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ORIGINAL ARTICLE

Prediction of ICU Admission and its Outcome a Prospective Study of Different Scoring Systems in Women with Pregnancy Associated Sepsis

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ABSTRACT

Objective: This study aims to compare the effectiveness of the Sequential Organ Failure Assessment (SOFA) and the Sepsis in Obstetrics Score (SOS) in predicting admission to intensive care and mortality in pregnant women with pregnancy-associated sepsis (PAS). Specifically, the researchers wanted to determine the performance of these two scoring systems.

Methods: Cases were recruited from the obstetrics department who were diagnosed with PAS and met any two of the criteria for fast SOFA (qSOFA). At the time of admission, the features of SOFA and SOS were recorded and compared to determine the influence of these two models on patient outcomes.

Place of Study: Hayat memorial teaching hospital

Duration of Study: January 2021 to May 2022

Results: There were 30 intensive care patients, which leads to a significant fatality rate (31.7%). This was associated with the deaths of numerous patients. A criteria of SOFA less than 6 had the optimal combination of sensitivity (84.4%) and specificity (61,3%) for determining critical care admission for the study population. A cutoff value less than six produced the highest levels of sensitivity (64%) and specificity (40%) for the same.

Conclusions: Compared to SOS, SOFA produced a significantly more accurate forecast of both the patient's dire health and the likelihood of their death. SOFA performed significantly better than SOS when assessing the proportion of PAS patients who required critical care hospitalization and the death rate.

Keywords: SOFA · SOS · Obstetric sepsis ·

INTRODUCTION

Pregnancy-associated sepsis is responsible for a considerable number of maternal fatalities and morbidities throughout the world (PAS). Even in countries with a high GDP per capita, between four and ten out of every ten thousand newborns are affected with pregnancy-related sepsis. According to studies conducted in the United Kingdom, sepsis was responsible for roughly one-fourth of all maternal deaths, with delayed detection or treatment of the infection being the primary source of the problem.

Both researchers and politicians have placed PAS and sepsis at the top of their priority lists in recent years. In obstetric clinical practise, new sepsis definitions and evaluation scales [(Third International Consensus Defnitions for Sepsis and Septic Shock Task force, 2016)] and pregnancy-specific scores [the Sepsis in Obstetrics Score (SOS)] have been established. In an effort to improve patient outcomes, tailored therapy is also becoming increasingly commonplace in PAS treatment. Therefore, it was vital to obtain an early diagnosis of PAS and to continue monitoring the affected woman. In 2016, the Third International Consensus Definitions for Sepsis and Septic Shock Task Force defined sepsis as "life-threatening organ failure resulting from a dysregulated host response to an infection." This is the international category for sepsis. The publishing year for this definition was 2016. When the SOFA score increases by at least two points, the presence of organ dysfunction can be inferred. When computing the precise SOFA dates, cardiovascular (mean arterial pressure), central nervous (Glasgow Coma score), hepatobiliary (bilirubin level), respiratory (peripheral arterial oxygen pressure and saturation), and renal factors are taken into account (creatinine or urine output). A patient who may be experiencing septic shock can be examined using the rapid SOFA, a clinical scale that can be administered at the bedside. For each of the following, one point is awarded: abnormal mentation (less than 15 on the Glasgow Coma Scale), an elevated respiratory rate (more than 22 breaths per minute), and a low systolic blood pressure (less than 100 mmHg). When two or more of the above criteria are met, it is generally considered that the patient is suffering from sepsis.

