Original Article

TO STUDY THE CO-RELATION BETWEEN SOFA SCORE ON ADMISSION AND 48 HOURS AND ITS OUTCOME IN CRITICALLY ILL GERIATRIC PATIENTS IN MEDICAL INTENSIVE CARE UNIT

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Abstract

Aim: To study the co-relation between SOFA score on admission and 48 hours and its outcome in critically ill geriatric patients in Medical Intensive Care Unit.

Materials and Methods: The present prospective observational study was conducted on 100 patients of age 60 years and above with dysfunction of at least two organ systems, admitted in medical intensive care unit of Dr DY Patil Medical College Hospital and Research Centre, Pimpri, Pune during the period from OCTOBER 2020– SEPTEMBER 2022. The study was carried out on a total of one hundred patients who fulfilled the qualifying requirements and were admitted to the hospital's medical intensive care unit. Every single one of our patients gave their consent after receiving adequate information. A comprehensive clinical examination, which included both general and physical examinations, was performed on each and every patient. Assessment of the patient's degree of consciousness as well as their score on the Glasgow coma scale were taken at the time of admission for each patient. The severity of an issue is graded according to the GCS as follows: severe (GCS score of 8), moderate (GCS score of 9–12), and mild (GCS score of 13 or lower) (GCS score of 13–15). Patients were monitored during their time in the hospital, and the staff kept a record of the patients' final status—whether they had passed away or had survived.

Results: In the present study, out of total 31 mortalities; maximum death (n = 22) reported in 60-69 years of age followed by 70-79 years (n = 9). The mortality was significantly higher in males in comparison with the females. The overall survived female patients were 31 and 38 in males. On analysis significant difference was observed between for the mean values of SOFA score at admission and 48 Hr. among survived and died patients (5.2609±2.95880 and 6.7742±3.98087, p = 0.034) and (4.4928±2.52996, 10.0000±4.29729, p=0.001). On analysis significant difference was observed between for the mean values of Delta SOFA score among survived and died patients (-0.5942±2.28369 and 2.8387±3.08865, p = 0.001).

Conclusion: The SOFA score at admission and 48 hours has shown statistically significant association with the outcome of critically ill elderly patients.

Keywords: SOFA, outcome, geriatric patients.

Introduction

A critical care prediction scoring system is a useful tool for forecasting a patient's course in the ICU by assigning a numeric value, or "severity score," to a number of observable clinical characteristics at the time of admission. Their primary function is to predict the outcome of a patient's condition, but they also aid in evaluating the efficacy of treatment options and the standard of care provided. They have been used to manage hospital resources by placing patients with lower severity scores in less expensive facilities, as well as for research and administrative purposes. They can also be expanded to be used in clinical trial settings, where a researcher can utilize them to guarantee that participants in each group have identical levels of disease. The Acute Physiology and Chronic Health Evaluation (APACHE)[i], the Simplified Acute Physiology Score (SAPS)[ii], and the Mortality Prediction Model are the most widely used predictive scoring systems (MPM)[iii]. Most of these scores, however, rely on a large number of factors, which can be time-consuming and cumbersome in a situation where rapid evaluation is required to keep up with patients' rapidly evolving medical conditions.

Rather of relying on complex methods, SOFA generates a severity score from basic assessments of major organ function gleaned through routine exams. It's easy to implement, involves only six variables, and provides immediate feedback. After an individual is admitted to the intensive care unit (ICU), a score is assigned and then recalculated every 48 hours. There is a direct correlation between the severity of illness as measured by the Sequential Organ Failure Assessment (SOFA) score and the likelihood of survival in the intensive care unit (ICU), a finding that has been confirmed in both medical and surgical ICUs.[iv]

Because of the rising demand produced by an ageing population and the scarcity of available resources, it is essential to understand the outcomes of senior patients who are admitted to the intensive care unit (ICU), as well as the factors that contribute to these outcomes. Numerous health problems affect the geriatric, and these are only exacerbated by the various obstacles they must overcome as a result of ageing, including psychological and financial difficulties. They are also accompanied by sensory and cognitive impairments, which only make matters worse. This has a multiplicative effect that raises morbidity and mortality rates. By allowing for faster administration of treatments, the examination of these factors may help reduce fatality rates.

Materials and methods

The present prospective observational study was conducted on 100 patients of age 60 years and above with dysfunction of at least two organ systems, admitted in medical intensive care unit of Dr DY Patil Medical College Hospital and Research Centre, Pimpri, Pune during the period from OCTOBER 2020– SEPTEMBER 2022.

