ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 03 | March - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ASSESSMENT OF SERUM PROCALCITONIN AS A DIAGNOSTIC AND PROGNOSTIC MARKER OF SEPSIS IN THE ELDERLY PEOPLE AT AL AMEEN MEDICAL COLLEGE AND HOSPITAL VIJAYAPUR

General Medicine

Vaheed. U. Mujawar — Assistant Professor, Department of General Medicine, Al-Ameen Medical College and Hospital, Vijayapur India.

Mohammed Saliq Noaman Siddiqui* — P.G Final Year, Department of General Medicine, Al-Ameen Medical College and Hospital, Vijayapur India. *Corresponding Author

Vithal Rao — Professor, Department of General Medicine, Al-Ameen Medical College and Hospital, Vijayapur India.

ABSTRACT

Background: Sepsis is defined as the presence of probable or documented infection together with systemic manifestation of infection. **Objective:** To assess serum pro calcitonin as a diagnostic and Prognostic biomarker of sepsis in the elderly people. **Methods:** A Prospective study was conducted among above 65 years patients who are diagnosed as sepsis on admission in medical intensive care unit in Al Ameen medical College and hospital Vijayapur. **Results:** Median serum PCT levels were 6.80ng/ml in sepsis, 13.60ng/mll in severe sepsis and 15.62ng/ml in septic shock and was statistically significant between the groups. The overall mortality was 55%, it was 28.6% in sepsis, 62.5% in severe sepsis and 80% in septic shock was statistically significant between the groups. **Conclusions:** Clinical parameters are of significant diagnostic values for the diagnosis of sepsis in the elderly. An additive biomarker like serum PCT to the routine standard work up increased the diagnostic specificity

KEYWORDS

Serum Procalcitonin, Diagnostic, Prognostic, Sepsis, Elderly People

INTRODUCTION

Severe sepsis is defined as sepsis plus sepsis-induced organ dysfunction or tissue hypoperfusion. Septic shock is defined as sepsis induced- hypotension persisting despite adequate fluid resuscitation. Sepsis continues to be the second-leading cause of death for patients in non-coronary ICUs, despite improvements in patient management. [1] Sepsis is more common and occurs more frequently as people age. [2] Septic shock and sepsis pose a serious threat to life. The ability of doctors to link organ dysfunction to infection and identify severe sepsis will determine how severe sepsis actually occurs in ICUs around the world. Sepsis accounts for 10% of ICU admissions in our nation, according to the INDICAPS study. [3]

Sepsis in the elderly is a serious concern because there has been an increase in the prevalence of elderly patients being admitted to intensive care units (ICUs) globally in recent years [4]. Not only may a fall in fertility, and consequently the birth rate, be used to explain this demographic transition, but also a decline in mortality rates that has boosted life expectancy. The old are expected to expand faster than any other age group in the near future, and by 2050, the senior population will surpass that of the young for the first time in history [5].

Early detection of bacterial infection is crucial since infected patients have a better prognosis when an adequate antibiotic course is instituted quickly following an accurate diagnosis.

Additionally, not all patients who appear septic actually do have an infection, and giving antibiotics to everyone who is thought to have an infection has drawbacks such as the selection of antibiotic resistance, medication toxicity, and high medical expenditures.

The leading cause of severe sepsis in Indian ICUs is Gram-negative bacteria. Due to the longer duration of stay, care for this population is resource-intensive and ICU mortality is high. Western literature accounts for the majority of the epidemiological data on sepsis. Rather than sepsis, which is the host's reaction to infection, data from India are scarce and in the form of epidemiology of infection (both community and hospital acquired).

Medical decision-making for geriatric ICUs would be considerably aided by an accurate, easily accessible test for bacteremia. One such sepsis measure is serum Pro calcitonin, which has been extensively researched in both the paediatric and adult population and has been found to be a reliable sepsis marker. Particularly in the North Karnataka region, studies on the elderly population are limited. Therefore, we plan to conduct this study to determine its value in the elderly patients

MATERIALS AND METHODS:

A Prospective observational study was conducted among successive patients aged above 65 years who are diagnosed as sepsis on admission in medical intensive care unit in Al Ameen Medical College and hospital Vijayapur. The desired sample size is 60. This study was conducted from Jan 2021 to June 2022. The study was approved by Institutional Ethics Committee. Pro calcitonin and various other biomarker will be measured in all the study subjects. These parameters will be compared among three study groups (sepsis, severe sepsis and septic shock). Informed consents were obtained from subjects. Based on the inclusion and exclusion criteria, the subjects were selected.

