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# A STUDY OF PROGNOSTIC VALUE OF CENTRAL VENOUS OXYGEN SATURATION IN PATIENTS WITH SEPTIC SHOCK AT A TERTIARY CARE HOSPITAL IN SOUTH GUJARAT

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**ABSTRACT** **Purpose of study :** Aim of the study is to measure ScvO2 level at Baseline, 12 hours and 24 hours in patients presenting with septic shock & their correlation with mortality. Introduction: Severe sepsis and septic shock, is a common cause of emergency room admission and is associated with high morbidity and mortality worldwide. When oxygen delivery fails to meet tissue oxygen demand in critical illness, tissues maintain their oxygen utilization by extracting more oxygen which ultimately decreases central venous oxygen saturation(ScvO2). As ScvO2 decreased, the mortality tends to increased. This suggests that ScvO2 is a useful prognostic marker in septic shock. Methodology: This is a prospective observational study of 30 patients with septic shock admitted in ICU of our tertiary care hospital. Patients are selected by SOFA score ≥2 and thorough general examination. 2nd step is to measure ScvO2 at baseline and 12 hours apart. Final analysis has been done with the help of Open EPI and SPSS software. **Results:** Out of 30 patients, 13(43%) did not survive for more than 7 days. Patients with ScvO2<50 at any point of time was associated with poor prognosis in septic shock. **Conclusion:** Among patients with septic shock, it is better to monitor serial ScvO2 rather than going for single value. Trend of ScvO2 was also indicative of prognosis in septic shock. It is concluded that ScvO2 can be used as an independent predictor of survival in patients with septic shock.

**KEYWORDS :** Septic shock,ScvO2 : central venous oxygen saturation

## INTRODUCTION:

Septicemia implies active replication of bacteria in the blood associated with systemic manifestations. Septic shock is characterized by hypotension (systolic BP < 90mmHg), hypoxia, increased serum lactate levels, high-anion-gap metabolic acidosis and oliguria with urine output < 30 ml/h[1]. In critical illness, the cardiovascular response to an increase in oxygen requirement is an increase in arterial oxygen content or an increase in CO(cardiac output). When these compensatory mechanisms fail to occur, CO and systemic oxygen delivery decreases; tissue extraction of oxygen will undergo a compensatory increase in order to sustain systemic oxygen consumption leading to a reduction in ScvO2.Thus ScvO2 can provide useful information regarding the adequacy of CO over time. So, ScvO2 has long been studied as a prognostic marker and resuscitation end-point in patients with septic shock[3]. Rivers et al.[4]showed that an early therapeutic strategy that includes aiming for the rapid normalization of ScvO2 (≥70%) in patients suffering from septicemia or septic shock at presentation to the emergency department could improve survival.[5-10]

## METHODOLOGY:

The study was done at Surat Municipal Institute of Medical Education & Research (SMIMER) Hospital, Surat, Gujarat, from year June 2020 to Nov 2021.This is a prospective observation study of total 30 ICU patients of septic shock in our tertiary care hospital. Patients with presumed septic shock with SOFA score ≥2; age ≥18yrs; willing for admission and willing to participate in study were included in the study after informed written consent. Patients having Cardiogenic shock, Neurogenic shock, Anaphylactic shock, Hypovolemic shock; Patients with chronic lung diseases , cyanotic heart diseases , not willing for admission and not willing to participate in study were excluded. Approval for this study was taken in institutional ethical committee. All necessary confidentiality of participants were maintained. Detail history, examination and necessary investigations were done for each participants. ScvO2 at baseline and 12 hours apart done by ABL 800 basic analyzer. Data was entered in MS EXCEL spread sheet and was analyzed with the help of Open EPI and SPSS software. Statistical analysis was done by appropriate statistical method.

## RESULT:

Out of total 30 patients, 6(20%) were having ARDS, 6(20%) were having community acquired pneumonia(CAP), 5(16.67%) were having septicemia, 5(16.67%) were having UTI+pyelonephritis , 1(3.33%) was having inflammatory bowel disease, 5(16.67%) were having spontaneous bacterial peritonitis and 2(6.66%) were having meningitis. Most of the patients were having ARDS and CAP.

Out of 30 patients, highest number of patients were in the age group of 21-40 years. Out of 30 patients, 13 (43.3%) expired within 7 days and 17 (56.7%) survived for more than 7 days. Highest mortality (16.7%) was seen in 21-40 years of age group.

In our study, male:female ratio was 8:7. Among 13 expired patients, 5(16.7%) were male and 8(26.6%) were female. Among 17 survived patients, 11(36.7%) were male and 6(20%) were female.