Inclusion criteria

- All critically ill elderly patients
- Age ≥60 years
- Both male and female patients in MICU

Exclusion criteria

- Patients on readmission are not taken into study
- Patients who did not give consent

Ethical approval and Informed consent

The protocol for the study was examined by the hospital's Ethical Committee, and they determined that it did not violate any ethical standards. Following the presentation of the objective of the research as well as its specifics, a written informed permission was collected.

Methodology

The study was carried out on a total of one hundred patients who fulfilled the qualifying requirements and were admitted to the hospital's medical intensive care unit. Every single one of our patients gave their consent after receiving adequate information. A comprehensive clinical examination, which included both general and physical examinations, was performed on each and every patient. Assessment of the patient's degree of consciousness as well as their score on the Glasgow coma scale were taken at the time of admission for each patient. The severity of an issue is graded according to the GCS as follows: severe (GCS score of 8), moderate (GCS score of 9–12), and mild (GCS score of 13 or lower) (GCS score of 13–15).

Investigations

When determining the severity of a critical disease, the SOFA score system is utilised, and this evaluation takes place both upon admission and after 48 hours have passed. A complete blood count, an erythrocyte sedimentation rate (ESR), blood urea, blood sugar, serum creatinine, serum electrolytes, a liver function test (LFT), an X-ray of the chest, an electrocardiogram, an Elisa test for human immunodeficiency virus (HIV), a CRP test, and a VDRL test are all examples of additional investigations. Each patient had a coagulation profile carried out on them, which included measurements of their bleeding time, clotting time, prothrombin time, and activated partial thromboplastin time.

Follow-up and outcome assessment

Patients were monitored during their time in the hospital, and the staff kept a record of the patients' final status—whether they had passed away or had survived.

Statistical Analysis

The collected data was entered into a spreadsheet application (Microsoft Excel 2010) and then transferred to the data editor in SPSS version 20. (SPSS Inc., Chicago, Illinois, USA). Percentages, averages, and standard deviations were all computed as part of the descriptive statistics process. The analysis used the student t-test as its statistical tool. Both the CI and p-value were established at a 95% and 5% level of significance, respectively.

Results

Table 1: Age wise distribution of the gender in the study

		Outcome		Total	p-value
		DEATH	SURVIVED		
Age (In Years)	60-69	22	46	68	0.223 (NS)

		71.0%	66.7%	68.0%	
	70-79	9	17	26	
		29.0%	24.6%	26.0%	
	>80	0	6	6	
		0.0%	8.7%	6.0%	
Total		31	69	100	
		100.0%	100.0%	100.0%	

Test applied: Chi-square test

In the present study, out of total 31 mortalities; maximum death (n = 22) reported in 60-69 years of age followed by 70-79 years (n = 9). The association between outcome and age was observed to be non-significant (p = 0.223).

Table 2: Association between gender and outcome in the study

		Outcome		Total	p-value
		DEATH	SURVIVED		
Gender	Female	7	31	38	0.033 (Sig.)
		22.6%	44.9%	38.0%	
	Male	24	38	62	
		77.4%	55.1%	62.0%	
Total		31	69	100	
		100.0%	100.0%	100.0%	

Test applied: Chi-square test

The mortality was significantly higher in males in comparison with the females. The overall survived female patients were 31 and 38 in males. Out of 100 patients of both sexes, 69 patients survived.

Table 3: Distribution of etiological spectrum of study population

		Outcome		Total	p-value
		DEATH	SURVIVED		
Etiology	Bacterial Meningitis	1	2	3	0.123 (NS)
		3.2%	2.9%	3.0%	
	Chronic Kidney Disease	9	8	17	
		29.0%	11.6%	17.0%	
	Cirrhosis Liver	9	9	18	
		29.0%	13.0%	18.0%	

	Congestive Cardiac Failure	0	2	2	
		0.0%	2.9%	2.0%	
	CVST	1	1	2	
		3.2%	1.4%	2.0%	
	Dilated Cardiomyopathy	0	1	1	
		0.0%	1.4%	1.0%	
	Gangrene Foot	1	0	1	
		3.2%	0.0%	1.0%	
	Hemorrhagic Stroke	1	5	6	
		3.2%	7.2%	6.0%	
	Ischemic Stroke	3	7	10	
		9.7%	10.1%	10.0%	
	Myocardial Infarction	2	21	23	
		6.5%	30.4%	23.0%	
	OPC Poisoning	0	1	1	
		0.0%	1.4%	1.0%	
	Pneumonia	4	8	12	
		12.9%	11.6%	12.0%	
	Pyelonephritis	0	3	3	
		0.0%	4.3%	3.0%	
	Ulcer Foot/Septicemia	0	1	1	
		0.0%	1.4%	1.0%	
Total		31	69	100	
		100.0%	100.0%	100.0%	

Test applied: Chi-square test

In the present study majority of the mortalities reported were occurred among patients admitted due chronic kidney disease and cirrhosis of liver (18 out of 31 cases) followed by pneumonia (4 cases). The association between etiologies and outcome on statistical analysis revealed non-significant association (p=0.123).

