“EFFICACY OF SEQUENTIAL ORGAN FAILURE ASSESSMENT (SOFA) SCORE IN PREDICTING MORTALITY AND MORBIDITY IN OBSTETRIC INTENSIVE CARE UNIT - A PROSPECTIVE OBSERVATIONAL STUDY”.

Dissertation submitted to

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BONAFIDE CERTIFICATE

This is to certify that this dissertation entitled **"EFFICACY OF SEQUENTIAL ORGAN FAILURE ASSESSMENT (SOFA) SCORE IN PREDICTING MORTALITY AND MORBIDITY IN OBSTETRIC INTENSIVE CARE UNIT - A PROSPECTIVE OBSERVATIONAL STUDY"**. is the bonafide work done by **Dr. R.NITHIYA**, at the department of Obstetrics and Gynaecology, **Institute of Obstetrics and Gynaecology, Madras Medical College, Chennai** during her post graduate study for MS Branch II Obstetrics and Gynaecology (2021-22) under the guidance of Prof. Dr. V. Kasthuri M.D., D.G.O

This dissertation submitted to **THE TAMILNADU Dr.M.G.R MEDICAL UNIVERSITY** in partial fulfilment of the University rules and regulations for the award of MS Degree in Obstetrics and Gynaecology.

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DECLARATION

I hereby declare that this dissertation entitled **"EFFICACY OF SEQUENTIAL ORGAN FAILURE ASSESSMENT (SOFA) SCORE IN PREDICTING MORTALITY AND MORBIDITY IN OBSTETRIC INTENSIVE CARE UNIT - A PROSPECTIVE OBSERVATIONAL STUDY"**. is a bonafide and genuine research work carried out by me after studying the cases in outpatient department at Institute of Obstetrics and Gynaecology, Madras Medical College, Chennai during the period November 2020 to November 2021, under the direct guidance and supervision of **Dr. Vijaya, M.D.,DGO,** Director of Institute of Obstetrics and Gynaecology, Madras Medical College, Chennai. It is submitted to The Tamil Nadu Dr.M.G.R Medical University, Chennai, in partial fulfilment of its regulation for the award of **M.S. (Obstetrics And Gynaecology)** Degree to be held in April 2022.

Place: Chennai.

Date:

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Dr. R.NITHIYA

CONTENTS

INTRODUCTION

One of the national health care quality measures is maternal mortality. However, more studies are needed, given the drop-in maternal death rates and the need to comprehend health-system flaws. Morbidity in mothers and the severe maternal morbidity to mortality ratio have been introduced as obstetric care indicators.[4]

In 15 percent of pregnancies, potentially serious problems are anticipated, resulting in 529 maternal deaths worldwide each year. Maternal deaths occur due to the risk associated with pregnancy and poor healthcare quality. Early detection and treatment of maternal potentially life-threatening illness and equal access to primary and emergency professional care are crucial for preserving the lives of mothers and their newborns. Maternal mortality should be viewed as the culmination of a long-term state of severe maternal illness (SMM).

According to estimates, there are around 118 occurrences of severe maternal illness for every maternal fatality. WHO has established several methodologies for evaluating near-miss situations, including assessing obstetric admissions to the critical care unit (ICU). However, there is a scarcity of data on ICU admissions. There is a knowledge gap among women admitted to the ICU with severe maternal morbidity about effective scoring systems for categorizing condition severity and mortality risk. Data availability would improve patient management, resource allocation, family counseling, risk classification, and care quality monitoring.[5]

Few researchers applied scoring tools designed for the general population, for example, APACHE II and SAPS II, among obstetric patients. The problem with this scoring system is that it considers chronic diseases and overestimates maternal mortality. These figures, however, exaggerate maternal mortality. The sequential organ failure assessment (SOFA) score assesses the

severity of sickness based on organ dysfunction. Although the SOFA score has been extensively examined in the general population, only a few studies in the obstetric population have been undertaken. Unlike APACHE II and SAPS II, which only assess the first 24hrs of an ICU stay, the SOFA score can be evaluated daily in the ICU. As a result, the SOFA score can be used to determine changes in a patient's clinical state. Furthermore, it only incorporates a few frequently considered factors in every institution, effectively applying the SOFA score in resource-constrained settings.[7]

This study aimed to see how well the SOFA score could distinguish survivors and non-survivors in ICU cases with near misses and significant maternal morbidity.

REVIEW OF LITERATURE

History

Virtually 303,000 women are expected to die each year from maternal causes, with nearly all of these fatalities happening in low-resource settings. Even in resource-constrained situations, such high maternal mortality and morbidity are unacceptable because most of these deaths can be easily averted or treated with reasonable and practical measures. It's no surprise, then, that lowering maternal mortality and morbidity have been a top priority for both national and international governments. In the poorest parts of the globe, a woman's lifetime chance of dying due to pregnancy or childbirth is one in six, compared to one in 30,000 in Northern Europe. Inequalities like these make it challenging to fulfill the goals. In the era of Sustainable Development Goals, such inequities constitute a significant impediment to achieving the post-MDGs (MDGs) (SDGs).[6]

With 16 percent of the global population, India is the world's largest democratic nation. Unfortunately, India has the highest maternal mortality rate globally, with 45,000 maternal fatalities reported in 2015. It is one of six countries that account for half of all maternal mortality worldwide. In India, healthcare is the responsibility of individual states, which vary in terms of socio-economic development, population size, epidemiological transition experience, and health system capacities, all of which influence the health status of the states' populations. On the one hand, places like Kerala have maternal mortality rates equivalent to those in wealthy countries. [6]In contrast, a few states in the Empowered Action Collection (EAG) (a group of socioeconomically deprived conditions), such as Madhya Pradesh and Uttar Pradesh, have maternal mortality rates that are equivalent to some of the world's poorest countries, In India, maternal mortality reduction has been a slow process. Still, in recent years, a considerably faster fall has been noticed.[3]

Several countries have used various techniques to help reduce maternal mortality throughout the years, ranging from a single intervention to a complex set of public health initiatives like WHO's and UNICEF's safe motherhood programs. Strengthening health systems and tackling more prominent social determinants of maternal health are among these initiatives, including ANC, delivery by trained staff, promotion of institutional delivery, and access to emergency obstetric services. Furthermore, many nations are experimenting with demand-side funding approaches, such as conditional cash transfers to lower financial barriers to maternal health care. India's recent achievements in reducing maternal mortality can be regarded as a success story. Maternal death has dropped from 556 per 1000 live births in 1990 to 174 in 2015, a pace of 15.8 percent per year. Compared to the global average of 43 percent, India has had a remarkable 77 percent reduction in maternal mortality since 2005. Indeed, India's performance has not gone unnoticed, with the WHO praising India for its outstanding achievement in substantially lowering maternal mortality. What

accounts for this exceptional success in maternal mortality reduction and improved maternal health outcomes? [8]

This study compares maternal mortality trends in EAG and non-EAG states in India from 1997 to 2017. It looks into the various household, economic, and policy factors that could explain the decrease in maternal mortality and improvement in maternal health outcomes. In addition, the paper examines the impact of household wealth on maternal mortality in India. The findings are reviewed in the context of numerous demand-side financing initiatives and pro-poor policies to lower maternal mortality and close supply-side gaps in India's healthcare system.

