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Emergency Medicine

COMPARISON OF SERUM LACTATE LEVEL WITH IVC DIAMETER IN CASES OF SEPSIS IN RURAL TERTIARY HOSPITAL

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ABSTRACT

INTRODUCTION: Sepsis is a common condition that is associated with unacceptably high mortality and long-term morbidity for those who survive. Lactate and inferior vena cava measurement can be used to guide management in cases of sepsis

AIM: The objective of the study is to correlate the serum lactate levels with IVC diameter in patients with suspected cases of sepsis. To find out whether lactate can be replaced by ivc diameter, at least in resource limited regions.

STUDY DESIGN: The study was a retrospective, time-bound, hospital-based, observational study

MATERIALS AND METHODS: The study was conducted with a sample size of 100 patients who presented to the EMERGENCY DEPARTMENT with features suggestive of sepsis and septic shock during the period December 2016 to November 2017

RESULTS: The mean age was 45.23 ± 16.84 in the study population, with an age range of 15 to 78 years and 66% of the participants were males. The correlation between the serum lactate and IVC was very weak and inconsistent at different time periods and in subgroups based on clinical improvement.

CONCLUSION: Although lactate is promising for sepsis cases large multi centered trials are needed to prove IVC is also a good predictor in suspected cases of sepsis to use it with confidence.

KEYWORDS :

INTRODUCTION

Sepsis is a common condition that is associated with unacceptably high mortality and long-term morbidity for those who survive. Increased awareness of the condition resulting from ongoing campaigns and the evidence arising from research in the past ten years have increased understanding of this problem among clinicians and lay people, and have led to improved outcomes.[1]

Sepsis is now defined as infection with organ dysfunction. This definition codifies organ dysfunction using the Sequential Organ Failure Assessment score. Ongoing research aims to improve the definition of patient populations to allow for individualized management strategies matched to a patient's molecular and biochemical profile. qSOFA scoring has been introduced recently as a quick diagnostic tool for organ dysfunction due to sepsis[1].

Lactateand inferior vena cava can be used to guide management either individually or in combination.Lactate has been proven as an important indicator of diagnosis, a guide for resuscitation and can be taken as a standard against which ivc can be compared to guide resuscitation[2].

Lactate is invasive, costly, and not available in many resource-limited regions. Thus IVC which is bed side, non invasive and less invasive parameter is considered to guide resuscitation

MATERIALS AND METHODS

The study was a retrospective, time-bound, hospital-based, observational study.

Study population: All cases presented to the EMERGENCY DEPARTMENT with features suggestive of sepsis with the period December 2016 to November 2017Patients presenting with clinical features of were analyzed using Q-SOFA.

Sample size: 100

Inclusion criteria:

1. All patients aged more than 15years
2. Patients satisfy the criteria for sepsis and septic shock based on QSOFA and SOFA scores.

RESULTS

A total of 100 people were included in the analysis. The mean age was 45.23 ± 16.84 in the study population, the minimum age was 15 years, and the maximum age was 78 years in the study population (95% CI 41.89 to 48.57). 66%participants were male, and 34%were female.85% participants had a fever, 62% participants had a cough and breathing difficulty, vomiting, 31% participants had loose stool, and 10% participants had altered sensorium. In the study population, 21 %participants were farmer, 20%participants were student, 20%participants were housewife, 12%participants were unemployed, 10 % participants were job holder, 9 % participants were self-employment and 8 %participants were coolly

Table 1: Descriptive analysis of symptoms

SYMPTOMS	Frequency	Percentage
FEVER	85	85.00%
COUGH	62	62.00%
VOMITING &LOOSE STOOLS	31	31.00%
ALTERED SENSORIUM	10	10.00%

Table 2: Descriptive analysis of clinical parameter

Parameter	Admission	24 hours
Lactate		
<2	12 (12%)	25 (25%)
≥2	88 (88%)	75 (75%)
IVC diameter		
<2CM	91 (91%)	69 (69%)
≥2CM	9 (9%)	31 (31%)

At admission, 12 (12%) participants had lactate <2 and 88 (88%) participants had lactate ≥2. After 24 hours of admission, 25 (25%) participants had lactate<2 and 75 (75%) participants had lactate>2.Among the people with admission, 91 (91%) participants had IVC diameter <2cm and 9 (9%) participants had IVC diameter ≥2cm. Among the people with after 24 hours, 69 (69%) participants had IVC diameter <2cm and 31 (31%) participants had IVC diameter ≥2cm.

