

ORIGINAL ARTICLE

Value of Soluble CD14 (Presepsin) in Diagnosis of Bacterial Sepsis in Patients with Chronic Liver Disease

¹Enas M. Ghoneim, ¹Azza M. Abd El Aziz, ²Ahmed M. AbuAmer, ¹Alaa M. Ghonaim*,
¹Samah M. Awad

¹Clinical Microbiology & Immunology Department, National Liver Institute, Menoufia University-Shebin El-Kom-Egypt

²Hepatology Department, National Liver Institute, Menoufia University- Shebin El-Kom -Egypt

ABSTRACT

Key words:

Presepsin, soluble CD14, chronic liver disease, sepsis

*Corresponding Author:

Alaa Mabrouk Ghonaim
Clinical Microbiology &
Immunology, National Liver
Institute, Menoufia University,
Shebin El-Kom, Egypt
Tel.: 01097081543
Alaaghoniam@liver.menoufia.edu.eg

Background: Sepsis in chronic liver disease (CLD) patients with high mortality and morbidity rates. Therefore, early detection in these patients may improve prognosis of the disease. CD14 may be a promising biomarker in the diagnosis of sepsis. **Objectives:** Our study aimed to evaluate presepsin (sCD14) as an early diagnostic marker in septic patients with CLD. Its value was compared to that of CRP, and total leucocytic count (TLC) for diagnosis of bacterial infection. **Methodology:** The study included 60 patients with sepsis in addition to 30 healthy subjects as controls. Complete blood count, CRP, liver and renal function tests as well as blood culture were performed. Identification of the isolated organisms and antibiotic susceptibility testing were performed using VITEK2 compact system and sCD14 was measured by ELISA. **Results:** Levels of sCD14 were significantly higher ($P < 0.001$) in septic patients compared with controls. ROC curve revealed that the sCD14 had a higher diagnostic performance than that of CRP and TLC ($P < 0.001$). The sCD14, at cutoff level greater than 0.89 mg/L, had 91.67% sensitivity and 63.33% specificity. **Conclusion:** sCD14 is more sensitive and specific for diagnosis of sepsis compared with CRP and TLC.

INTRODUCTION

Sepsis is a systemic inflammatory response syndrome (SIRS) to an infection, in which the body has a severe response to bacteria. SIRS symptoms do not originate from the bacteria themselves, but by the chemicals released by the body in response to the bacteria¹. Severe sepsis and septic shock are due to the changes that occur at the micro-vascular and cellular level which lead to hypoperfusion and various organ dysfunctions².

Patients diagnosed with chronic liver disease (CLD) usually suffer from intestinal barrier disruption, intestinal microecologic disorder, immune activation disorder and ascites, making them susceptible to infections and developing sepsis³.

The appropriate therapy of CLD patients with sepsis depends on early sepsis diagnosis. Blood cultures, however, frequently take a long time and have little sensitivity⁴. Early detection of bacterial infections (BI) in individuals with chronic liver disease (CLD) is frequently hindered by the constraints of conventional markers⁵. Hypersplenism and cirrhosis-associated immunological dysfunction (CAID) may have an impact on leucocytes⁴. Moreover, the established used serum biomarkers have poor accuracy. The C-reactive protein (CRP) may reflect the underlying chronic inflammatory condition rather than an infection⁵. In cases of renal

dysfunction or in situations when many diseases are present, such as acute on chronic liver failure (ACLF), procalcitonin (PCT) could be falsely elevated⁶. Therefore, additional potent biomarkers are still required for the early detection of sepsis in patients with CLD and to improve their prognosis.

CD14, a multifunctional cell surface glycoprotein, is expressed by monocytes, dendritic cells, and neutrophils. This high-affinity receptor for lipopolysaccharides (LPS) triggers the toll-like receptor 4-specific pro-inflammatory signaling cascade⁷. The CD14 in its soluble state, also known as presepsin, has been observed to increase in numerous infectious diseases. Furthermore, it has been associated with the seriousness and outcome of sepsis^{8,9}. As a result, it holds promise as a potential biomarker for sepsis. Nevertheless, studies investigating the effectiveness of sCD14 in diagnosing and predicting sepsis in patients with chronic liver disease (CLD) are currently lacking. Our study aims to assess the use of presepsin (sCD14) as an early diagnostic marker in patients suffering from sepsis and chronic liver disease.