Table 4: Comparison of mean value of SOFA and Delta SOFA score according to outcome

SOFA	Outcome	N	Mean	Std. Deviation	p-value
At Admission	SURVIVED	69	5.2609	2.95880	0.037 (Sig.)

	DEATH	31	6.7742	3.98087	
At 48 Hr.	SURVIVED	69	4.4928	2.52996	0.001 (Sig.)
	DEATH	31	10.0000	4.29729	
Delta SOFA	SURVIVED	69	-0.5942	2.28369	0.001 (Sig.)
	DEATH	31	2.8387	3.08865	

Test applied: Independent sample t-test

On analysis significant difference was observed between for the mean values of SOFA score at admission and 48 Hr. among survived and died patients (5.2609±2.95880 and 6.7742±3.98087, p = 0.034) and (4.4928±2.52996, 10.0000±4.29729, p=0.001). On analysis significant difference was observed between for the mean values of Delta SOFA score among survived and died patients (-0.5942±2.28369 and 2.8387±3.08865, p = 0.001).

Table 5: Comparison of mean values of various SOFA parameters at admission and at 48 hr according to outcome of patients

Parameters	Outcome						p-value
	SURVIVED			DEATH			
	N	Mean Score	Std. Deviation	N	Mean Score	Std. Deviation	
At Admission							
Renal (creatinine)	69	1.28	1.235	31	1.55	1.434	0.334 (NS)
Liver (Total Bilirubin)	69	1.09	1.147	31	1.32	1.326	0.368 (NS)
Coagulation (Platelet)	69	0.74	0.949	31	1.06	1.237	0.153 (NS)
Respiratory (PaO2/FiO2)	69	0.5797	0.81178	31	0.5806	0.80723	0.996 (NS)
CNS (GCS)	69	0.91	1.348	31	1.06	1.389	0.608 (NS)
Cardiovascular (MAP)	69	0.52	0.917	31	1.16	1.440	0.009 (Sig.)
At 48 Hr.							
Renal (creatinine)	69	0.96	1.021	31	1.94	1.482	0.001 (Sig.)
Liver (Total Bilirubin)	69	0.91	1.095	31	1.26	1.290	0.171 (NS)
Coagulation (Platelet)	69	0.5652	0.88248	31	1.1935	1.44728	0.009 (Sig.)

Respiratory (PaO2/FiO2)	69	0.5507	0.79588	31	0.8387	0.82044	0.101 (NS)
CNS (GCS)	69	0.83	1.306	31	2.45	1.261	0.001 (Sig.)
Cardiovascular (MAP)	69	0.55	1.022	31	2.35	1.603	0.001 (Sig.)

At admission on comparison significant difference was observed between for the mean values of SOFA score among survived and died for CVS parameter only (0.52±0.917 and 1.16±1.440, p = 0.009). At 48 Hr. on comparison significant difference was observed between for the mean values of SOFA score among survived and died for renal (0.96±1.021 and 1.94±1.482, p = 0.001), coagulation (0.5652±0.88248 and 1.1935±1.44728, p = 0.009), CNS (0.83±1.306 and 2.45±1.261, p = 0.001) and CVS (0.55±1.022 and 2.35±1.603, p = 0.001).

Discussion

Patients in critical condition are treated in the Intensive Care Unit (ICU) of any hospital, where they may undergo resuscitation in the face of acute physiological deterioration. As a result, accurate interventions and efficient use of hospital resources depend on a thorough assessment of the patient's condition upon admission to the intensive care unit.[v]

The Sequential Organ Failure Assessment (SOFA) is one of the newest organ failure scores that quantify morbidity by assessing the progression of organ dysfunction or failure over time.[vi]

We observed that, mortality was significantly higher in males in comparison with the females (p = 0.033). Similarly, Thompson et al.[vii] noted that compared to women, men are at an increased risk of death. Also, Nasir N et al. observed that males with sepsis have a 70% greater mortality rate.[viii]