Inclusion Criteria

All patients above the age of 65 years being admitted to MICU.

Exclusion Criteria

- History of recent trauma
- Recent surgical history
- Active neoplasia
- Cardiac diseases

Sample Size Calculation

n = sample size for study group

In the reference study: Estimates of sepsis prevalence and outcome in adult patients in the ICU in India: a cross-sectional Study; Authors: Naomi E, Hammond PhD; Sepsis in India Prevalence Study (SIPS) Investigator Network

Prevalence of sepsis was 56.4%
P = 54.2 Q = 45.8
L = Permissible error 25% of P is L = 13.5
Power of study was 80.0

Sample size (n) = $Z^2_g PQ/L^2$
$= (1.96)^2 \times 54.2 \times 45.8/(13.5)^2$
n = 3.845 X 2482.36/182.2
n = 9544.67/182.2
n = 52.38
Sample size n = Round figure 60 sepsis cases were selected randomly.

Methodology

A detailed thorough history will be taken from the patients along with general physical examination and systemic examination.Routine investigations like CBC, Renal function test, RBS, liver function test, serum electrolytes, CRP, urine analysis, ECG, chest x-ray, sputum Gram's stain, AFB, cultures -blood, sputum, urine,2D echo, PT INR will be conducted wherever indicated and serum PCT will be done in all patients.

Patients will be followed up for the total duration of stay in the medical

intensive care unit. In the context of their association with pro calcitonin levels, aetiology, clinical presentation and prognosis of a given case will be thoroughly studied. The main final outcome would be to discharge the patients from MICU to the wards or death in MICU.

Statistical Analysis:
Software from IBM SPSS 25.0 was used to analyse the data. Standard deviation was used in descriptive statistics for the study of quantitative data. To compare the mean values of two variables, an independent samples t test was initially utilised. Chi-square test and Fischer exact probability tests were used. P value of 0.05 or lower was regarded as statistically significant.

RESULT:
The minimum age of patient was 65 years and maximum age was 96 years. The mean age of patients was 74.30 years**.** Majority of patients 36 (60.0%) were males and 24 (40.0%) of patients were females. The male to female ratio in the study was 1.5:1

Majority of patients 35 (58.3%) had the co-morbid of hypertension, 28 (46.7%) of patients had diabetes mellitus, each 9 (15.0%) patients had COPD and IHD respectively and 3 (5.0%) of patients had hypothyroidism. There was no statistically significant difference of distribution of co-morbid patients among males and females.

Twenty four (40.0%) of patients were seen severe sepsis, 21 (35.0%) of patients were seen sepsis and 15 (25.0%) of patients were seen septic shock

Table 1: Classification Of Sepsis Wise Distribution Of Patients

Categories	Number of patients	Percentage
Sepsis	21	35.0
Severe Sepsis	24	40.0
Septic Shock	15	25.0
Total	60	100.0

There was no statically significant difference of distribution of patients with presenting symptoms of Fever, Breathlessness, Cough, Altered sensorium, Loose stools and Pain abdomen between sepsis, severe sepsis and septic shock (P>0.05). Whereas there was statistically significant difference of presenting symptom of decreased urine output between sepsis, sever sepsis and septic shock (P<0.05). The decreased urine output were seen in severe sepsis and septic shock not in sepsis

Table 2: Comparison Of Sepsis Categories With Presenting Symptoms

Presenting symptoms	Sepsis (n = 21)	Severe Sepsis (n=24)	Septic Shock (n = 15)	Total (N = 60)	P-value
Fever	14 (66.7%)	17 (70.8%)	11 (73.3%)	42 (70.0%)	P = 0.218, NS
Breathlessness	10 (47.6%)	9 (37.5%)	7 (46.7%)	26 (43.3%)	P = 0.917, NS
Cough	10 (47.6%)	8 (33.3%)	6 (40.0%)	24 (40.0%)	P = 0.653, NS
Altered Sensorium	6 (28.6%)	10 (41.7%)	5 (33.3%)	21 (35.0%)	P = 0.193, NS
Loose Stools	3 (14.3%)	3 (12.5%)	2 (13.3%)	8 (13.3%)	P = 0.931, NS
Decreased Urine output	0 (0.0%)	5 (20.8%)	4 (26.7%)	9 (15.0%)	P = 0.041, S
Pain Abdomen	2 (9.5%)	3 (12.5%)	2 (13.3%)	7 (11.7%)	P = 0.873, NS

NS= not significant, S=significant, HS=highly significantThere was no statistically significant difference of distribution of patients with systemic inflammatory response syndrome of tachycardia, tachypnea and temperature between sepsis, severe sepsis and septic shock (P>0.05).