PATIENTS AND METHODOLOGY

Patients:

This case-control study included 90 participants recruited between July 2020 and July 2021 from The

Inpatient Wards of the National Liver Institute and Menoufia University Hospitals, Egypt. Each participant provided an informed consent, and the study received approval from Research Ethics Committee of the National Liver Institute. Participants were divided into three groups, group 1: Patients with sepsis and underlying chronic liver disease, group 2: Patients with sepsis in absence of liver disease, and group 3: healthy controls. Each group included thirty subjects. Patients aged < 18 years or those with hepatic carcinoma or any other malignancy were excluded. Chronic liver disorder diagnosis was performed by liver biopsy, when available, or by clinical, biochemical, ultra-sonographic data and endoscopic features 10. Liver disease severity was assessed using the Model for End-Stage Liver Disease (MELD) score 11. Diagnoses of SIRS, sepsis, septic shock as well as grading of sepsis severity were based on criteria of the American College of Chest Physicians/Society of Critical Care Medicine (ACCP/SCCM) 12.

Sampling:

Blood specimens were obtained from patients and controls. The sample was dispensed into three tubes; an EDTA-tube for complete blood count (CBC), citrate tube for prothrombin time and INR, and plain tube for serum separation. Serum was further divided into two aliquots; one was used for assessment of liver and kidney function tests and CRP and the other aliquot was stored at -80°C for measurement of sCD14 by ELISA. Additionally, ten milliliters of venous blood were aseptically collected from each patient for blood culture before antibiotic administration.

Methods:

Biochemical investigations:

Complete blood count was done using Sysmex XN-1000 Automated Hematology Analyzer (Sysmex Corporation, Kobe 651-0073, and Japan). CRP and hepatic and kidney function assessments were performed using Au 680 Chemistry Auto-analyzer (Beckman Coulter, USA).

Microbiological study:

Blood culture bottles (aerobic and anaerobic) were inoculated and incubated in blood culture system (BacT/ALERT 3D system (bioMérieux, Durham, NC) until positive results were obtained with a maximum of seven days. Bottles which gave positive signal were sub-cultured on Mac-Conkey agar, blood and chocolate plates. Growing colonies were recognized by standard microbiological methods 13. Antibiotic sensitivity was tested using the disk diffusion technique according to CLSI 14. Vitek2 compact system (bioMérieux, France) was used for further confirmation of the identified

bacterial and fungal isolates and for antibiotic susceptibility testing of the isolates 15.

Measurement of sCD14:

Serum sCD14 was measured using a presepsin (sCD14) ELISA kit from SunRed Biotechnology. In brief, standards, test samples, and reagents were added to designated wells and incubated at 37°C for 60 minutes. After washing, chromogen solution was added, and the reaction was stopped with stop solution. Optical density (OD) was measured at 450 nm, and sample concentrations were calculated using a standard curve. Sensitivity: 0.05 mg/L; assay range: 0.1-9 mg/L 16.

Statistical analysis:

Statistical analysis was conducted with IBM SPSS version 22 software (SPSS, Chicago, USA). Chi-squared test was utilized in the context of comparisons of qualitative data. Student's t test, ANOVA test with Post Hoc test (Tukey's) was utilized for comparison of parametric quantitative data among groups. For non-parametric data, Mann-Whitney test and Kruskal-Wallis test were used. Correlation between variables was assessed using Spearman rank order correlation. P-values less than 0.05 were considered statistically significant. The diagnostic accuracy was checked using receiver operating characteristic curve (ROC plot). The best cut-off value for each marker was chosen. Sensitivity, specificity, negative predictive value (NPV), and positive predictive value (PPV) were calculated.

RESULTS

Demographic data of the studied groups:

Patients included males (56.7%) and females (43.3%) in the first and second groups. Their age was 54.77 ± 8.80 and 51.13 ± 13.71 in the first and second groups respectively with no significant difference. Diabetes mellitus (33.3% and 23.3) and hypertension (36.7% and 20.0%) were present among patients in the first and second groups respectively (not shown).