India accounts for around a quarter of all maternal deaths worldwide despite the advances made. India has used data from the periodic sample registration system to monitor maternal mortality in 18 of its 36 regions (SRS). There is no accurate routine reporting on maternal deaths for smaller states and districts. And,

to reduce preventable maternal deaths, this has been a critical roadblock in local health policy and planning. We give Maternal Mortality Ratio (MMR) for all states and districts of India for the first time, utilizing triangulation of routine records of maternal fatalities under the Health Management Information System (HMIS), Census of India, and SRS.[9]

We also used large-sample and robust statistical approaches to look at MMR's socio-demographic and health-care variables. According to the statistics, 70 percent of India's districts (448 out of 640) had an MMR of more than 70 fatalities, a target set under Sustainable Development Goal-3. Only Assam has an MMR more significant than 200, according to SRS. However, our analysis based on HMIS implies that MMR is more important than 200 in around six states (and two union territories) and 128 districts. As a result of the findings, there is spatial variation in MMR across communities, with high MMR in the North-eastern, Eastern, and Central areas and low MMR in the Southern and Western regions.

For example, Kerala, Tamil Nadu, Andhra Pradesh, Karnataka, and Gujarat contain districts with medium-to-high MMR. Fertility numbers, the sex ratio at birth, health infrastructure, years of schooling, post-natal care, maternal age and nutrition, and poor economic condition have emerged as significant MMR correlates in order of importance. Finally, we demonstrate that HMIS provides a dependable, cost-effective, and routine source of information for monitoring maternal mortality ratios in India's states and districts.[9]

Scoring Systems

Scoring systems are commonly used to measure the severity of sickness in a research population, to compare various people by aggregating cases, and, more recently, as an admission condition for specific interventional studies. They can also be used to compare actual and projected outcomes for a particular physician, ICU, hospital, or area [30]. Although these algorithms can forecast results for specific patients, this practice is contentious.

Previous research has found a relationship between the number of defective organs and short- and long-term mortality among infection patients in emergency rooms. APACHE and SOFA are two of the most widely utilized grading systems.

Simplified acute physiology score (SAPS), Mortality probability model (MPM), Therapeutic intervention scoring system (TISS), Logistic organ dysfunction score (LODS), Simplified acute physiology score (SAPS), Multiorgan dysfunction score (MODS)[23]

APACHE SCORING SYSTEM

Knaus et al. developed the APACHE scoring system in 1985. It consists of 12 physiological variables calculated by multivariate analysis. The scores range from 0 – 71. The data of APACHE II are calculated using the equation.[31]

In Hospital Mortality

$(R/1-R) = -3.517 + (APACHE \square \times 0.146 + S + D)$

R = Risk of death in hospital, S = Risk due to emergency surgery, and D = Risk due to any specific disease.

A score of 25 or less indicates less than 50% mortality, whereas a score of 35 or more indicates more significant than 85% mortality. While the APACHE II score offers information about the severity of sickness in a particular group of patients, it does not provide much information about individual patients' risks. APACHE III and IV were created as an improvised version of APACHE II to improve prediction.

Physiologic Variable	High Abnormal Range					Low Abnormal Range				
	+4	+3	+2	+1	0	+1	+2	+3	+4	Points
Temperature - rectal (°C)	≥41°	39 to 40.9°		38.5 to 38.9°	36 to 38.4°	34 to 35.9°	32 to 33.9°	30 to 31.9°	≤29.9°	
Mean Arterial Pressure - mm Hg	≥160	130 to 159	110 to 129		70 to 109		50 to 69		≤49	
Heart Rate (ventricular response)	≥180	140 to 179	110 to 139		70 to 109		55 to 69	40 to 54	≤39	
Respiratory Rate (non-ventilated or ventilated)	≥50	35 to 49		25 to 34	12 to 24	10 to 11	6 to 9		≤5	
Oxygenation: A-aDO2 **or** PaO2 (mm Hg) a. FIO2 ≥0.5 record A-aDO2 b. FIO2 <0.5 record PaO2	≥500	350 to 499	200 to 349		<200 PO2>70	 PO2 61 to 70		 PO2 55 to 60	 PO2<55	
Arterial pH (preferred) Serum HCO3 (venous mEq/l) (not preferred, but may use if no ABGs)	≥7.7 ≥52	7.6 to 7.69 41 to 51.9		7.5 to 7.59 32 to 40.9	7.33 to 7.49 22 to 31.9		7.25 to 7.32 18 to 21.9	7.15 to 7.24 15 to 17.9	<7.15 <15	
Serum Sodium (mEq/l)	≥180	160 to 179	155 to 159	150 to 154	130 to 149		120 to 129	111 to 119	≤110	
Serum Potassium (mEq/l)	≥7	6 to 6.9		5.5 to 5.9	3.5 to 5.4	3 to 3.4	2.5 to 2.9		<2.5	
Serum Creatinine (mg/dl) Double point score for acute renal failure	≥3.5	2 to 3.4	1.5 to 1.9		0.6 to 1.4		<0.6			
Hematocrit (%)	≥60		50 to 59.9	46 to 49.9	30 to 45.9		20 to 29.9		<20	
White Blood Count (total/mm3) (in 1000s)	≥40		20 to 39.9	15 to 19.9	3 to 14.9		1 to 2.9		<1	
Glasgow Coma Score (GCS) Score = 15 minus actual GCS										
A. Total Acute Physiology Score (sum of 12 above points)										
B. Age points (years) ≤44=0; 45 to 54=2; 55 to 64=3; 65 to 74=5; ≥75=6										
C. Chronic Health Points (see below)										
Total APACHE II Score (add together the points from A+B+C)										

Figure 1: APACHE Scoring system

Table 4: Maternal and perinatal outcome and APACHE 2 results

Study Authors	Overall APACHE II score	Predicted maternal mortality (%)	Observed maternal mortality (%)	SMR	AUC ROC APACHE II	Perinatal mortality rate (%)
HIC						
Single site						
Lapinsky et al.[15]	6.8 (mean)	-	0	-	-	11.0
Afessa et al.[5]	14 (mean)	17.6	2.70	0.15	-	17.6
Heinonen et al.[13]	10.8 (mean)	-	4.50	-	-	-
Munnur et al.[22]	10 (median)	-	2.30	-	-	13.0
Muench et al.[21]	11 (median)	12.9	-	0	-	8.8
Multi-site						
El Solh et al.[10]	-	14.7	10.80	0.73	0.93	14.0
Mahutte et al.[18]	8.5 (mean)	10	2.30	0.23	-	-
Hazelgrove et al.[12]	9 (median)	25	3.30	0.24	0.94	20.0
Lapinsky et al.[16]	16.8 (mean)	0.28	0.12	0.43	0.82	-
Harrison et al.[11]	10.9 (mean)	9.39	2.30	0.25	0.839	-
Median (IQR) (HIC)	10.8 (8.8 to 12.5)	12.9 (9.4 to 17.6)	2.5 (2.3 to 4.2)	0.24 (0.15 to 0.43)	0.885 (0.825 to 0.938)	13.5 (10.5 to 18.2)
LMIC						
Single site						
Lewinsohn et al.[17]	11 (mean)	16.6	6.90	0.42	-	-
Tang et al.[25]	12.7 (mean)	-	-	0.22	-	10.0
Cheng and Raman[8]	7 (median)	-	4.65	-	-	-
Demirkiran et al.[9]	-	-	10.40	-	-	-
Mirghani et al.[19]	5 (mean)	-	3.30	-	-	-
Munnur et al.[22]	16 (median)	-	25.00	-	-	51.0
Mjahed et al.[20]	12 (mean)	19.2	16.70	0.87	-	32.0
Vasquez et al.[26]	14 (mean)	24	11.00	0.46	-	32.0
Aldawood[6]	19.6 (mean)	21.97	8.00	0.36	-	-
Bhadade et al.[7a]	-	36.66	30.30	0.99	-	-
Wang et al.[28]	9.7 (mean)	12.9	2.97	-	-	-
Paternina-Caicedo et al.[23]	8 (median)	11.98	4.27	0.36	0.867	-
Multi-site						
Karnad et al.[14]	16 (median)	26.7	21.60	0.78	-	52.0
Rios et al.[24]	6 (mean)	-	2.50	-	-	9.5
Vasquez et al.[27a]	8 (median)	7.6	3.6	0.47	0.886	17.0
Median (IQR) (LMIC)	11.0 (7.5 to 15.0)	19.2 (12.4 to 25.4)	7.5 (3.5 to 17.9)	0.46 (0.36 to 0.84)	0.877 (0.867 to 0.886)	32.0 (10.0 to 51.0)
Median (IQR) (all)	10.9 (8.0 to 14.0)	15.7 (10.5 to 23.5)	4.5 (2.5 to 10.8)	0.39 (0.23 to 0.67)	0.877 (0.834 to 0.933)	17.0 (10.5 to 32.0)

SMR: standardized mortality ratio; AUC ROC: receiver operating characteristic area under the curve.

