

**Research Article****Can Eosinopenia be used as an Indicator to Predict Mortality in Surgical Intensive Care Unit**Aslam A Shivani<sup>1</sup>, Vinod V Prabhu<sup>2</sup>, Shashikant H Kulkarni<sup>3</sup><sup>1</sup>Associate Professor in Surgery, Bharati Vidyapeeth University, Bharati Medical College, Sangli, Maharashtra, India<sup>2</sup>Associate Professor in Surgery, Bharati Vidyapeeth University, Bharati Medical College, Sangli, Maharashtra, India<sup>3</sup>Professor in Surgery, Bharati Vidyapeeth University, Bharati Medical College, Sangli, Maharashtra, India**\*Corresponding author**

Aslam A Shivani

Email: [cghert@yahoo.co.in](mailto:cghert@yahoo.co.in)

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**Abstract:** The aim of this study was to test the efficacy of eosinophilic count as a broad indicator in prognosticating mortality in surgical intensive care unit (ICU). 437 patients admitted to the emergency ward were evaluated for eosinophilic count and absolute eosinophilic count. In a ten years study undertaken from 2004 to 2014, patients admitted to the emergency ward were evaluated for eosinophilic count (EC) and absolute eosinophilic count (AEC) alongwith blood culture. The numbers of patients were tabulated according to a range and deaths in these ranges were analyzed. The results were statistically analyzed using SPSS 22 software. There were 69 deaths. Maximum deaths were seen in patients with AEC < 40/cmm (21 deaths). 15 out of the 21 deaths had a positive blood culture. Eosinopenia paired with blood culture, on admission give a fair indication of mortality.**Keywords:** Eosinopenia, Eosinophilic Count (EC), Absolute Eosinophilic Count (AEC), Indicator, Mortality

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**INTRODUCTION**

Prognostication of mortality has been attempted worldwide using a number of scoring systems or by using various hematological parameters. The existing methodologies are a complex set of investigations or a multitude of clinical parameters that may not be easily available in all hospital setups. Even hematological investigations like procalcitonin, C reactive protein (CRP) is costly and not easily available [1]. Hence an endeavour to look for cheaper alternatives, prompted us to revisit the study of eosinopenia as a predictor of mortality in critically ill surgical patients.

Studies have been undertaken worldwide to assess the significance and relevance of eosinopenia as a predictive marker of mortality. The limited aim of this study was to find a correlation between mortality, blood culture and eosinopenia and if statistically valid, extrapolate the findings to prognosticate mortality.

Eosinophils for long have been found to be playing a role in acute infections. A distinct characteristic of the eosinophil is to initiate a host response to acute infection. The initial response to acute inflammation includes a rapid drop in circulating eosinophils and an accumulation of eosinophils at the peripheral inflammatory site, alongwith inhibition of release of eosinophils from the

bone marrow. The responses of eosinophils have been variable in infection, bacteremia and Systemic Inflammatory Response Syndrome (SIRS).

This study aims to find the relation between Eosinopenia and mortality. We have used the word “indicator” in the title because the eosinophilic count was done only on admission and could not probably act as a “marker” for mortality. It could be used as a predictive indicator.

**MATERIALS AND METHODS**

All patients admitted to the surgical intensive care ward were investigated for EC and AEC. Blood cultures were taken at the same time and patients vitals monitored. The patients were treated according to their respective surgical needs.

The AEC value of 240/cubic millimeter (cmm) (Average of the normal range 40-440/cmm) was taken as normal. The blood collection was done on admission. Patients with malignancies, septic shock and Systemic Inflammatory Response Syndrome (SIRS) were excluded. Paediatric cases were excluded. AEC values less than 40 were classified as severe eosinopenia

**RESULTS**

This series of 437 patients revealed 69 deaths (15.7%). This is a large percentage considering all

septic cases were excluded. As 240/cmm was taken as the cutoff for eosinopenia in this series the total number of patients having counts less than 200/cmm were 308, which formed 70% of patients in this series. Thus a sizable number of patients had eosinopenia. Out of these 308 patients, the mortality was 19% (59 patients). Thus it is observed that the maximum mortality was seen in eosinopenic patients. The

maximum mortality was seen in the 160 patients having <40/cmm, where there were 21 deaths.