Clinical data of the studied patients:

About 73.3% of group 1 patients had nosocomial infection (NI) while 26.7% of them had community-acquired infection (CAI). In contrast, 63.3% and 36.7% of patients in group 2 had NI and CAI respectively. The most predominant infection types in group 1 were intra-abdominal infection followed by pneumonia, isolated bacteremia, and urinary tract infection (UTI), while in group 2 the most predominant types were pneumonia then intra-abdominal infection, UTI and isolated bacteremia. About 30% and 23.3% of patients in the first and second groups respectively had fever, chills and sweating. Both groups showed similar patterns in

antibiotic utilization without significant differences, exposure to invasive procedures or the admission to ICU. In group 1, the percent of encephalopathy was 33.3%, gastrointestinal tract (GIT) bleeding was 33.3%,

spontaneous bacterial peritonitis (SBP) was 20.0% and ascites was 43.3%. The cause of chronic liver disease was mainly due to HCV (96.7%). The mean of MELD score was 14.33 ± 7.35 (table 1).

Table 1: Clinical Data of the Studied Patients

The studied parameters	Group 1 (n = 30)	Group 2 (n = 30)	P
Sources of infection ^a			
Nosocomial-acquired	22 (73.3)	19 (63.3)	0.037*
Community-acquired	8 (26.7)	11 (36.7)	
Type of infection ^a			
Intra-abdominal infection	12 (40.0)	8 (26.7)	MC p=0.895
Pneumonia	8 (26.7)	9 (30.0)	
UTI	3 (10.0)	7 (23.3)	
Isolated bacteremia	7 (23.3)	6 (20.0)	
Symptoms and signs of infection (fever -chills -sweating) ^a	9 (30.0)	7 (23.3)	0.559
Rate of ICU admission ^a	21 (70.0)	23 (76.7)	0.559
Use of antibiotics ^a	29 (96.7)	28 (93.3)	^{FE} p=1.000
Combination of antibiotics ^a	10 (33.3)	12 (40.0)	0.592
Invasive procedures ^a	19 (63.3)	22 (73.3)	0.405
Ascites ^a	13 (43.3)	0 (0.0)	<0.001*
GIT bleeding ^a	10 (33.3)	0 (0.0)	0.001*
Encephalopathy ^a	10 (33.3)	0 (0.0)	0.001*
Spontaneous bacterial peritonitis ^a	6 (20.0)	0 (0.0)	^{FE} p=0.024*
Cause of liver disease ^a			
Alcohol	1 (3.3)	–	–
HCV	29 (96.7)	–	–
MELD score ^b	14.33 ± 7.35	–	–

^a: data expressed as number (percent), ^b: data expressed as mean ± standard deviation

*: Statistically significant at $P \leq 0.05$

Group 1: Septic patients with chronic liver disease

Group 2: Septic patients without liver disease

Blood culture results in the studied patients:

About 29 of 60 (48.3%) patients had microbiologically positive blood cultures. The most commonly isolated organism was *Staph. aureus* (34.5%) followed by *E. coli* (17.3%), then *Klebsiella pneumoniae* (13.9%), while *Candida albicans* was identified in 6.9%. In group 1, the most frequent Gram-negative organism was *E. coli* (10%) followed by

Klebsiella pneumoniae (6.7%), while *Staph aureus* was the most frequent Gram-positive organism (23.3%). In group 2, the most frequent Gram-negative organisms were *E. coli* and *Klebsiella pneumoniae* (6.7%), while *Staph aureus* was the most frequent Gram-positive organism (10%). A solitary occurrence of fungal infection (*Candida albicans*) was detected (3.3%) in each group as shown in (table 2).