**Table 1.** The Sequential Organ Failure Assessment (SOFA) Score*

| | SOFA Score | | | | |
|---|---|---|---|---|---|
| **Variables** | **0** | **1** | **2** | **3** | **4** |
| Respiratory $Pao_2/Fi_{O_2}$, mm Hg | >400 | ≤400 | ≤300 | ≤200† | ≤100† |
| Coagulation Platelets ×10³/μL‡ | >150 | ≤150 | ≤100 | ≤50 | ≤20 |
| Liver Bilirubin, mg/dL‡ | <1.2 | 1.2-1.9 | 2.0-5.9 | 6.0-11.9 | >12.0 |
| Cardiovascular Hypotension | No hypotension | Mean arterial pressure <70 mm Hg | Dop ≤5 or dob (any dose)§ | Dop >5, epi ≤0.1, or norepi ≤0.1§ | Dop >15, epi >0.1, or norepi >0.1§ |
| Central nervous system Glasgow Coma Score Scale | 15 | 13-14 | 10-12 | 6-9 | <6 |
| Renal Creatinine, mg/dL, or urine output, mL/d‖ | <1.2 | 1.2-1.9 | 2.0-3.4 | 3.5-4.9 or <500 | >5.0 or <200 |

*Norepi indicates norepinephrine; Dob, dobutamine; Dop, dopamine; Epi, epinephrine; and $Fi_{O_2}$, fraction of inspired oxygen.
†Values are with respiratory support.
‡To convert bilirubin from mg/dL to μmol/L, multiply by 17.1.
§Adrenergic agents administered for at least 1 hour (doses given are in μg/kg per minute).
‖To convert creatinine from mg/dL to μmol/L, multiply by 88.4.

**Figure 1 : SOFA Score**

**Table-1 Trend of Central venous oxygen saturation (ScvO2) in survived & expired patients:**

| Central venous oxygen saturation(ScvO2) | Survived | Expired |
|---|---|---|
| | Mean ± SD | Mean ± SD |
| 0 Hour | 64.91 ± 1.74 | 47.64 ± 2.03 |
| 12 Hour | 65.3 ± 0.934 | 44.84 ± 1.49 |
| 24 Hour | 68.21 ± 2.47 | 42.2 ± 0.744 |

ScvO2 trend was decreasing in expired patient & increasing in survived patients, thus decreasing trend of ScvO2 had bad prognosis in our study. We observed in our study that ScvO2<50 at any point of time was associated with poor prognosis in septic shock. Trend of ScvO2 was also indicative of prognosis in septic shock. Decreasing trend of ScvO2 was usually associated with poor outcome in patients with septic shock.

## DISCUSSION:

Central venous oxygen saturation has diagnostic, therapeutic as well as prognostic value in critically ill patients. As a diagnostic, derangement in ScvO2 can ascertain the underlying etiology. The oxygen consumption by the tissues of whole body is usually independent of oxygen delivery ($DO_2$). ScvO2 is a measure of the oxygen content of the blood returning to the right side of the heart after perfusing the entire body. When the oxygen supply is insufficient to meet the metabolic demands of the tissues, an abnormal ScvO2 ensues and reflects an inadequacy in the systemic oxygenation. ScvO2 is, therefore, dependent on oxygen delivery and oxygen extraction. In our study we had measured ScvO2 in patients with septic shock. Mean value of ScvO2 at 0 Hour, 12 Hours and 24 Hours in survived patients were 64.91, 65.3 and 68.21. Mean value of ScvO2 at 0 Hour, 12 Hours and 24 Hours in expired patients were 47.64, 44.84 and 42.2. According to the study published in Journal of anesthesia & intensive care medicine[11], the overall mean ScvO2 in non-survivors and survivors was 53.34 ± 4.08 and 73.33 ± 5.03 respectively, which is comparable to our study. On observing the ScvO2 trend, Serial ScvO2 levels were increasing in survived patients while serial ScvO2 levels were decreasing in expired patients. There was correlation between ScvO2 at 0, 12, and 24 hours with mortality in our study (P value <0.05). Present study had near perfect agreement with ScvO2 level for mortality prediction (AUC >0.5). We can see that as ScvO2 increased, the mortality tends to reduced. This suggests that ScvO2 is a useful prognostic marker in patients with septic shock.

## CONCLUSION:

Our study confirms the prognostic value of serial ScvO2 monitoring and its trends for prediction of mortality. If ScvO2 levels are static or increasing then prognosis is good and prognosis is grave if it is decreasing. Our study indicates that it is better to monitor serial ScvO2 level rather than going for single value. We concluded that ScvO2 can be used as an independent predictor of survival in patients with septic shock.

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