There was a week positive correlation between lactate at admission and IVC Diameter (cm) at admission. There was a week positive

correlation between lactate at admission and IVC Diameter (cm) at 24 hours (R-Value: 0.246, P value: 0.014).

Table 3: Correlation between lactate at admission and IVC Diameter (cm) at admission in the improved group (N= 100)

Parameter	Spearman Correlation	P value
Improved group		
IVC Diameter (cm) at admission	0.121	0.311
IVC Diameter (cm) at 24 hours	0.044	0.711
Worsened group		
IVC Diameter (cm) at admission	0.141	0.475
IVC Diameter (cm) at 24 hours	-0.010	0.958

In the improved group, there was a weak positive correlation between lactate at admission and IVC Diameter (cm) at. In the improved group, there was a weak positive correlation between lactate max at 24 hours and IVC Diameter (cm) at 24 hours the worsened group there was a weak positive correlation between lactate max at admission and IVC Diameter (cm) at admission. In the worsened group there was a weak negative correlation between lactate max at 24 hours and IVC Diameter (cm) at 24 hours.

Table 4:Comparison of outcome with Serum lactate level at admission and 24 hours (N=100)

Lactate	Outcome		Chi square	P-value
	Improved	Worsened		
At admission				
<2 (N=12)	10 (83.3%)	2 (16.7%)	0.617	0.432
>2 (N=88)	64 (72.7%)	24 (27.3%)		
After at 24 hours				
<2 (N=25)	18 (72%)	7 (28%)	0.069	0.792
>2 (N=75)	56 (74.7%)	19 (25.3%)		

The proportion of people who have worsened was 16.7% among people with serum lactate level <2gm/dl at admission and it was 27.3% among people with serum lactate level >2gm/dl at admission. The proportion of people who have worsened was 28% among people with serum lactate level <2gm/dl at 24 hours and it was 25.3% among people with serum lactate level >2gm/dl at 24 hours.

Table 5:Comparison of outcome with IVC at admission and 24 hours (N=100)

IVC	Outcome		Chi square	P-value
	Improved	Worsened		
At admission				
<2 (N=91)	69 (75.8%)	22 (24.2%)	1.749	0.186
>2 (N=9)	5 (55.6%)	4 (44.4%)		
After at 24 hours				
<2 (N=69)	54 (78.3%)	15 (21.7%)	2.100	0.147
>2 (N=31)	20 (64.5%)	11 (35.5%)		

The proportion of people who have worsened was 24.2% among people with IVC diameter < 2 mm at admission and it was 44.4% among people with IVC diameter > 2 mm at admission. . The proportion of people who have worsened was 21.7% among people with IVC diameter < 2 mm at 24 hours and it was 35.5% among people with IVC diameter > 2 mm at 24 hours.

DISCUSSION

Severe sepsis and septic shock contribute to significant morbidity and mortality in the emergency departments. Risk stratification of the patients at the time of admission may enable the clinicians to provide focused care and effective utilization of the limited resources, to achieve better treatment outcomes in these patients. Appropriate risk communication is also extremely vital in these populations, considering the higher proportion of mortality.

Hence the role of various clinical and laboratory parameters, as predictors of adverse outcome has been a subject of tremendous research interest. The current study has been one such attempt to correlate the serum lactate and IVC diameter in patients with suspected cases of sepsis.