Table 2: Results of Blood Culture in the Studied Patients

Blood culture results	Group 1 (n = 30)	Group 2 (n = 30)	Total patients with sepsis (n = 60)
No growth	14 (46.7)	17 (56.7)	31 (51.7)
Growth	16 (53.3)	13 (43.3)	29 (48.3)
Gram-negative bacteria	6 (20.0)	6 (20.0)	12 (41.4)
<i>E. coli</i>	3 (10.0)	2 (6.7)	5 (17.3)
<i>Klebsiella pneumoniae</i>	2 (6.7)	2 (6.7)	4 (13.9)
<i>Stenotrophomas maltophilia</i>	1 (3.3)	0 (0.0)	1 (3.4)
<i>Sphingomonas Paucimobilis</i>	0 (0.0)	1 (3.3)	1 (3.4)
<i>Pseudomonas aeruginosa</i>	0 (0.0)	1 (3.3)	1 (3.4)
Gram-positive bacteria	9 (30.0)	6 (20.0)	15 (51.7)
<i>Staph. aureus</i>	7 (23.3)	3 (10.0)	10 (34.6)
<i>Staph. epidermidis</i>	1 (3.3)	1 (3.3)	2 (6.9)
<i>Staph. haemolyticus</i>	1 (3.3)	0 (0.0)	1 (3.4)
<i>Staph. lentus</i>	0 (0.0)	1 (3.3)	1 (3.4)
<i>Staph. hominis</i>	0 (0.0)	1 (3.3)	1 (3.4)
Fungal (<i>Candida albicans</i>)	1 (3.3)	1 (3.3)	2 (6.9)

All data is expressed as number (percent).

Group 1: Septic patients with chronic liver disease

Group 2: Septic patients without liver disease

Infection markers in the studied groups:

Levels of sCD14 and CRP were significantly different ($P < 0.001$) among the three groups. Regarding the percentages of TLC and neutrophils, significant increases ($P < 0.001$) were detected in first and second groups compared to third group, however, no significant difference was detected between first and second groups. The percentage of lymphocytes was

significantly ($P < 0.001$) different among the groups under study. A significant ($P < 0.001$) decrease was observed in first and second groups compared to third group. On the hand, no statistically significant difference was detected between groups 1 and 2. Regarding the qSOFA score, there was no statistically significant difference between groups 1 and 2 as in (table 3).

Table (3): Markers of Infection in the Studied Groups

Marker of infection	Group 1 (n = 30)	Group 2 (n = 30)	Group 3 (n = 30)	P	Sig. among. groups		
					1 vs. 2	1 vs. 3	2vs 3
sCD14 (mg/L)	6.28 ± 1.02	6.23 ± 0.92	0.77 ± 0.27	<0.001*	>0.05	<0.001*	<0.001*
CRP (mg/L)	77.95 (28–157)	31.0 (22–72.90)	2.95 (2–3.50)	<0.001*	>0.05	<0.001*	<0.001*
TLC (×10 ³ /μl)	16.4 (9.4–24.0)	14.3 (13–18.1)	7.0 (5.9–7.8)	<0.001*	>0.05	<0.001*	<0.001*
Lymphocytes %	8.5 (6.7–17)	9.5 (6–16)	37.0 (34–40)	<0.001*	>0.05	<0.001*	<0.001*
The qSOFA score							
1	16(53.3%)	19(63.3%)	–	MC p= 0.690	–	–	–
2	12(40.0%)	10(33.3%)	–				
3	2(6.7%)	1(3.3%)	–				

rtile range SD: Standard deviation

□2: Chi square test MC: Monte Carlo U: Mann Whitney test

F: ANOVA test, Pairwise comparison bet. each 2 groups was done using Post Hoc Test (Tukey)

H: Kruskal Wallis test, Pairwise comparison bet. each 2 groups was done using Post Hoc Test (Dunn's for multiple comparisons test)

*: Statistically significant at $p \leq 0.05$

Group 1: Septic patient with chronic liver disease

Group 2: Septic patient without liver disease

Group 3: Healthy controls

Levels of sCD14 regarding blood culture result, type of organisms, infection source and SBP among septic patients:

There was no statistically significant difference in the sCD14 levels among patients with positive and those

with negative blood culture or among patients with Gram-negative and Gram-positive blood culture. Also, there was no significant difference regarding the infection type, or presence of SBP (**table 4**).