In the present study, at the time of admission, mean scores of parameters of the SOFA score were calculated. Amongst those who survived, mean creatinine, total bilirubin, platelet count, PaO2/FiO2, GCS and MAP are 1.28±1.235, 1.09±1.147, 0.74±0.949, 0.5797±0.81178, 0.91±1.348 and 0.52±0.917 respectively. Amongst those who did not survive, the mean creatinine, total bilirubin, platelet count, PaO2/FiO2, GCS and MAP are 1.55±1.434, 1.32±1.326, 1.06±1.237, 0.5806±0.80723, 1.061.389 and 1.16±1.440 respectively. On performing statistical analysis, we observed that only cardiovascular (Mean Arterial Pressure) parameter found significant compared in survived and death patients at the time of admission (0.52±0.917 and 1.16±1.440, p = 0.009).

At 48 hours of admission, mean scores of parameters of the SOFA score were calculated. Amongst those who survived, mean creatinine, total bilirubin, platelet count, PaO2/FiO2, GCS and MAP are 0.96±1.021, 0.91±1.095, 0.5652±0.88248, 0.5507±0.79588, 0.83±1.306 and 0.55±1.022 respectively. Amongst those who did not survive, the mean creatinine, total bilirubin, platelet count, PaO2/FiO2, GCS and MAP are 1.94±1.482, 1.26±1.290, 1.1935±1.44728, 0.8387±0.82044, 2.45±1.261 and 2.35±1.603 respectively. At 48 hours of admission on comparison, a significant difference was observed between for the mean values of SOFA score among survived and died for renal (0.96±1.021 and 1.94±1.482, p = 0.001), coagulation (0.5652±0.88248 and 1.1935±1.44728, p = 0.009), CNS (0.83±1.306 and 2.45±1.261, p = 0.001) and CVS (0.55±1.022 and 2.35±1.603, p = 0.001).

The cardiovascular score on days 1 and 3 likewise linked substantially with the result in the study by Jain A. et al.[ix]

Moreno R et al.[12] found similar results, noting that the cardiovascular score had the highest discriminative value among individual organ scores. It was also noted that the presence of hepatic dysfunction or failure did not correlate with a worse outcome (odds ratio of 0.82).

The cardiovascular score has the highest discriminatory power among the individual organ ratings. According to Srivastava U et al.[x] cardiovascular (odds ratio 1.68) and renal (odds ratio 1.46) scores were more sensitive to the

effects of organ dysfunction or failure on outcome. There was no difference in outcome based on the presence or absence of hepatic dysfunction or failure (odds ratio: 0.82).

Chopra S. et al.[xi] identified a statistically significant relationship between variables pertaining to the respiratory system, the hemogram, the central nervous system, and the cardiovascular system.

The mean SOFA score at admission and 48 hours were 5.73 ±3.36 and 6.2 ± 4.06 respectively. The mean value of Delta SOFA score was 0.47±3.00. On analysis significant difference was observed between for the mean values of SOFA score at admission and 48 Hr. among survived and died patients (5.2609±2.95880 and 6.7742±3.98087, $p = 0.034$) and (4.4928±2.52996, 10.0000±4.29729, $p=0.001$). the mean total SOFA score was significantly higher in non-survivors than in survivors Similar to the present study, Lie et al.[xii], the mean total SOFA score was significantly higher in non-survivors than in survivors (6.7 vs. 4.6, OR 1.25; 95%CI 1.16–1.34, $p < 0.001$).

The mean values of delta sofa in survived patients were (-0.5942 + 2.28369), while in death patients was 2.8387 + 3.08865. The difference in delta SOFA score according to outcome was found statistically significant.

As the delta SOFA number rises from its prior level, there is a higher likelihood of the patient dying from his condition, according to the available research. In research looking at the relationship between SOFA score and outcome of geriatric patients admitted to the ICU, Gupta V et al.[56] found a substantial link between mortality and SOFA score both at admission and at 48 hours. According to their findings, the overall death rate for the geriatric was 78.4%. Patients who did well on the study by Qiao et al.[xiii] had lower scores on the Survival Outcomes Following Acute Illness (SOFA)-initial, SOFA-48h, and SOFA than those who did not.

Conclusion

The data suggests that the delta SOFA score is also useful to measure to predict outcome. Serum creatinine, platelet count, Glassgow Coma Scale and mean arterial pressure of the SOFA score showed significant association with mortality as an outcome at 48 hours, whereas only mean arterial pressure had a significant association with mortality as an outcome on admission. The SOFA score at admission and 48 hours has shown statistically significant association with the outcome of critically ill elderly patients.

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