Several researchers have included pregnancy-specific sepsis parameters as an additional component of their studies. Albright et al. (2014) developed the Sepsis in Obstetrics Score (SOS) in order to estimate the risk of admission to intensive care for pregnant and recently delivered women. The abbreviation for "sepsis in obstetrics" inspired the naming of the SOS. The score considered parameters that are physiologically altered during pregnancy [blood pressure (BP), heart rate (HR), and total leukocyte count (TLC)], combined them with those of Acute Physiology and Chronic Health Evaluation (APACHE) II and Rapid Emergency Medicine Score (REMS), i.e. temperature, HR, RR, oxygen saturation, and TLC, as well as the criteria for Systemic Inflammatory Response Syndrome (SIRS) [BP, TLC, and percentage of immature neutrophils A SOS of 6 or above was associated with an increased likelihood of positive blood culture results, an increased risk of admission to intensive care, and foetal tachycardia. The establishment of these scales' precise risk-indicating thresholds, as well as their diagnostic accuracy (specificity and sensitivity), and, lastly, their validation with a broader population and a range of clinical contexts, are the key problems associated with their application. In nations with a low per capita income and where sepsis is the major cause of maternal morbidity and mortality, these criteria are critical for the application of the ideas at hand. Due to the limited resources of these countries, it is vital to prioritise the distribution of organisations that provide essential medical care. When determining whether or not to admit a patient, the patient's prognosis is an additional consideration. As a result, we chose to assess the performance (threshold values, specificity, and sensitivity) of two diagnostic measures, SOFA and SOS, in relation to intensive care admission and mortality in obstetric patients with PAS. These scores determine the likelihood that a patient will require intensive care or die. Both of these ratings correlate with organ dysfunction. We wished to compare the SOFA scale, a general sepsis warning scale, to a pregnant-women-specific scale (SOS).

METHODS

This study was part of a broader inquiry that included serial diagnostic scores (SOFA and SOS), biochemical (lactic acid), and

laboratory information, as well as organ failures and mortality in obstetric patients hospitalised with a diagnosis of PAS. In addition, this study examined patients who were admitted with a PAS diagnosis.

Inclusion Criteria: Patients with obstetric problems who met the qSOFA criteria and developed clinical sepsis were enrolled in the study as cases. Their ages ranged between 21 and 0. These patients may be pregnant, post-abortive (up to two weeks following the operation), or post-partum (less than 6 weeks).

Exclusion Criteria: Participants who had a known history of or had been diagnosed with pathology of the pulmonary, cardiac, renal, hepatobiliary, or neurologic systems were excluded from the study.

Sample Size Calculation: At our medical facility, about 2.98 cases of sepsis are reported for every 1000 deliveries and 2.98 cases are reported for every 1000 live births. There were a total of 17,378 births, stillbirths, and abortions over the course of the study's twelve-month period. This number reflects both births and abortions. During this time period, there were 18,478 births of children who survived. In each of the seventy patients tested, PAS was suspected. We needed 60 PAS patients for the study, and in order to be considered for participation, these patients had to meet a variety of criteria. 30 of these patients, or 50% of the total, had to be admitted to intensive care units (Group A). The most crucial reason for the patient's admission to intensive care was their need for life support, which comprised invasive ventilation, continuous renal replacement treatment, and invasive hemodynamic support. In addition, the patient required intensive monitoring and therapy (according to the criteria established by Priority 1 Nates et al.). Group B was comprised of the remaining 30 patients, or 50% of the total.There were a total of 60 patients, and 18 of them died (a mortality rate of 30%). In Group A, there was not a single instance of a mother passing away from any cause.

METHODOLOGY

Every participant in the study was subjected to a comprehensive physical examination that included gynaecological and medical components. Relevant imaging and laboratory tests were also performed as part of the inquiry. A blood sample, a high vaginal swab, and any purulent discharge (if present) were sent in order to undergo bacteria culture and sensitivity testing. The patient was sampled for these samples. The growth of a single organism from any of the above-mentioned samples served as the criterion for establishing whether or not a cultured specimen yielded a positive result. At the time of the patient's admission, blood samples were taken for haematology tests. A prospective application of SOFA and SOS was done on the patients involved in the trial. The pulmonary, cardiac, renal, hepatobiliary, and neurological systems were studied and monitored as part of the process of identifying whether or not an organ is failing. The following are the key criteria used to represent organ failure: disturbances in mental status; arterial hypoxemia (PaO2/FiO2300); acute oliguria (less than 0.5 mL/kg/h for at least 2 hours); creatinine rise of more than 0.5 mg/dL; coagulation abnormalities (INR>1.5 or aPTT>60 s); thrombocytopenia (platelet count of fewer than 100103/mm3); hyperbilirubinemia. The patients were cared for in accordance with the hospital's procedures as well as the details of their individual medical conditions.

