61

Table 2: LqSOFA score VS PICU admission.

LqSOFA	Number of PICU admission	Percentage	Total patient admitted
0	0	0	7
1	0	0	10
2	4	4	24
3	10	10	34
4	20	20	25
7	34	34	100

The Table 2 shows the association between LqSOFA score and PICU admission. The study included 100 patients, and among them, 7 patients had an LqSOFA score of 0, and none of them were admitted to the PICU. Similarly, 10 patients had an LqSOFA score of 1, and none of them were admitted to the PICU. 24 patients had an LqSOFA score of 2, and 4 (4%) of them were admitted to the PICU. 34 patients had an LqSOFA score of 3, and 10 (10%) of them were admitted to the PICU. 25 patients had an LqSOFA score of 4, and 20 (20%) of them were admitted to the PICU. Lastly, 100% of patients (n=34) with an LqSOFA score of 7 were admitted to the PICU.

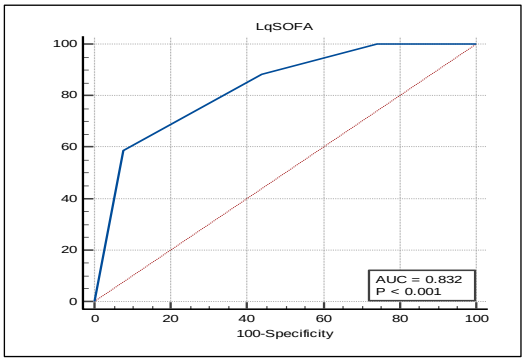

Figure 1: ROC curve LqSOFA score Vs PICU admission.

The AUC was 0.832 (p<0.001), indicating a good discriminatory power of LqSOFA score in predicting PICU admission. The sensitivity of LqSOFA score >2 in predicting PICU admission was 88.24%, with a 95% confidence interval (CI) of 72.5-96.7. The specificity was 56.06%, with a 95% CI of 43.3-68.3. The PPV was 50.8%, with a 95% CI of 43.4-58.2, and the NPV was 90.2%, with a 95% CI of 78.2-96.0 (Figure 1).

Table 3: LqSOFA score VS confirmed sepsis.

Confirmed sepsis			Total patients
LqSOFA	**Number**	**%**	
0	0	0	7
1	0	0	10
2	2	800	24
3	6	1800	34
4	9	3600	25
Total	17	62	100

Among the total of 100 patients admitted, 17 patients were confirmed to have sepsis according to the study criteria. The distribution of confirmed sepsis cases according to LqSOFA score showed that no patients with a score of 0 or 1 were confirmed to have sepsis. The highest number of sepsis cases (9 out of 25) was observed among patients with a score of 4, followed by patients with a score of 3 (6 out of 34). The percentage of sepsis cases increased with increasing LqSOFA score, from 0% in patients with a score of 0 or 1 to 36% in patients with a score of 4 (Table 3).

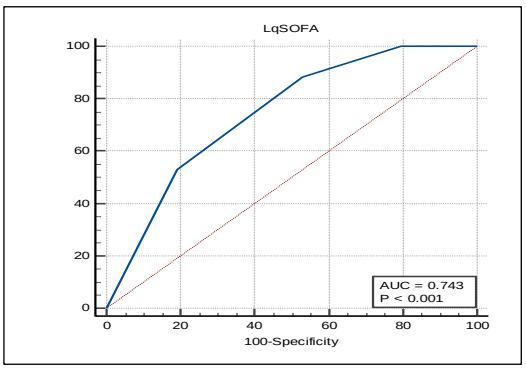

Figure 2: ROC curve LqSOFA score Vs confirmed sepsis.

The area under the curve (AUC) for LqSOFA score in predicting confirmed sepsis was 0.743 (p<0.001), indicating good discrimination between patients with and without sepsis. The sensitivity was 88.24% with a 95% confidence interval (CI) of 63.6-98.5, and the specificity was 46.99% with a 95% CI of 35.9-58.3. The positive predictive value was 25.4% with a 95% CI of 20.7-30.8, and the negative predictive value was 95.1% with a 95% CI of 83.9-98.7. Therefore, LqSOFA score >2 had a high sensitivity but a relatively low specificity in predicting confirmed sepsis (Figure 2).

Table 4: LqSOFA score VS mortality.