Table 4: sCD14 level in relation to blood culture result, type of organism, source of infection and SBP in patients with sepsis

The studied parameters	sCD14	P value
Culture		
Growth (n= 29)	5.04 ± 2.60	0.584
No growth (n= 31)	5.40 ± 2.52	
Type of organism		
Gram-positive (n= 15)	5.20 ± 2.65	0.565
Gram-negative (n= 12)	4.59 ± 2.73	
Source of infection		
Intra-abdominal infection (n= 20)	4.39 ± 2.86	0.119
Pneumonia (n= 17)	5.77 ± 2.19	
UTI (n= 10)	6.07 ± 2.48	
Isolated bacteremia (n= 13)	6.10 ± 1.72	
SBP		
Present (n= 6)	4.83 ± 2.81	0.694
Absent (n= 54)	5.27 ± 2.54	

SD: Standard deviation

t: Student's t test

F: ANOVA test

Correlation between sCD14 value and the laboratory findings in septic patients:

The correlation test demonstrated a strong relationship between sCD14 levels and TLC. ($P < 0.05$) and CRP ($P < 0.001$), however, no significant correlation

was detected with other parameters (Hepatic and Renal function tests, and count of RBCs, platelets, neutrophils and lymphocytes in the studied septic patients with (**table 5**).

Table 5: Correlation between sCD14 and the laboratory findings in patients with sepsis

The studied parameters	sCD14	
	r- value	P value
AST (U/L)	-0.202	0.121
ALT (U/L)	-0.084	0.523
Total bilirubin (mg/dl)	-0.206	0.114
Direct bilirubin (mg/dl)	-0.183	0.162
Albumin (g/dl)	0.005	0.972
INR	-0.204	0.118
Creatinine (mg/dl)	-0.058	0.658
Urea (mg/dl)	-0.025	0.851
RBCS count ($\times 10^3/\mu\text{l}$)	-0.094	0.474
Platelet count ($\times 10^3/\mu\text{l}$)	0.048	0.715
TLC ($\times 10^3/\mu\text{l}$)	0.314	0.015*
Neutrophils (%)	0.0	0.998
Lymphocytes (%)	0.109	0.407
CRP (mg/L)	0.371	<0.001*

r_s: Spearman correlation coefficient

***: Statistically significant at $p \leq 0.05$**

Effectiveness of sCD14 in diagnosing sepsis:

Analysis of the ROC curve revealed that the sCD14 had a higher diagnostic performance than that of CRP and TLC where the under-curve area for sCD14, CRP

and TLC were 0.941, 0.890 and 0.875 respectively. The sCD14 at cutoff value greater than >0.89 mg/L had 91.67% sensitivity, 63.33% specificity, 79.17% PPV and 82.22% NPV (**table 6 and Fig.1**).

Table 6: Efficiency of biomarkers in the diagnosis of sepsis

	AUC	p	95% C.I	Cut off	Sensitivity	Specificity	PPV	NPV
sCD14 (mg/L)	0.941	<0.001*	0.897 – 0.985	>0.89	91.67	63.33	79.17	82.22
CRP (mg/L)	0.890	<0.001*	0.824 – 0.956	>2.85	85.0	60.0	80.95	66.67
TLC($\times 10^3/\mu\text{l}$)	0.875	<0.001*	0.799 – 0.960	>7.55	86.67	66.67	83.87	71.43