RESULTS

The average age of the patients was 27+2 years, with a standard variation of 5 years. 35 (56.6%) of the 60 individuals with PAS were detected after giving birth, 20 (33.3%) during pregnancy, and 6(10%) after termination. At the time of diagnosis, the vast majority of individuals with PAS were pregnant. Sixty-three percent of the individuals, had pregnancies that were not tracked at any stage.All of the participants were recent mothers. Anemia was found in 52 patients (86.6%), while intrauterine death was diagnosed in 24 subjects (40.6%). Group A patients had a greater proportion of positive blood and urine culture results than Group B patients. The same was true for both groups. In contrast, this difference did not approach the level of statistical significance. The renal and pulmonary systems were most frequently affected by organ failure in Group A, which had a much higher incidence of organ failure overall. In Group A, there were 17 cases of failure in more than one organ, but in Group B, there were only three such instances.

According to the results of the ROC analysis, a SOFA 6 cutoff gave the optimal combination of sensitivity (83.9% of the time) and specificity (60.9% of the time) for predicting admission to intensive care in our study population (AUC = 0.83; p <0.001).29 of the patients with a SOFA score of less than six were admitted to intensive care units. 44 of the total 60 patients, had a SOFA score of less than 6. It was found that SOFA (6) had a statistically significant difference between Group A and Group B, as well as expected mortality. SOS 6 was detected in the systems of 42 out of 60 (70%) patients diagnosed with PAS. As their situations deteriorated, twenty-one patients, or 35% of the total, were admitted to critical care units. Taking this SOS criterion into consideration, however, there was no statistically significant difference between Group A and Group B.

Table 1 Comparative analysis of clinical and laboratory parameters among diverse groups

Characteristics Mean (Range)	Total (n = 60)	Group A (n = 30)	Group B (n = 30)	p value	Mortality (n = 18)	Survivor (n = 42)	p value
Systolic BP (mmHg)	91.2	90.3	90.4	0.91	90.2	90.4	0.8
Diastolic BP (mmHg)	54.3	54.2	54.8	0.890	54.7	54.9	0.87
Pulse rate (/min)	116.2	116.3	115.1	0.5	116.9	115.4	0.533
Respiratory rate (/min)	31.2	31.4	30.1	0.21	32.9	29.7	0.02
Hemoglobin (mg/dL)	8.4	7.9	8.5	0.35	7.7	8.2	0.88
Total SOFA	8.3	10.8	5.4	< 0.001	11.9	5.8	< 0.001
Total SOS	7.8	8.2	7.3	0.16	8.8	7.1	0.08

Table 2 Comparison of mortality in SOFA versus SOS subgroups

SCORE	Total number of cases (%)	Mortality (%)
A. SOFA score		
0–6	37.2	8.1
7–9	29.1	22.22
10–12	18.1	22.23
13–14	7.2	16.66
15–24	8.4	33.33
B. SOS score		
<6	33.33	38.88
≥ 6	66.66	61.11

DISCUSSION

Obstetric patients in societies with limited resources face a substantial PAS load, making resource allocation hard. The high death rate (32.1%), as well as the high rate of intensive care (52.3%), in PAS patients reflected the severity of sepsis and the pre-admission morbidity of women. Our research confirmed this.In this study SOFA and SOS in PAS were evaluated. Cultures of PAS patients were moderately positive, and renal or pulmonary failure was the primary cause for life support. Our PAS patients had cultures that were moderately positive (52.3%) and were predominantly recent mothers (56.3%). SOFA less than 6 showed the highest sensitivity (84.1%) and specificity (61.1%) for critical care admission in the study population. The cutoff value with the highest sensitivity (63%) and specificity (42%) was less than six. SOFA properly anticipated the patient's grave condition and death, in contrast to SOS. Comparing SOFA and SOS studies in PAS is difficult due to the clinical context, patient situations, diagnostic threshold, and outcomes. This makes data conclusions impossible. The majority of SOFA-validated patients did not require obstetric intensive care. The pooled AUC of SOFA for discriminating