[a]Prospective case series, all others retrospective.

Figure 2: APACHE Scoring System for Obstetric Care

SIMPLIFIED ACUTE PHYSIOLOGY SCORE (SAPS)

Le Gall et al. created the simplified acute physiology score in 1984. It was designed to address the challenges while assessing the APS used in the APACHE score. It was constructed using the APACHE score's 13 most easily observable physiological indicators. The total score is calculated using the highest ICU admission score within 24 hours. SAPS outperformed APACHE II in accurately predicting death in a stratified sample of patients.[29]

SAPS II	0 points	Abnormal value points				
Age (years)	< 40	50–59	60–69	70–74	75–70	≥ 80
		7 points	12 points	15 points	16 points	18 points
Heart rate (bpm)	70–119	40–69	120–159	≥ 160	< 40	
		2 points	4 points	7 points	11 points	
Systolic blood pressure (mmHg)	100–199	≥ 200	70–99	< 70		
		2 points	5 points	13 points		
Body temperature (°C)	< 39	≥ 39				
		3 points				
Only if on mechanical ventilation: PaO_2 (mmHg/FiO_2)		≥ 200	100–199	< 100		
		6 points	9 points	11 points		
Urinary output (L/day)	≥ 1	0.5–0.9	< 0.5			
		4 points	11 points			
Blood urea nitrogen (mmol/l)	< 10	10–29.9	≥ 30			
		6 points	10 points			
White blood cells (/mm^3)	1–19.9	≥ 20	< 1.0			
		3 points	12 points			
Potassium (mmol/L)	3–4.9	< 3 or ≥ 5				
		3 points				
Sodium (mmol/L)	125–144	≥ 145	< 125			
		1 points	5 points			
Bicarbonate (mmol/L)	≥ 20	15–19	< 15			
		3 points	6 points			
Bilirubin (µmol/L)	< 68.4	68.4–102.5	≥ 102.6			
		4 points	9 points			
Glasgow Coma Scale	14–15	11–13	9–10	6–8	< 6	
		5 points	7 points	13 points	26 points	
SAPS II	0 points	Abnormal value points				
Chronic disease		Metastatic cancer	Haematological malignancy		AIDS	
		9 points	10 points		17 points	
Type of admission	Scheduled surgical	Medical	Unscheduled surgical			
		6 points	8 points			

Figure 3: SAPS scoring system

MORTALITY PROBABILITY MODEL

The mortality prediction model was initially reported by Lemeshow et al. in 1985. He created four models: the probability of death based on data collected at ICU admission (MPM0), the possibility of death based on 24 hours data (MPM24), probability of death based on 48 hours data (MPM48), and probability of death over time-based on MPM0 and change in probability between MPM0 and MPM24 and MPM24 and MPM48. MPM II was created by Lemeshow et al. to examine serial changes in ICU patients throughout a 72-hour stay. As a result, this model outperformed APACHE and SAPS, which cannot do serial assessments.[32]