The mean age in the study population was 45.23 ± 16.84. In a study by Shetty et al.[3], the median age was 72.4 years. In a study by Lara et al.[4], the mean age was 67±18 years

Among the study population, 6 (6%) participants were aged below 20 years, 27 (27%) participants were aged between 21 to 30 years, 8 (8%) participants were aged between 31 to 40, 23 (23%) participants were aged between 41 to 50 years, 16 (16%) participants were aged between 51 to 60 years and 20 (20%) participants were aged more than 60 years. In the current study, Males constituted 66%, and the remaining 34% were females. In a study by Houwink et al2, the proportion of males was 64.8%, almost similar to the current study.reason for this is, in rural areas, males are given more importance and are preferentially brought to higher levels of care[4].

Fever (85%) is the most frequent presenting complaint followed by a cough and difficulty in breathing (62%) and vomiting and loose stools in 31 (31%). With the above symptoms, the respiratory system appears to be the most common site of infection leading to sepsis followed by gastrointestinal and genitourinary systems. In a study by Esper, respiratory tract infections were the most common site of infection correlating with the findings of the current study, followed by gastrointestinal infections, also comparable with the current study[5].

In the current study, the mean lactate was 5.65 ± 3.48 with a range of 1.09 to 18. Twelve (12%) participants had lactate <2 and 88 (88%) participants had lactate ≥2. In a study by Houwink et al2, the median lactate level at admission was 1.9 which is comparatively low. The number of patients that had first measured lactate above 2mmol/l was 46 %, whereas the same in the current study is 86%. The higher lactate levels in the current study can be due to delayed presentations, improper resuscitation before presenting to the ED. However, the possibility of genetic predisposition to higher lactate cannot be ruled out, and further studies are needed to differentiate this.

The mean lactate at 24 hours was 4.19 ± 4.02 in the study population with a range of 0.50 to 21. Twenty-five (25%) participants had lactate <2 and 75 (75%) participants had lactate ≥2. In a study by Houwink et al2, the median lactate level after 24 hours was 1.8 (1.2–2.8), which is comparatively low. It appears that both lactate build-up and clearance is different in different geological locations. Genetic makeup and level of resuscitation also appear to influence the lactate clearance. We suggest further multi-cantered trials to answer this question.

The mean IVC diameter was 1.41 ± 0.4 cm at the time of admission with a range from 0.40 cm to 2.30 cm (95% CI 1.33 to 1.49). At 24 hours, the mean IVC diameter was 1.78 ± 0.36 in the study population, ranged between was 0.60 cm to 2.70 cm (95% CI 1.71 to 1.85). At admission, 91 (91%) participants had IVC diameter <2cm suggesting fluid depletion and 9 (9%) participants had IVC diameter ≥2cm. After 24 hours, 69 (69%) participants had IVC diameter <2cm and 31 (31%) participants had IVC diameter ≥2cm. Feissel et al.[6]have reported IVC can be a useful parameter in guiding fluid management in sepsis patients. The mean IVC values reported in this study are quite close the mean IVC values reported in our study

In the improved group there was a weak positive correlation between lactate at admission and IVC Diameter (cm) at admission. In the improved group, there was a weak positive correlation between lactate at 24 hours and IVC Diameter (cm) at 24 hours.

In the worsened group there was a weak positive correlation between lactate max at admission and IVC Diameter (cm) at admission (r_s value: 0.141, P value: 0.475). In the worsened group there was a weak negative correlation between lactate max at 24 hours and IVC Diameter (cm) at 24 hours

Conclusion:

Even though sepsis patients were treated according to standard sepsis protocol followed now, about half of them seemed to deteriorate. This is mainly due to increasing age, associated co morbidities and lifestyle habits. Lactate has again proved as one of the main indicators of deduction of sepsis. Keeping lactate <2 is the important endpoint in treating sepsis patients effectively. The correlation between the serum lactate and IVC has very weak and inconsistent at different time periods and in subgroups based on clinical improvement .As lactate and ivc comparison are not showing more positive prediction value because of delayed presentation and less sample size in this study. Newer studies are needed to prove ivc is also a good predictor in assessing sepsis

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