There was statically significant association between sepsis, severe sepsis and septic shock (P<0.05). PCT positive patients were observed significantly more in severe sepsis and septic shock categories as compare to sepsis category. Study reveals that; there was statistically highly significant correlation with serum PCT levels and categories of sepsis.

Out of 60 sample patients 33 (55.0%) of deaths were observed and survivors were 27 (45.0%). 80.0% of deaths were seen in septic shock, 62.5% deaths were seen in severe sepsis and 28.6% deaths were seen in sepsis. There was statistically highly significant difference of deaths between sepsis, severe sepsis and septic sepsis (P<0.001)

Table 3: Comparison Of Serum PCT With Categories Of Sepsis

PCT	Sepsis (n = 21)	Severe Sepsis (n=24)	Septic Shock (n = 15)	Total (N=60)	P-value
PCT Negative (< 0.5ng/ml)	7 (33.3%)	3 (12.5%)	2 (13.3%)	12 (20.0%)	P = 0.0217, S
PCT Positive (> 0.5ng/ml)	14 (66.7%)	21 (87.5%)	13 (86.7%)	48 (80.0%)	

Table 4: Distribution Of Study Population According To Outcome

Categories	Survivors		Deaths		Total	
	No.	%	No.	%	No.	%
Sepsis	15	71.4%	6	28.6%	21	35.0
Severe Sepsis	9	37.5%	15	62.5%	24	40.0
Septic Shock	3	20.0%	12	80.0%	15	25.0
Total	27	45.0%	33	55.0%	60	100.0
$\chi 2$ –Test value, P-value	$\chi 2$ = 12.26, P = 0.001 HS					

There was statistically significant association between serum PCT and study outcome (P<0.05). There was statistically no significant difference of mean Age, RBS, HB%, TLC, Platelet count, Sodium, Potassium, duration of stay between sepsis, severe sepsis and septic shock (P>0.05). Whereas there was statistically significant difference of mean creatinine, Bilirubin and Albumin between sepsis, severe sepsis and septic shock (P<0.05)

DISCUSSION:
The most common co morbid condition is hypertension, constituting 58.3% of patients. Followed by diabetes mellitus with 28%. Study done by Lai et al had 38% of population with diabetes. [6]

The study group was divided into three categories based on ACCP/SCCM criteria in to sepsis, severe sepsis and septic shock. There were 21(35%) patients in sepsis group, 24(40%) in severe sepsis and 15 (25%) in septic shock group.

The most common presenting complaint was fever, around 66.7%. Similar observations were noted in the study done by Lai et al 67.8%. [6]

66.7% of sepsis group, 70.8% of severe sepsis, and 73.3% in septic shock group had fever as the presenting complaint. This in contrast to study done by Castle et al who had 53% with fever. [7]

Tachypnea was the most common manifestation, with 20(95.2%) patients with sepsis, 23(95.8%) with severe sepsis and 14(93.3%) with septic shock patients had tachypnea as their sign. In contrast to studies done by Lai et al, stucker et al who didn't have tachypnea as the common manifestation of SIRS. [6,8]

In our study, 58.3% of the patients were hypertensive and 60% of them were on beta blockers. Also due to the ageing process, many patients may develop sinus bradycardia. Therefore tachycardia may not be helpful in diagnosing sepsis in elderly patients.

Serum PCT was positive in 80% and negative in 20% of the total study population. Among the categories it was positive in 66.7% in sepsis group, 87.5% in severe sepsis and 86.7% in septic shock group. There was a significant statistical association of PCT in the categories of sepsis with p Value 0.0217.