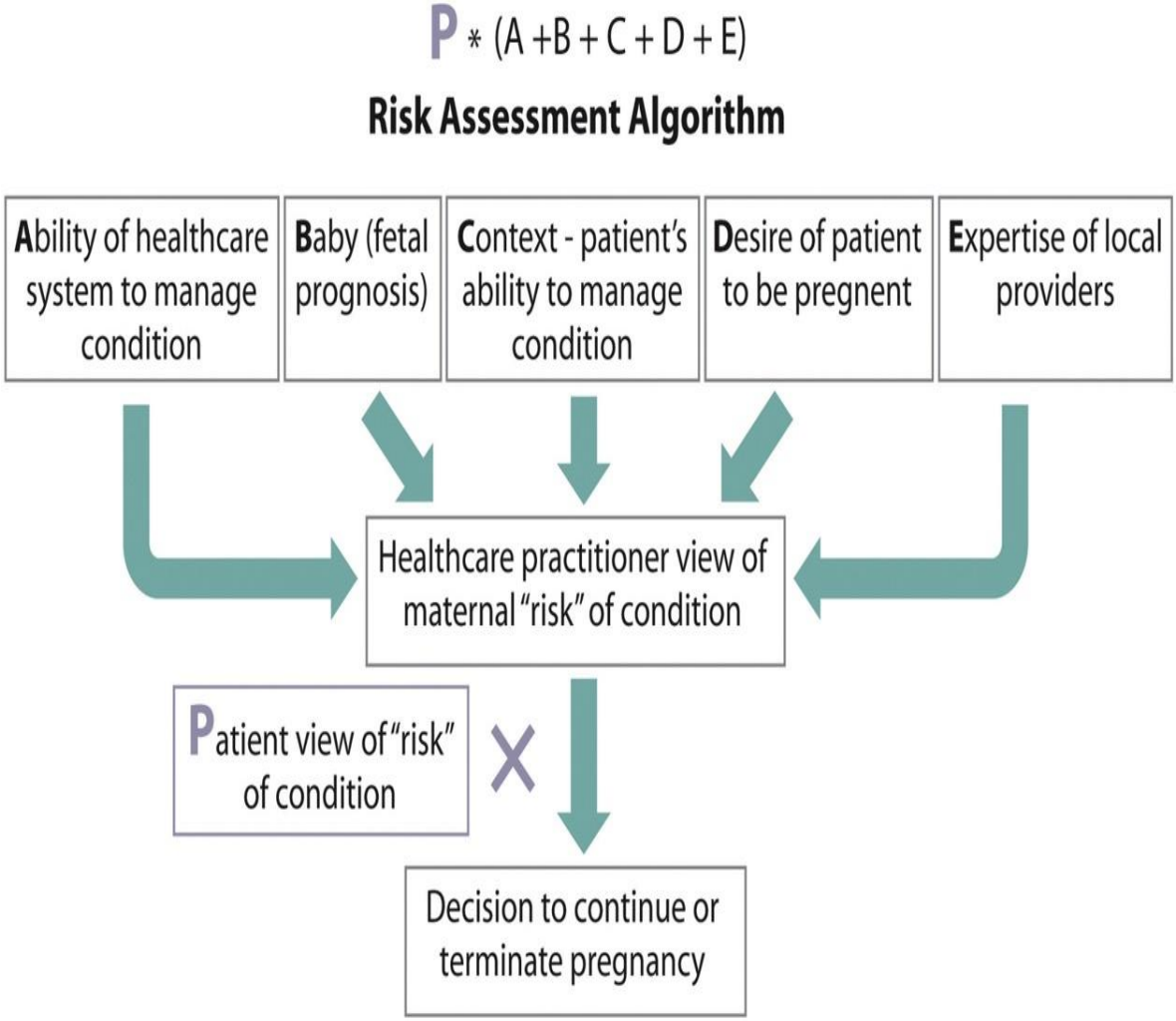


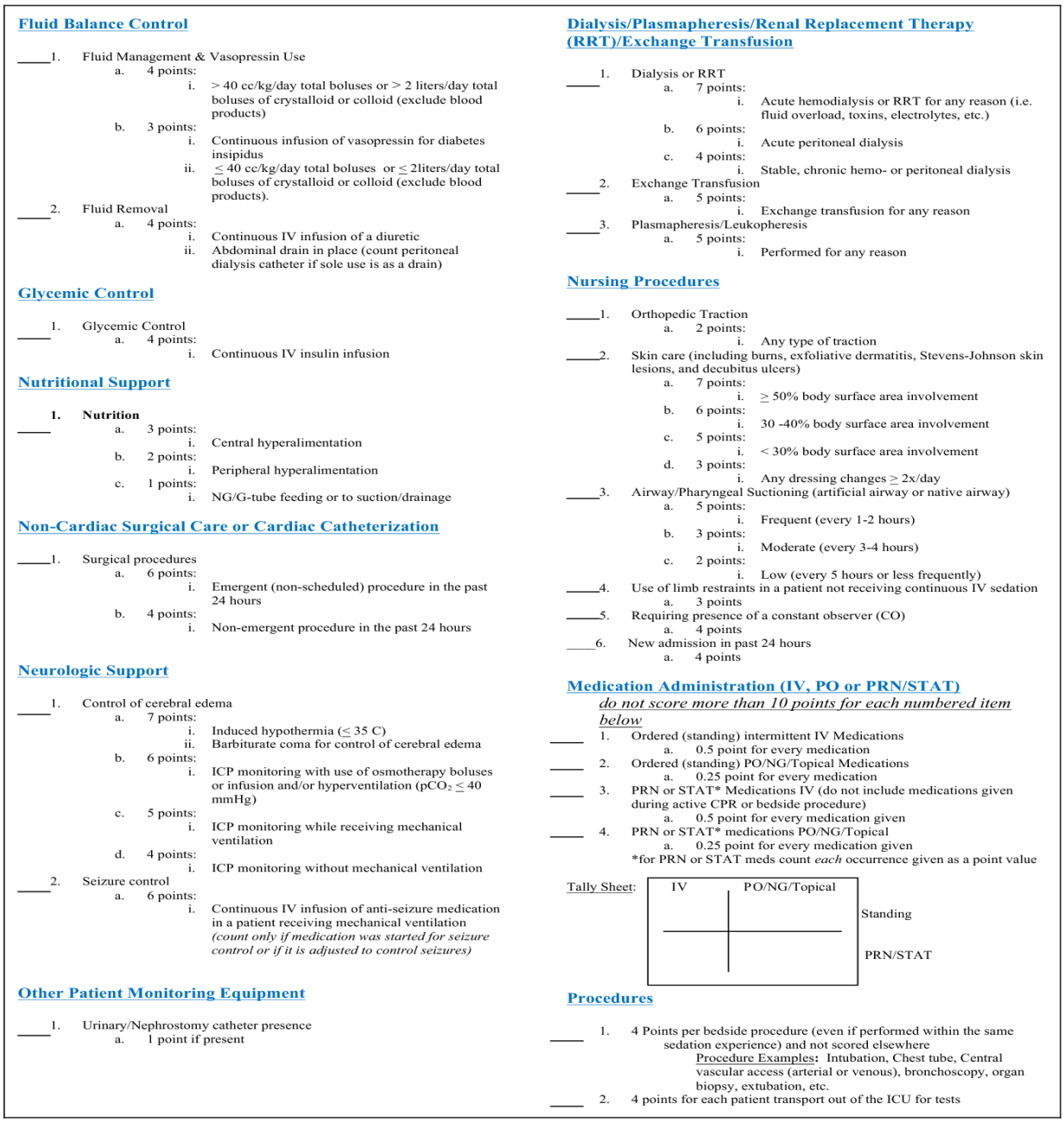
Figure 4: Risk assessment index

THERAPEUTIC INTERVENTION SCORING SYSTEM

This grading system was created by Cullen et al. in 1974. (14). There are 76 monitoring and therapeutic parameters used in this system. The first three days of an ICU stay strongly correlate with survival. As a result, it can distinguish survivors from non-survivors based on whether the score rises or falls.[41]

1. Respiratory support with mechanical ventilation.
2. Cardiovascular resuscitation (not due to myocardial infarction) needing continuous monitoring, c–v line, continous infusion of cardio-active drugs.
   Acute arrhythmias.
3. Neuro-resuscitation (medical or before neurosurgery).
4. Septicemia (immunocompromised patients).
5. Gastrointestinal bleeding (needing multiple venous lines and dopamine support for BP).
6. Peritoneal dialysis with respiratory support.
7. Acute liver failure.
8. Diabetic coma.
9. Poisoning.

Figure 5: Therapeutic intervention scoring system for patients in ICU.



Fluid Balance Control

____1. Fluid Management & Vasopressin Use
- a. 4 points:
  - i. > 40 cc/kg/day total boluses or > 2 liters/day total boluses of crystalloid or colloid (exclude blood products)
- b. 3 points:
  - i. Continuous infusion of vasopressin for diabetes insipidus
  - ii. ≤ 40 cc/kg/day total boluses or ≤ 2liters/day total boluses of crystalloid or colloid (exclude blood products).

____2. Fluid Removal
- a. 4 points:
  - i. Continuous IV infusion of a diuretic
  - ii. Abdominal drain in place (count peritoneal dialysis catheter if sole use is as a drain)

Glycemic Control

____1. Glycemic Control
- a. 4 points:
  - i. Continuous IV insulin infusion

Nutritional Support

1. Nutrition
- a. 3 points:
  - i. Central hyperalimentation
- b. 2 points:
  - i. Peripheral hyperalimentation
- c. 1 points:
  - i. NG/G-tube feeding or to suction/drainage

Non-Cardiac Surgical Care or Cardiac Catheterization

____1. Surgical procedures
- a. 6 points:
  - i. Emergent (non-scheduled) procedure in the past 24 hours
- b. 4 points:
  - i. Non-emergent procedure in the past 24 hours

Neurologic Support

____1. Control of cerebral edema
- a. 7 points:
  - i. Induced hypothermia (≤ 35 C)
  - ii. Barbiturate coma for control of cerebral edema
- b. 6 points:
  - i. ICP monitoring with use of osmotherapy boluses or infusion and/or hyperventilation ($pCO_2 \leq 40$ mmHg)
- c. 5 points:
  - i. ICP monitoring while receiving mechanical ventilation
- d. 4 points:
  - i. ICP monitoring without mechanical ventilation

____2. Seizure control
- a. 6 points:
  - i. Continuous IV infusion of anti-seizure medication in a patient receiving mechanical ventilation *(count only if medication was started for seizure control or if it is adjusted to control seizures)*

Other Patient Monitoring Equipment

____1. Urinary/Nephrostomy catheter presence
- a. 1 point if present

Dialysis/Plasmapheresis/Renal Replacement Therapy (RRT)/Exchange Transfusion

____1. Dialysis or RRT
- a. 7 points:
  - i. Acute hemodialysis or RRT for any reason (i.e. fluid overload, toxins, electrolytes, etc.)
- b. 6 points:
  - i. Acute peritoneal dialysis
- c. 4 points:
  - i. Stable, chronic hemo- or peritoneal dialysis