Mortality		
LqSOFA	**No of patients**	**%**
0	0	0
1	0	0
2	1	1
3	6	6
4	10	10
Total	17	17

The mortality rate among the study sample was 17%. The distribution of mortality across different LqSOFA scores is as follows: LqSOFA score of 0 had 0% mortality, score of 1 had 0% mortality, score of 2 had 1% mortality, score of 3 had 6% mortality, and score of 4 had 10% mortality (Table 4).

An LqSOFA score greater than 2 predicted mortality with an AUC of 0.785 (p-value <0.001), 94.12% sensitivity (95% CI: 71.3-99.9), and 48.19% specificity (95% CI: 37.1-59.4). The positive predictive value was 27.1% (95% CI: 22.7 32.1), and the negative predictive value was 97.6% (95% CI: 85.5-99.6) (Figure 3).

The average duration of hospital stay increases as the LqSOFA score increases. Patients with a LqSOFA score of 0 have an average duration of 8 hours, while patients

with a LqSOFA score of 4 have an average duration of 49 hours. The increase in duration of hospital stay was due to the severity of illness indicated by higher LqSOFA scores, which required more intensive treatment and monitoring (Figure 4).

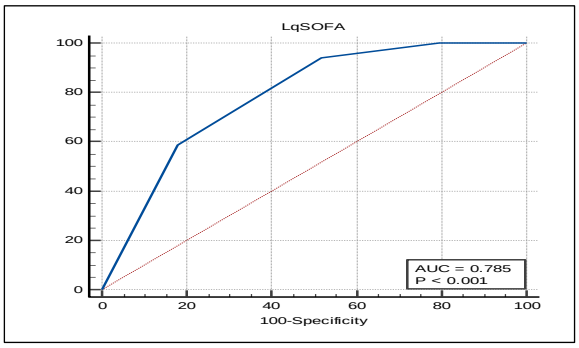

Figure 3: ROC curve LqSOFA score Vs mortality.

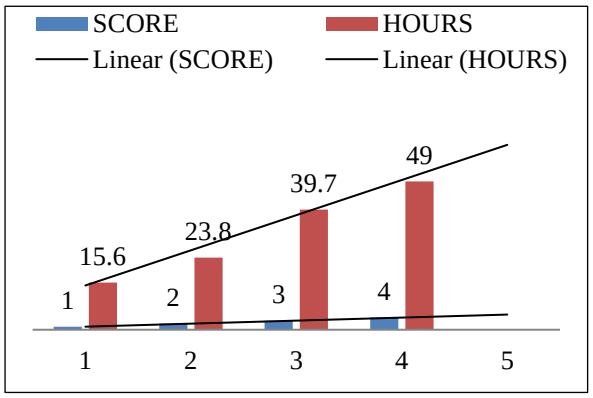

Figure 4: Average duration of hospital stay against LqSOFA score.

DISCUSSION

The current study aimed to investigate the association between the LqSOFA score and PICU admission, confirmed sepsis, and mortality in pediatric patients presenting to the ED with suspected infection. The results of the study suggest that the LqSOFA score is a reliable predictor of PICU admission, confirmed sepsis, and mortality in pediatric patients with suspected infection.

The study found that an LqSOFA score of >2 predicted PICU admission with approximately 88% sensitivity and 56% specificity. This finding is consistent with a study conducted by Kuan et al, which found that a score of >2 had a sensitivity of 81.3% and a specificity of 97.5% in predicting PICU admission in pediatric patients with suspected infection.[11] The current study also found that an LqSOFA score of >2 predicted confirmed sepsis with 88% sensitivity and 47% specificity. This finding is similar to a study conducted by Shehabi et al, which found that an SOFA score of >2 had a sensitivity of 81% and a specificity of 46% in predicting sepsis in critically ill patients.[12]

Furthermore, the study found that an LqSOFA score of >2 predicted mortality with 94% sensitivity and 48% specificity. This finding is consistent with a study conducted by Vincent et al, which found that an SOFA score of >2 had a sensitivity of 87% and a specificity of 74% in predicting mortality in critically ill patients.[13]

The study also found that the duration of hospital stay increased with increasing LqSOFA score, which is consistent with the findings of a study conducted by Leisman et al., which found that an increase in SOFA score was associated with a longer hospital stay in critically ill patients.[14]

Overall, the results of the current study suggest that the LqSOFA score is a reliable predictor of PICU admission, confirmed sepsis, and mortality in pediatric patients with suspected infection. These findings are consistent with previous studies conducted in adult patients and highlight the utility of the LqSOFA score as a tool for predicting outcomes in patients with suspected infection.