AUC: Area under the curve

CI: Confidence Intervals

NPV: Negative predictive value

PPV: Positive predictive value

*: Statistically significant

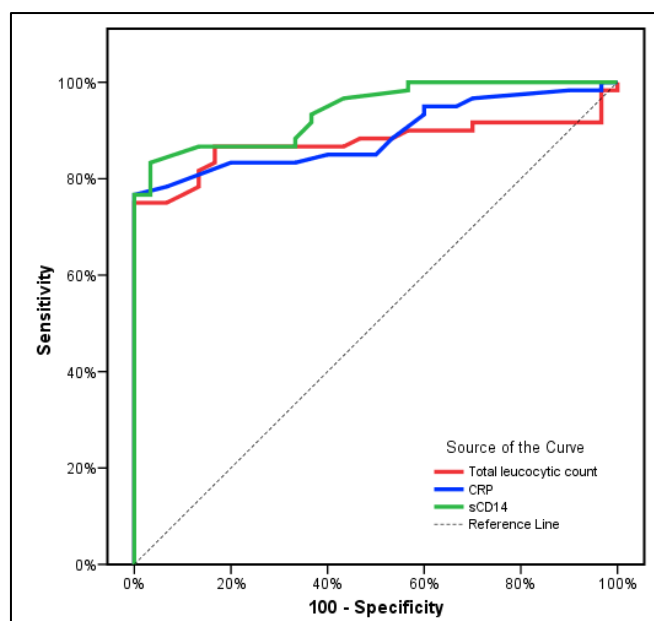


Fig. 1: Receiver-operating characteristic curves (ROC) for diagnostic accuracy of sCD14, C-reactive protein, and total leucocytic count in identification of sepsis.

DISCUSSION

Sepsis is a condition characterized by life-threatening organ dysfunction resulting from an aberrant host immune reaction to infection.¹⁷ Sepsis and bacterial infection may be asymptomatic at initial stages of infection in CLD patients. However they are highly susceptible to microbial dissemination due to their immune-compromised

state. This often leads to serious illness with many complications and high mortality rate¹⁸.

Appropriate early diagnosis and treatment of sepsis are critical to enhance patient outcomes and decrease mortality¹⁹. The current biomarkers such as CRP and procalcitonin (PCT) are fairly sensitive but poorly specific²⁰. CRP is the frequently used biomarker but has some limitations in patients with CLD²¹. Subsequently, identification of new biomarkers for these groups of patients is needed. Therefore, our study aimed to assess presepsin (sCD14) as an early diagnostic marker in patients with septic and CLD. A comparison was made between it and the value of CRP,

and total leucocytic count (TLC) in diagnosis of bacterial infection.

In this study, 56.7% of the patients were males while females were 43.3%. The mean age of the studied patients in years was 54.77 ± 8.80 and 51.13 ± 13.71 for groups 1 and 2 respectively. In the study of Papp *et al*²², 45% of patients were women and 55% were men with a mean age of 58.9 years. Additionally, Novelli *et al*¹⁸ and Ferrarese *et al*⁶ reported that sepsis was more common in men than women and the mean age of their patients was 49.5 and 57.4 years respectively. In our patients, diabetes mellitus was present in 33.3% and 23.3%, and hypertension was present in 36.7 % and 20.0% of patients in groups 1 and 2 respectively. Papp *et al*²² found that about 60% of Patients with cirrhosis and bacterial infection had co-morbidities including cardiovascular and cerebrovascular diseases, and diabetes mellitus.

In our patients, the most frequent type of infection was intra-abdominal infection followed by pneumonia, isolated bacteremia, and UTI. However, other studies mentioned that the most frequent types were pneumonia, UTI and bacteremia⁶, SBP, UTI, pneumonia and bacteremia²³, and UTI, SBP, and pneumonia²². Moreover, pneumonia, SBP, UTI and bacteremia were the most common types in acute on chronic liver failure (ACLF) patients²⁴. This variation may be accounted for by disparities in demographic characteristics and number of the studied patients. The etiology of CLD in our patients was mainly (96.7%) due to HCV. Novelli *et al*, reported that hepatitis C followed by hepatitis B and alcohol abuse were the principal causes¹⁸, while alcohol abuse was the predominant cause in some studies^{5,22}.

The MELD score in our patients was 14.33 ± 7.3 ; a similar finding was reported by Papp *et al*²². However, the MELD score was 23 ± 3.6 in a different study¹⁸. In our CLD patients; ascites, encephalopathy, gastrointestinal bleeding, and SBP were observed in 43.3%, 33.3%, 33.3% and 20.0% of them respectively. However, 70% of them had no clinical features of infection at admission. Parallel findings were demonstrated by Novelli *et al* who found that the main reasons for hospital admission were refractory ascites, variceal bleeding, encephalopathy, suspected infectious condition and renal failure, while 45% of patients had no clinical features of infection at admission¹⁸. These variations may be attributed to in the variations causes of CLD and other associated diseases in different localities.