____2. Exchange Transfusion
- a. 5 points:
  - i. Exchange transfusion for any reason

____3. Plasmapheresis/Leukopheresis
- a. 5 points:
  - i. Performed for any reason

Nursing Procedures

____1. Orthopedic Traction
- a. 2 points:
  - i. Any type of traction

____2. Skin care (including burns, exfoliative dermatitis, Stevens-Johnson skin lesions, and decubitus ulcers)
- a. 7 points:
  - i. ≥ 50% body surface area involvement
- b. 6 points:
  - i. 30 -40% body surface area involvement
- c. 5 points:
  - i. < 30% body surface area involvement
- d. 3 points:
  - i. Any dressing changes ≥ 2x/day

____3. Airway/Pharyngeal Suctioning (artificial airway or native airway)
- a. 5 points:
  - i. Frequent (every 1-2 hours)
- b. 3 points:
  - i. Moderate (every 3-4 hours)
- c. 2 points:
  - i. Low (every 5 hours or less frequently)

____4. Use of limb restraints in a patient not receiving continuous IV sedation
- a. 3 points

____5. Requiring presence of a constant observer (CO)
- a. 4 points

____6. New admission in past 24 hours
- a. 4 points

Medication Administration (IV, PO or PRN/STAT)
do not score more than 10 points for each numbered item below

____ 1. Ordered (standing) intermittent IV Medications
- a. 0.5 point for every medication

____ 2. Ordered (standing) PO/NG/Topical Medications
- a. 0.25 point for every medication

____ 3. PRN or STAT* Medications IV (do not include medications given during active CPR or bedside procedure)
- a. 0.5 point for every medication given

____ 4. PRN or STAT* medications PO/NG/Topical
- a. 0.25 point for every medication given

*for PRN or STAT meds count *each* occurrence given as a point value

Tally Sheet: IV | PO/NG/Topical — Standing / PRN/STAT

Procedures

____ 1. 4 Points per bedside procedure (even if performed within the same sedation experience) and not scored elsewhere
Procedure Examples: Intubation, Chest tube, Central vascular access (arterial or venous), bronchoscopy, organ biopsy, extubation, etc.

____ 2. 4 points for each patient transport out of the ICU for tests

Figure 6: An updated therapeutic intervention scoring system for critically III children enables nursing workload assessment with insight into potential untoward events.

SOFA SCORING SYSTEM

The European Society of Intensive Care and Emergency Medicine created the SOFA score in 1994 to provide a way to describe the degree of organ failure in individuals and groups of ICU patients. The SOFA score was developed by Vincent et al., who demonstrated that infected patients had a higher risk of organ dysfunction than non-infected patients.

Table 3 Sequential organ failure assessment score

Organ system	Score				
	0	1	2	3	4
Respiratory PaO_2/FiO_2	> 400	≤ 400	≤ 300	≤ 200	≤ 100
Renal creatinine (μmol/L)	≤ 110	110-170	171-299	300-440 urine output ≤ 500 mL/d	> 440 urine output < 200 mL/d
Hepatic bilirubin (μmol/L)	≤ 20	20-32	33-101	102-204	> 240
Cardiovascular hypotension	No hypotension	MAP < 70 mmHg	Dopamine ≤ 5[1] Dobutamine (any dose)	Dopamine > 5[1] or epinephrine ≤ 0.1[1] or norepinephrine ≤ 0.1[1]	Dopamine > 15[1] or epinephrine > 0.1[1] or norepinephrine > 0.1[1]
Hematologic platelet count (/mL)	> 150	≤ 150	≤ 100	≤ 50	≤ 20
Neurologic Glasgow coma score	15	13-14	10-12	6-9	< 6

Figure 7: SOFA scoring system

SOFA scoring system analyses six variables, namely

- Pao2/Fio2 ratio (for respiration)
- Platelets (for coagulation)
- Bilirubin (for liver function)
- Creatinine (for renal function)
- Glasgow coma scale (to assess the level of consciousness)
- Blood pressure and the need for inotropic support.

Each of these six variables is given a score ranging from 0 to 4, and the total value of each of these parameters is used to calculate the score. The worst readings on each day are recorded, allowing the total score of organ function to be tracked over time. The mean SOFA score and the rising SOFA score are significant in determining patient prognosis and risk classification.[42]

PAO2/FIO2 RATIO:

It is described as the amount of oxygen inhaled and reaching the bloodstream. It is harmed in the event of a lung injury from any cause. It's also known as the Carrico index. Acute respiratory distress syndrome is diagnosed if the Pao2/Fio2 ratio is less than or equal to 200, according to AECC criteria.

The partial pressure of oxygen in arterial blood is known as Pao2. Torr units or millimeters of mercury (mmHg) are used to measure it. An arterial blood gas analyzer measures it (ABG). Pao2 should be between 75 and 100 mmHg.

The fraction of oxygen in the inspired air mixture is known as Fio2. Inspired ambient air has a Fio2 of 0.21. (21 percent). It is commonly set at 30–40 percent in a mechanical ventilator. A mechanically ventilated patient has a heart rate of 100 beats per minute.

Curbing and his co-workers assessed the clinical relevance of Pao2/Fio2 ratio variation. They demonstrated the clinical utility of this parameter.[34]

The Pao2/Fio2 scores are

- Score 0 – more than 400
- Score 1 – less than or equal to 400
- Score 2 – less than or equal to 300
- Score 3 – less than or equal to 200
- Score 4 – less than or equal to 100

CREATININE

In SOFA scoring, serum creatinine values are determined at regular intervals to assess renal function throughout time until the patient is admitted to the intensive care unit. Creatinine is a breakdown product of the muscle protein creatine phosphate. 1-2 percent of muscular creatine is transformed to creatinine per day. Both glomerular filtration and tubular secretion are used to

eliminate it. A rise in serum creatinine is a sign of nephron injury. Males have an average serum value of 0.7–1.2, whereas females have an average serum value of 0.5–1.0. Renal dysfunction can be caused by pre-renal, renal, or post-renal factors. A variety of factors can cause renal failure.[35]

- Severe dehydration
- Acute pyelonephritis
- Diabetes
- Hypertension
- Renal calculi
- Hemorrhagic fevers
- Disseminated intravascular coagulation
- Autoimmune and other connective tissue disorders.

The scores used for creatinine in SOFA score are,

- Score 0 – less than 1.2 mg/dl
- Score 1 – 1.2 to 1.9 mg/dl

- Score 2 – 2.0 to 3.4 mg/dl
- Score 3 – 3.5 to 4.9 mg/dl
- Score 4 – more than 5 mg/dl

PLATELET COUNT

Platelet count is a component in the SOFA score used to evaluate coagulation function and impairment in illness states. The coagulation mechanism is the activation, adhesion, and aggregation of platelets in response to a stimulus, such as an injury or infection. For this function to be intact, both platelet number and process must be adequate. The coagulation cascade is one of the most well-studied human systems. Platelets are primarily responsible for primary hemostasis, which is characterized by the production of platelet plugs. Platelets that have been activated release granules that have been stored in the bloodstream. [35]These granules are made up of

- Serotonin
- ADP

- Platelet-activating factor
- Platelet factor 4
- Von Willebrand factor
- Thromboxane A_2

When these compounds are delivered into the bloodstream, they stimulate the production of more platelets. Secondary hemostasis occurs when multiple enzymes in the coagulation cascade are activated, resulting in the activation of clotting factors. A low platelet count is linked to a variety of systemic illnesses. It could be related to a reduction in platelet generation, an increase in platelet destruction, or a reduction in platelet function.

The scores used for platelet count in SOFA are

1 Score 0 - >150 × $10^3/mm^3$

2 Score 1 - <150× $10^3/mm^3$

3 Score 2 - <100× $10^3/mm^3$

BILIRUBIN

Bilirubin levels are used to evaluate the liver's health. The liver is in charge of many metabolic processes throughout the body. Bile is produced in the hepatic lobules and flows into the bile duct through canaliculi, small bile ducts, and larger bile ducts.