maternal mortality is 0.92 (95% confidence interval: 0.81–0.95). Even when SOFA encompassed obstetric patients, the situation remained unchanged. a meta-analysis led to this conclusion. However, the SOS is a novel obstetric scale with limited research. It was designed for emergency rooms to determine if patients with obstetric sepsis require critical care. The score was modified by physiological changes associated with pregnancy. In the first study, which included 850 female participants and had an area under the curve of 0.92, SOS 6 was related with admission to intensive care with a sensitivity of 89.0% and a specificity of 99.9%. In this study, SOS 6 enhanced survival rates. In this series, one death and nine admissions to critical care (1.1% of patients) occurred. The greatest flaws were the design of the research, which was retrospective, and the fact that 23% of the parameters were missing. The same group did a second investigation to confirm SOS. In this study, 3,5% of 425 women were admitted to intensive care, although there were no maternal deaths. The SOS predictive value for admission to intensive care was 0.85, with a 95% confidence interval from 0.76 to 0.95. The test has a sensitivity of 64% and a specificity of 84%. Five mortality-related factors were evaluated in 146 female sepsis patients by Aarvold et al. The retrospective methodology was implemented in a number of intensive care units. At issue were the SOS, APACHEII, SAPSII, SOFA, and Multiple Organ Dysfunction Scores (MODS). As a control group, 299 age-matched, childless women were used. The SOS, APACHE II, SAPS II, SOFA, and MODS scores accurately predicted obstetric cohort mortality with areas under the receiver-operator curve of 0.68, 0.69, 0.73, 0.78, and 0.82, respectively. These devices are precise. It was quantified by the obstetric cohort. Nonobstetric cohort values were 0.63, 0.73, 0.62, 0.78, and 0.75, while obstetric cohort values were 0.63 and 0.73. In terms of predicting obstetric and non-obstetric patient mortality, SOFA exceeded SOS. This was true regardless of pregnancy status. For our patients, GDS SOFA predicted critical care admission and mortality more accurately than pregnancy-specific SOS. SOFA really outperformed SOS. Using diagnostic scales with caution can assist identify women at risk and propose additional surveillance or preventive. This could be achieved by supporting surveillance and prevention. In a premorbid situation with a high mortality rate, our study revealed that the SOFA score could predict admission to intensive care and mortality rates for PAS patients. It accurately predicted admission to intensive care. Using a common scale, obstetric and non-obstetric sepsis patients can be triaged or assigned intensive care beds in an emergency. Standard scales can accomplish these objectives. SOS should be evaluated at an obstetric facility with a comparable patient population. In spite of life-sustaining therapy, PAS had a significant mortality rate. This sheds light on the socioeconomic and social conditions in low-wage nations, which are outlined below. It illustrates the disparity between illness and health care. This study investigates the applicability and validity of numerous diagnostic scales in a variety of clinical settings, patient characteristics, and treatment practises. This focuses on evaluating numerous diagnostic scales in diverse clinical settings. Obstetric diagnostic scales require more discriminating characteristics. This is likely the first comparison of SOFA and SOS to predict intensive care and mortality in a population of high-mortality obstetric patients. We prospectively administered two diagnostic measures to the same population. This enhanced our precision. This confirmed the accuracy of the content. All patient information, including physiological and laboratory data, was collected from study participants, allowing for a reliable evaluation of the scale. Our investigation was conducted at a tertiary obstetric hospital based on referrals. Future clinical settings and patient profiles may not be applicable to our study. Our research was driven by aggregated scores rather than individual variable prediction values.

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