In our study, blood cultures were positive in 29 (48.3%) of our patients. The isolated organisms included Gram-positive (51.7%) and Gram-negative (41.4%) bacteria, and fungi (6.9%). The identified species were *Staph aureus* (34.5%), *E. coli* (17.3%), *Klebsiella* species (13.9%) and *Candida* species. Ferrarese *et al*⁶ found that culture was positive in 62.2%

of cases and Gram-positive strains were prevalent. However, others showed that Gram-negative bacteria were the major causative organisms^{22, 23}. Some studies demonstrate that blood cultures were positive in 76%²⁵ and 57.1%²⁶.

In our study sCD14 level was a significant ($P < 0.001$) increase in both patient groups in comparison with the controls. However, sCD14 and qSOFA score were not significantly different between the two patient groups. Chen *et al* demonstrated that soluble trigger receptor 1 (sTREM-1) and myeloid cell-expressed presepsin emerged as potential biomarkers for sepsis diagnosis. They reported that the combining of presepsin and chronic liver failure-sequential organ failure assessment (CLIF-SOFA) score was reported to be promising for diagnosing sepsis in ACLF patients⁴.

Some studies suggest that presepsin has the potential to be a valuable biomarker for both diagnosing sepsis and assessing its severity in cirrhosis. On the contrary, another study indicated that presepsin was less reliable and suboptimal as a biomarker for early bacterial infection diagnosis in hospitalized patients with cirrhosis when compared to CRP⁶.

Presepsin levels were notably elevated in patients with sepsis^{26, 28} and proved to be a valuable early biomarker for discriminating sepsis from non-infectious conditions^{29, 30}. This elevation was particularly significant in septic patients when compared to those with systemic inflammatory syndrome²⁹, and its diagnostic accuracy was higher than that of the other conventional biomarkers³¹. Moreover, Presepsin was served as a predictor of poor prognosis and mortality^{26, 30}. Measurement of presepsin on day 3 proved to be highly effective in distinguishing the severity of sepsis and as a dependable predictor of 30-day mortality, especially when combined with other biomarkers²⁸. Furthermore, presepsin emerged as an early biomarker for assessing the severity of neonatal sepsis^{7,32}.

In our study, the value of sCD14 was not significantly different from the blood culture result, or types of bacterial organism or presence of SBP. Our result may be attributed to the small number of our patients. Similar results were reported in other studies^{7, 32, and 33}. However, few studies found that the diagnostic precision of presepsin for identifying infected patients was reduced in advanced liver disease and the accompanying renal failure^{6,22}.

Prior research Masson *et al.*³⁴, Abd El-Latif *et al.*²⁵, and Novelli *et al.*¹⁸ emphasized presepsin's clinical relevance for early sepsis risk assessment and its potential as a prognostic tool. In severe sepsis and septic shock cases, presepsin and IL-6 have shown promise as prognostic markers Ferrarese *et al.*⁶ and Lee *et al.*³⁰. However, presepsin's diagnostic and early risk assessment capabilities have limitations³⁵, and its predictive performance for sepsis outcomes varies³⁶.

In our study, sCD14 outperformed CRP in sepsis diagnosis, as supported by In our study, sCD14 exhibited significantly higher sensitivity and specificity ($P < 0.001$) compared to CRP for sepsis diagnosis, a result consistent with findings from Abd El-Latif *et al.*²⁵ and Novelli *et al.*¹⁸ and performed well in diagnosing neonatal sepsis, surpassing CRP and PCT³⁸. Nevertheless, presepsin was found to be less accurate than CRP in diagnosing early bacterial infections in cirrhotic patients Ferrarese *et al.*⁶, and it had lower sensitivity but higher specificity than CRP in septic adult leukemic patients Ghonaim *et al.*³⁹.

CONCLUSION

The sCD14 have a higher diagnostic sensitivity and specificity than CRP and total leucocytic count in sepsis diagnosis. However, a further study with larger number of patients is recommended

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AUTHOR CONTRIBUTIONS

All authors contributed in the conception and design of the study and drafting of the article. They have read and approved the manuscript.

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Ethical approval

This research was approved by the Research Ethics Committee at Liver Institute -Menoufia University according to 1964 Helsinki

Declaration and informed consent was taken from every participant in the study. IRB approval number: 19919CPATH31.

Conflicts of interest

There are no conflicts of interest.

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