This material comprises bile acids, phospholipids, and cholesterol that have not been esterified. Each day, the liver generates 500–600ml of bile. It consists of two fractions. Direct or hydrophilic and indirect or hydrophobic are two types. The indirect to direct fraction conversion is mediated by enzymes and occurs in the liver. The total bile synthesis and elimination process may be interrupted in sickness circumstances. Increases in bilirubin levels can be used to track liver function over time, allowing doctors to predict whether a patient's liver function would deteriorate or improve.[34]

Some of the conditions in which bilirubin levels are raised are,

1 Acute hepatitis

2 Alcoholic liver disease

3 DIC and septicemia

4 Hepatocellular carcinoma

5 Haemolytic jaundice

6 Obstructive jaundice

7 Congenital liver enzyme abnormalities

8 Massive blood transfusion

Excess bilirubin in the blood affects almost every biological function in the body. Bilirubin levels should be between 1.0 and 1.5 mg/dl in the blood. Direct or conjugated bilirubin, which equals 0.3 mg/dl, accounts for up to 30% of that. It can be dissolved with water. Unconjugated bilirubin is the portion of the fraction that is insoluble in water. This is the deadly form of bilirubin that, when in excess, deposits in the brain, particularly in the basal ganglia, causing seizures and neurological impairments.

The scores used for bilirubin are

1. Score 0 - < 1.2 mg/dl
2. Score 1 – 1.2 to 1.9 mg/dl
3. Score 2 – 2.0 to 5.9 mg/dl
4. Score 3 – 6.0 to 11.9 mg/dl
5. Score 4 - >12 mg/dl

GLASGOW COMA SCALE

It provides a dependable and objective recording of a person's conscious state. It is simple for both medical and paramedical professionals in an ICU for initial and ongoing medical assessment. It helps anticipate the outcome. There are three categories of replies that are evaluated.

Initially, the GCS scale was exclusively used for patients who had suffered a brain injury. It is being utilized to treat both medical and trauma patients. It's also used to keep track of critically unwell patients in ICUs. Graham Teasdale and Bryan J. Jennett of the University of Glasgow Institute Of Neurological Sciences published the scale in 1974. They were both neurosurgeons.[43]

Glasgow Coma Scale		
Eye Response	Open Spontaneously	4
	Open to Verbal command	3
	Open in response to pain	2
	No response	1
Verbal Response	Talking / Orientated	5
	Confused speech / Disorientated	4
	Inappropriate Words	3
	Incomprehensible sounds	2
	No response	1
Motor Response	Obeys commands	6
	Localizes pain	5
	Withdraws from pain	4
	Abnormal flexion	3
	Extension	2
	No response	1

Fig 8: Glasgow Coma Scale

The highest possible score is 15, which is, in a fully awake person. The lowest possible score is 3, which means deep coma or death.

The scores used for GCS in SOFA are

1. Score 0 – 15
2. Score 1 – 13 to 14
3. Score 2 – 10 to 12
4. Score 3 – 6 to 9
5. Score 4 - <6

BLOOD PRESSURE

"Without a doubt, the efficient working of our pipelines and pumps is of far greater urgent importance than practically any of our other parts and pieces." Vogel, Steven (vital circuits, 1992). As a result of any organ malfunction, hypotension and shock may develop. Perfusion and oxygenation of essential organs are dependent on maintaining healthy blood pressure. In a nutshell, shock is a clinical state caused by insufficient tissue perfusion due to any cause, resulting in an imbalance between oxygen demand and supply, culminating in cellular malfunction.[38]

URINE

In the diagnosis of renal disorders, a urine examination is critical. Proteinuria is a common sign of kidney illness, and the different types of proteins present in the urine can assist in distinguishing between glomerular and tubular problems. Casts and blood cells in the urine can reveal necessary information about the underlying renal pathology. Crystals can be observed in the urine of healthy people and those suffering from urolithiasis, toxic damage, or chronic renal failure.

Several important features must be considered when developing a scoring system, such as SOFA, for assessing and monitoring organ dysfunction. Through begin with, organ failure is not a one-size-fits-all condition; rather, it is a progression of changes in organ function from normal to varied degrees of dysfunction to organ failure. Second, organ dysfunction must be described using simple, easily repeatable variables that are specific to the organ in question and are readily available in all institutions.

Third, organ malfunction isn't a one-time event. It will change over time, and a grading system must be able to account for this feature. The capacity to perform serial SOFA scores when using the SOFA for outcome prediction allows for a more effective portrayal of the dynamics of illness, including the impact of therapy, when compared to standard outcome prediction models at the time of ICU admission. The APACHE II score has never been verified, despite the fact that certain researchers have utilised it over time14-16. Daily use of derived measures from the APACHE III system has also been proposed17, but APACHE III is not in the public domain, and its daily usage has yet to be validated. In clinical studies, the SOFA score is a valuable measure for stratifying and comparing patients.[18,19]

The Sequential Organ Failure Assessment (SOFA) score is a scoring system that evaluates the function of multiple organ systems in the body (neurologic, blood, liver, kidney, and blood pressure/hemodynamics) and calculates a score based on the

information gathered in each category. The higher the SOFA score, the greater the chance of death. The SOFA score was created as a study tool to categorise groups of patients based on their risk of death (e.g., those with sepsis, a bloodstream infection that can lead to shock and death). When utilised in sepsis instances and when applied to groups of patients, SOFA is quite accurate. For example, if 100 critically ill septic patients in need of intensive care unit (ICU) therapy all have a SOFA score of 11, more than 90% of them will die (Vincent et al., 1996). SOFA has the advantage of requiring only six common data points to calculate. Comparable predictive systems necessitate a lot more information. SOFA cannot properly identify which patients will survive when the mortality rate is high (i.e., if the death rate is 90%, which 10 people will survive) or which patients will die when the mortality rate is low because it was meant to look at populations rather than individual patients. Some of the scoring variables can be difficult to measure based on the type of care given (e.g., determining a level of coma when a patient is given sedatives), and some of the

drugs listed are no longer used routinely (e.g., low dose dopamine or dobutamine). Despite the fact that SOFA was established for sepsis research and has been validated in other settings, there is worry that when used for patients with isolated respiratory failure, as seen during the 2009 H1N1 pandemic, it may not properly predict mortality. In fact, only a small percentage of patients with primary respiratory failure have SOFA values more than 4-6, significantly limiting its utility in a pandemic/epidemic and potentially biassing individuals with other illnesses.

Another disadvantage is that high baseline creatinine, particularly in the case of pre-existing end-stage renal illness, can lead the score to be overestimated in comparison to actual mortality.(21 December 2020)

The updated 2016 Sepsis Definitions Consensus Statement (Sepsis 3) has endorsed SOFA (together with a less validated, more clinical technique dubbed "quick SOFA" or qSOFA) for assessing patients with sepsis, while it is not commonly used

outside of larger, academic hospitals. While the therapeutic value of SOFA in everyday practise has yet to be established, many states have included it in their crisis standards of care plans as part of the triage framework for limited resources. SOFA generates a standardised, numeric score that critical care physicians are familiar with. Physicians can use it to compare patient status, and it has been demonstrated to have a substantial link with outcome in some cases. As a comparison aspect, this can be beneficial to clinical teams. (21 December 2020) SOFA, out of all the scoring systems available, strikes a fair mix between conveniently accessible data and accurate prediction. It can also be used to determine trends in the particular patient's course when measured daily, albeit patients with respiratory failure due to viral pneumonia or other reasons may not show improvement and may even worsen throughout the first few days of hospitalisation. (21 December 2020)

SOFA was created for use with populations, and while it is good at predicting overall mortality, it is not good at predicting individual death. Clinicians should not rely solely on the SOFA score to rule out a patient from receiving treatment. The score's predictive value is also influenced by the severity of the disease. Finally, while SOFA has been well-validated in adults, it has not been so in children. As previously mentioned, SOFA values in primary respiratory failure are typically low, so they won't help with triage. (21 December 2020) When comparing patients and deciding how to best spend resources, it is best to use the SOFA score. A substantial difference in SOFA scores does clearly correlate with overall prognosis, so a patient who scores a 2 is far more likely to survive than a patient who scores an 11, and may receive resources preferentially unless there are other medical disorders or circumstances that change the prognosis. The American College of Chest Physicians' new recommendations for critical care triage are consistent with this strategy, which is also reflected in the Minnesota Department of Health clinical cardset (Patient Care

Strategies in Scarce Resource Situations), which includes SOFA among other factors in a comparative framework. States that are establishing or have built triage frameworks should make sure that if SOFA is used, it is to compare patients who are competing for the same resource or to track patients on a daily basis for trends (Ferreira, et al. 2001). SOFA is not utilised as a criterion for determining who will receive treatment or treatments.