However, the current study has some limitations. First, the study was conducted at a single center, which limits the generalizability of the findings. Second, the study had a small sample size, which may have limited the statistical power of the analysis. Finally, the study was retrospective in nature, which limits the ability to establish causality.

CONCLUSION

In conclusion, the current study provides evidence that the LqSOFA score is a reliable predictor of PICU admission, confirmed sepsis, and mortality in pediatric patients with suspected infection. These findings have important implications for clinical practice, as they suggest that the LqSOFA score may be a useful tool for identifying high-risk patients who may benefit from early intervention.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee of FAAMCH, Barpeta

REFERENCES

1. Singer M, Deutschman CS, Seymour CW, Shankar-Hari M, Annane D, Bauer M, et al. The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). JAMA. 2016;315(8):801-10.
2. Rudd KE, Johnson SC, Agesa KM, Shackelford KA, Tsoi D, Kievlan DR, et al. Global, regional, and national sepsis incidence and mortality, 1990-2017: analysis for the Global Burden of Disease Study. Lancet. 2020;395(10219):200-11.
3. Seymour CW, Gesten F, Prescott HC, Friedrich ME, Iwashyna TJ, Phillips GS, et al. Time to treatment

and mortality during mandated emergency care for sepsis. N Engl J Med. 2017;376(23):2235-44.
4. Seymour CW, Liu VX, Iwashyna TJ, Brunkhorst FM, Rea TD, Scherag A, et al. Assessment of clinical criteria for sepsis: for the third international consensus definitions for sepsis and septic shock (Sepsis-3). JAMA. 2016;315(8):762-74.
5. Freund Y, Lemachatti N, Krastinova E, Van Laer M, Claessens YE, Avondo A, et al. Prognostic accuracy of sepsis-3 criteria for in-hospital mortality among patients with suspected infection presenting to the emergency department. JAMA. 2017;317(3):301-8.
6. Churpek MM, Snyder A, Han X, Sokol S, Pettit N, Howell MD, et al. Quick sepsis-related organ failure assessment, systemic inflammatory response syndrome, and early warning scores for detecting clinical deterioration in infected patients outside the intensive care unit. Am J Respir Crit Care Med. 2017;195(7):906-11.
7. Zhang X, Liu D, Liu Y. The value of modified SOFA and qSOFA scoring systems for predicting mortality in hospitalized patients with acute exacerbation of COPD complicated by sepsis. Ann Palliat Med. 2020;9(2):332-40.
8. Henning DJ, Puskarich MA, Self WH, Howell MD, Donnino MW, Yealy DM, Jones AE, et al. An emergency department validation of the SEP-3 sepsis and septic shock definitions and comparison with 1992 consensus definitions. Ann Emerg Med. 2017;70(4):544-552.e5.
9. Luo H, Truong QA, Zeng ISL. Modified Quick Sequential Organ Failure Assessment Scores for Sepsis in the Emergency Department. JAMA Netw Open. 2018;1(7):e185067.
10. Vincent JL, Moreno R, Takala J, Willatts S, De Mendonça A, Bruining H, et al. The SOFA (Sepsis-related Organ Failure Assessment) score to describe organ dysfunction/failure. On behalf of the working group on sepsis-related problems of the european society of intensive care medicine. Intensive Care Med. 1996;22(7):707-10.
11. Song JU, Sin CK, Park HK, Shim SR, Lee J. Performance of the quick sequential (sepsis-related) organ failure assessment score as a prognostic tool in infected patients outside the intensive care unit: a systematic review and meta-analysis. J Hosp Infect. 2018;98(4):401-8.
12. Shehabi Y, Sterba M, Garrett PM. Prognostic value of the SOFA score in septic shock. J Crit Care. 2010;25(1):176.e1-5.
13. Vincent JL, Moreno R, Takala J, et al. The SOFA (Sepsis-related Organ Failure Assessment) score to describe organ dysfunction/failure. On behalf of the Working Group on Sepsis-Related Problems of the European Society of Intensive Care Medicine. Intensive Care Med. 1996;22(7):707-710.
14. Leisman DE, Doerfler ME, Ward MF, Masick KD, Wie BJ, Gribben JL. Survival benefit and cost savings from compliance with a simplified 3-hour sepsis bundle in a series of prospective, multisite, observational cohorts. Crit Care Med. 2019;47(9):1242-50.

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