Study done by Lai et al documented serum PCT as a diagnostic marker for bacteraemia in the elderly. [6]

Median serum PCT level was 6.80ng/ml in sepsis, 13.60ng/ml in severe sepsis and 15.62ng/ml in septic shock group. The Increase in serum PCT levels is directly proportional to the severity of sepsis. This fact was comparable in multiple studies done by Meisner et al, stucker et al. [6,8]

There was a significant statistical association between serum PCT level and categories of sepsis with p value of 0.01. The PCT levels kept on increasing with the increasing severity of sepsis, therefore serum

PCT levels appears to possibly help in assessing the prognosis of the elderly patients with severe sepsis and septic shock.

Severe forms of sepsis are associated with a poorer outcomes. In our study,the overall mortality was 55%. It was 28.6% in sepsis, 62.5% in severe sepsis and 80% in septic shock group.

Study done by NASA p et al 60.7% mortality in the age group of 60-80years and 78.9% in age group more than 80years. [9]

Study done by Opal et al had mortality rates between 50-60%. [3] There was a significant statistical association between the outcome and categories of sepsis with p Value of $\leq$ 0.001.

The mean duration of stay in our study is 4.20+/- 2.36 days. Study done by Nasa p et al noted the mean duration of study was 4.11+/-5.4days. [9]

In our study, the most common site of Infection was respiratory tract (63.3%). Followed by gastrointestinal tract infection (15%), urinary tract infection (20%) and neuro infection (1.7%) and blood stream infection (3.3%). In 4% of the population the site of Infection couldn't be documented.

Various multiple studies done by Stucker et al(58.4%), Prashant NASA et al(45.5%) and Lai et al (40.2%) have demonstrated that respiratory tract infection to be the common site of infection in the elderly. [6,8, 9] The results of our study group were comparable with other studies. There was no statistical association between serum PCT and the site of Infection. However, there was an increasing level of serum PCT in the study group as the severity increased with various sites of Infection.

Study reveals that ,out of 10 culture positive patients, PCT was positive in 8 patients (80%) and negative in 2 patients(20%),and out of 50 culture negative patients,41(82%) of the patients were PCT positive and 9(18%) were PCT negative. So there was no statistically significant co relation between PCT levels and microbiological yield ($p \geq 0.05$)

Gram negative organism are the most common isolates in our study group. The most common being the pseudomonas.

Serum PCT as a biomarker of primary and secondary bacterial infection had a sensitivity of 84%, negative predictive value of 88%. This was comparable to the study done by Lai et al who had a sensitivity of 96% and a negative predictive value of 98.8%. [6] However, there was no statistical significance among bacteraemic and non bacteraemic group using PCT as a biomarker.

CONCLUSION:

serum PCT acts as a fruitful diagnostic marker of sepsis in the elderly but also helps in assessing the severity of sepsis, severe sepsis and septic shock. It was also found to b a significant biomarker in predicted the outcome of elderly patients with sepsis.

REFERENCES

1. MartinGS, Mannino DM, Moss M. The effect of age on the development and outcome of adult sepsis. Crit CareMed2006; 34: 15-21
2. Angus DC, Linde-ZwirbleWT, LidickerJ, ClermontG, Carcillo J, Pinsky MR. Epidemiology of severe sepsis in the United States: analysis of incidence, outcome, and associated costs of care.CritCareMed2001;29: 1303-1310
3. OpalSM, GirardTD, ElyEW. The immunepathogenesis of sepsisinelderlypatients. *ClinInfectDis*2005;41 Suppl7:S504-S512
4. Population Division, Department of Economic and Social Affairs. World Population Ageing: 1950-2050.2001.Availablefrom:URL:http://www.un.org/esa/population/publications/worldageing19502050.
5. Gavazzi G, Krause KH. Ageingandinfection.LancetInfectDis2002; 2:659–666.
6. Chih-ChengLai,Shey-Ying Chen, Cheng. YiWang: Diagnostic Value of Procalcitonin for Bacterial Infection in Elderly Patients in the Emergency Department. J Am GeriatricSociety2010 ;58:518–522
7. Anil T Kumar, U Sudhir , K Punith et al ;Cytokine profile in elderly patients withsepsis;IJCCM;2009:13;2 :74-78.
8. Fabien Stucker, Francois Herrmann, Jean-Daniel Gra fetal Procalcitonin and Infection in Elderly Patients, J Am GeriatrSoc 2005 ; 53:1392–1395.
9. Nasa P, Juneja D, Singh O, Dang R, Arora V. Severe Sepsis and its Impact on Outcome in Elderly and Very Elderly Patients Admitted in Intensive Care Unit. *J Intensive Care Med* 2012