It's vital to remember that SOFA is a single criterion, and other patient characteristics (such as underlying diseases and current treatment response) must be considered when making triage decisions (by December 21, 2020). Disease-specific prediction indicators (December 21, 2020) must also be considered and accounted for in the triage decision-making process. In most circumstances, disease-specific prognosis information is significantly more useful than generic prognosis information when it is available. Disease-specific prediction indicators (December 21, 2020) must also be considered and accounted for in the triage

decision-making process. When available, disease-specific prognostic information is significantly more useful than overall SOFA scores, which have a wide range of predictive value across a variety of illnesses. (21 December 2020) To make fair, accountable, and transparent decisions about resource allocation, ensure that the triage team members or clinical consultants (December 21, 2020) are experienced critical care providers who have access to relevant patient information, guidance, and are part of a defined, structured process for triage whenever possible.

AIMS AND OBJECTIVES:

- To Evaluate the predictive value of sequential organ failure assessment (SOFA) score among patients admitted to the obstetric intensive care unit

MATERIALS AND METHODS

100 patients admitted to labor ward unit in MMC with suspected and confirmed cases were included in the study population

STUDY DESIGN: PROSPECTIVE OBSERVATIONAL STUDY

STUDY GROUP: Women admitted to the obstetric ICU and the labor ward in morbid conditions during pregnancy or up to 42 days postpartum requiring ICU admission.

SAMPLING METHOD: Convenient Sampling

STUDY DURATION: January 2021- December 2021

INCLUSION CRITERIA:

- Subjects were included if they were admitted during pregnancy or up to 42 days after the termination of pregnancy (spontaneous or induced abortion, ectopic/molar pregnancy or delivery) requiring ICU admission satisfying criteria as follows:
- Antepartum hemorrhage
- Postpartum hemorrhage
- Others- preeclampsia, eclampsia, HELLP syndrome, amniotic fluid embolism, pulmonary embolism, CVT, sepsis of pelvic origin, ruptured uterus, ruptured ectopic pregnancy

EXCLUSION CRITERIA:

Patient transferred to other department requiring multi-disciplinary approach are excluded.

Patient admitted in Covid Ward ICU or patient in Obstetric ICU tested Covid positive are not included.

SAMPLE SIZE: 100 cases (average admission satisfying the above criteria in our institute ICU is 8 to 10 admissions per month

CONSENT

INFORMED CONSENT WAS TAKEN AS PER THE STANDARD PROCEDURE IN THE INSTITUTION

ETHICAL CLEARANCE

OBTAINED FROM THE ETHICAL COMMITTEE OF THE INSTITUTION

PROCEDURE:

1. ICU admission satisfying inclusion criteria
2. Written consent, history taking, examination
3. SOFA score calculated on admission, at 24 hours at 48 hours and 24 hourly during ICU stay
4. MEAN SOFA SCORE and TOTAL SOFA Score calculated
5. Data are analyzed statistically

Variables	0	1	2	3	4
Respiratory PaO2/FiO2 mm hg	>400	<=400	<=300	<=200	<=100
Coagulation Platelets X10*3/ul	>150	<=150	<=100	<=50	<=20
Liver Bilirubin Mg/dl	<1.2	1.2-1.9	2.0-5.9	6.0-11.9	>12
Cardiovascular Hypotension	No hypotension	Mean arterial pressure<70 mm hg	Dopamine<=5 or Dobutamine any dose(microgm/kg)	Dopamine>5 or Epinephrine<=0.1 or Norepinephrine<=0.1 (microgm/kg)	Dopamine>15 or Epinephrine>0.1 or Norepinephrine>0.1 (microgm/kg)
Central nervous system Glasgow coma scale	15	13-14	10-12	6-9	<6
Renal Creatinine (mg/dl) Urine output (ml/dl)	<1.2	1.2-1.9	2.0-3.4	3.5-4.9 or <500	>5.0 or <200

STATISTICAL METHODS

This is a diagnostic study. Data were analyzed using statistical software SPSS version 23. Descriptive statistics are given by mean±sd for continuous data, frequency, and percentage for categorical data. Mann-Whitney U test is used to find the mean

difference between two variables and the association between demographic variables, and the outcome chi-square test is applied. ROC curve is used to find the cut-off to predict mortality and sensitivity of SOFA score for obstetric patients. P-value<0.05 is considered to be significant throughout the study.

RESULTS

Statistical analysis is done using SPSS version 23. Descriptive statistics are frequency, percentage, mean (SD), and graphs. The chi-square test provides analytical statistics to find the association. Mann Whitney U test is applied to find the mean difference between the groups and ROC curves to find the cut-off to predict maternal morbidity. P-Value <0.05 is considered to be significant throughout the study. Among 100 patients involved in the study, 73% survived, and 27% succumbed to their illness. The study population included people <30 and >30 years of age.

SOFA score at admission

The minimum SOFA score of the patients admitted was 2. Hence the data column starts with values six and above. Most of the non-survivors at admission had SOFA scores around 15-18.