All these patients underwent a blood culture. In the <200/cmm (308 patients) count group there were 36 positive blood culture patients out of a total of 59 deaths in this group (61%) thus indicating that eosinopenic patients do have blood cultures positive without overt manifestation of sepsis (Table 1).

**Table 1: Absolute eosinophilic count and mortality**

Eosinophils/cmm (absolute count)	No. of pts	Deaths	% of total	Blood culture positivity	% of deaths
<40	160	21	13.1%	15	71%
41-100	60	20	33.3%	10	50%
101-200	88	18	20.45%	11	61.1%
201-500	101	08	7.9%	03	37.5%
>500	28	02	7.1%	01	50%
Total	437	69	15.7%	40	66.6%

## DISCUSSION

Eosinopenia as an outcome of an infectious disease was first put forward by Schilling in 1929 [2, 3]. Eosinophils normally account for only 1-3% of blood leucocytes [4]. The AEC values range between 40-440 /cmm. As this is a wide range this series adopted the average of the range as the cut off below which the value was termed as eosinopenia. But values less than 40/cmm was termed as severe eosinopenia. The eosinophils in the body are normally well regulated. The causative mechanisms that control eosinopenia in acute infections, involve mediation by glucocorticoids and adrenaline. The initial eosinopenic response seen, in acute infections is the culmination of a peripheral sequestration of circulating eosinophils. A part of this sequestration can be attributed to the migration of eosinophils into the inflammatory site itself, in response to the chemotactic substances released during acute inflammation. The major chemotactic substances include C5a and fibrin fragments that have been detected in the peripheral circulation during acute inflammatory states [5].

Hospitalized patients were studied prospectively in an attempt to determine whether eosinopenia in surgical intensive care could be used to determine the mortality of patients. We used the eosinophilic count only on admission to determine if it offers any credibility. There has been a lot of discussion as to the utility of eosinophil values in SIRS and septic shock patients [6]. We concentrated on the broader concept of eosinopenia to prognosticate mortality. This was correlated with blood culture samples. The maximum deaths seen were in the eosinopenic patients. Although SIRS and septicemic patients were excluded, this series threw up the finding that even in overtly non-septicemic patients, there is bacteremia which showed up in 36 patients of eosinopenia thus suggesting that eosinopenia could be an early warning sign of sepsis.

Eosinopenia is an easy but often ignored marker of acute infection that has not been given its due weightage, previously in surgical intensive care units (ICUs). Various animal models have suggested the significance of eosinopenia and infection. Animal models suggest that eosinopenia is a response to the acute inflammatory process rather than a response to a specific pathogen [7]. Though eosinopenia has a reasonable specificity as a marker of bloodstream infection in adult patients, its sensitivity is poor [8]. However, this is precisely the aim of this study to put forth a cheap and fairly predictive indicator in a rural setup. These results strengthen the fact that the presence of eosinopenia can be as an inexpensive alert for bloodstream infections [9]. In adult patients so that the treating faculty is warned and further investigations can be initiated to exclude bloodstream infection. An absence of eosinopenia is, however, not sensitive enough to exclude bloodstream infection in hospitalised adult patients. This test however might not hold true in paediatric patients as these patients have an immature immune system and mild differences in the activation of cytokines in response to bloodstream infection.

This series had patients with eosinopenia with sizable patients having blood culture positive and a high mortality rate having both the parameters i.e eosinopenia and positive blood culture. It also suggests that these simple laboratory tests will alert the treating faculty to anticipate a complicated future for the patient [10].

## CONCLUSION

Eosinopenia and a positive blood culture are a very sensitive yet not specific serological indicator of mortality in the surgical intensive care unit and can be utilized to guide the surgical faculty in the prognostication of mortality.

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