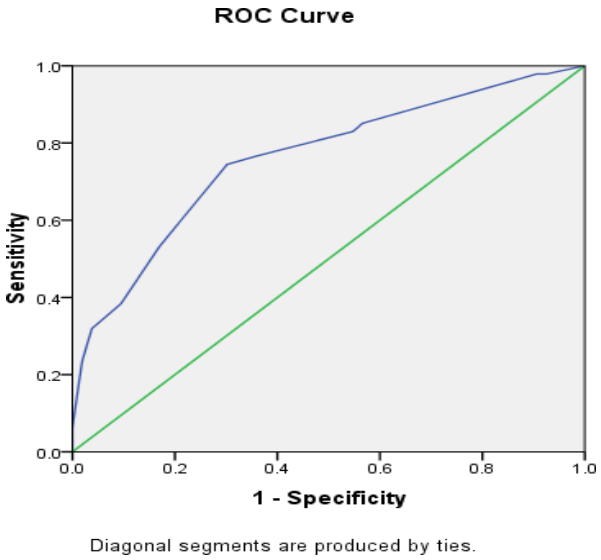
The area under the curve

Test results variables: SOFA ADMISSION

Area	St. Error	p-value	95% CI	
			Lower bound	Upper Bound
0.8	0.23	0.01	0.6	0.9

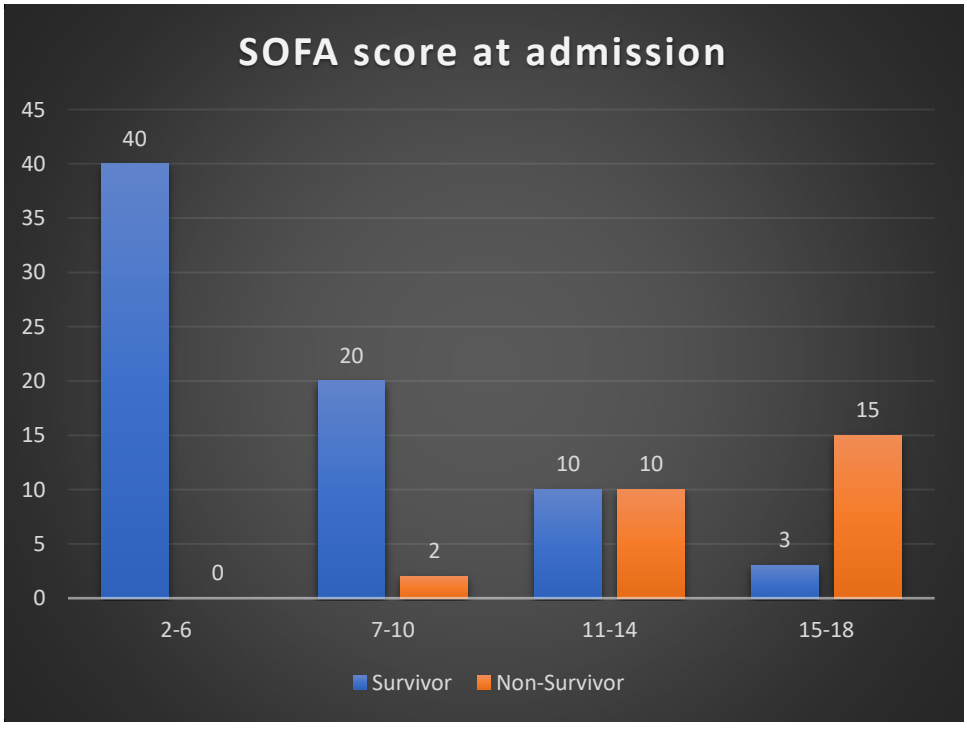
The area under the curve is 0.8. The sensitivity of the SOFA score at admission is 80% which is significant with a p-value<0.05. SOFA admission has at least one tie between the positive actual state group and the negative.

ROC CURVE FOR ADMISSION SOFA



Comparison between admission SOFA and NO.of deaths

The minimum admission SOFA score of patients in this study is 2. Among the patients with SOFA scores 2-6, no one expired. There is a vea very negligible percentage of mortality among people with SOFA scores between 2-6. A maximum number of deaths is seen with patients with SOFA scores of 14 and above.



SOFA at 24hrs for NON-SURVIVORS.

SOFA SCORE	No. OF NON-SURVIVORS
7-10	1
11-14	10
15-18	16

At 24hrs, the minimum SOFA score observed among the study population is 7. Hence the table starts with a SOFA score >=7.

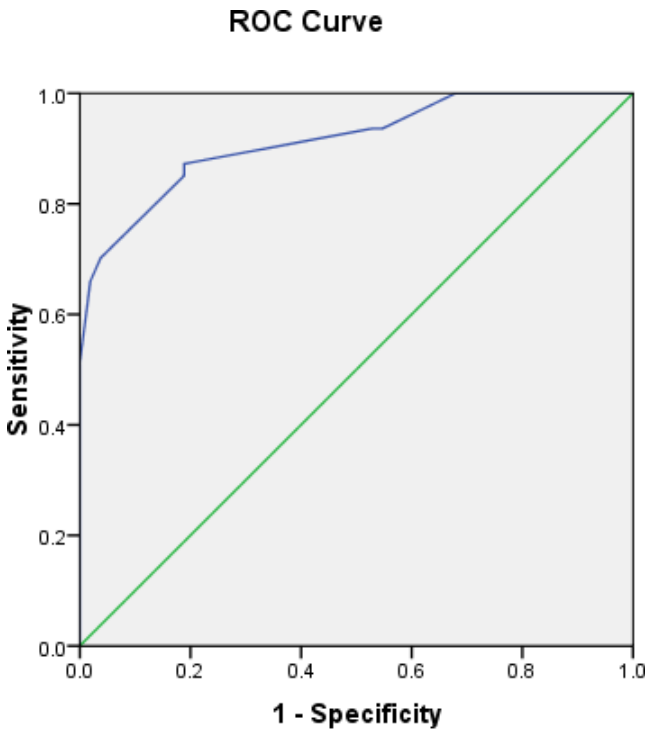
The area under the curve

Test results variables: SOFA 24hrs

Area	Std.Error	p-value	95% CI	
			Lower bound	Upper Bound
0.97	0.13	0.02	0.7	0.89

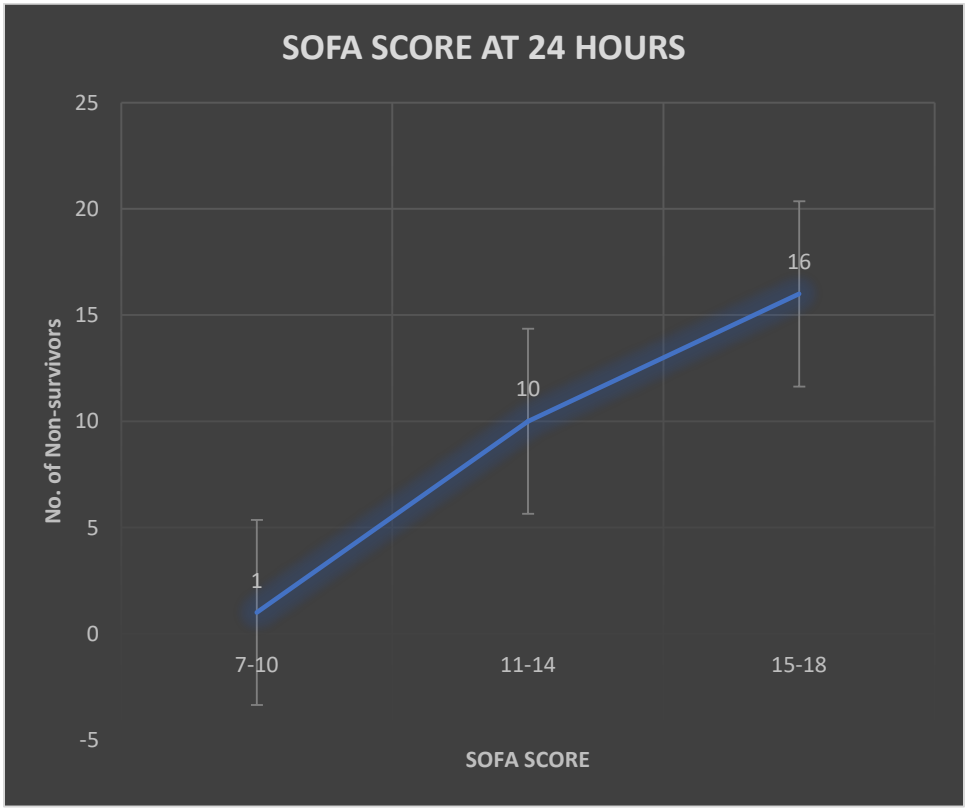
The area under the curve is 0.97. The sensitivity of the SOFA score at 24hrs is 97% which is significant with a p-value<0.05. SOFA admission has at least one tie between the positive actual state group and the negative.

ROC CURVE FOR ADMISSION 24hrs



The LINE graph shows a comparison between the SOFA score at 24hrs and the number of deaths.

The line graph shows that several deaths increases as patients fall into SOFA score 14 and above. The following diagram shows that 16 people succumbed, with SOFA scores around 15-18.



SOFA at 48hrs for NON-SURVIVORS.

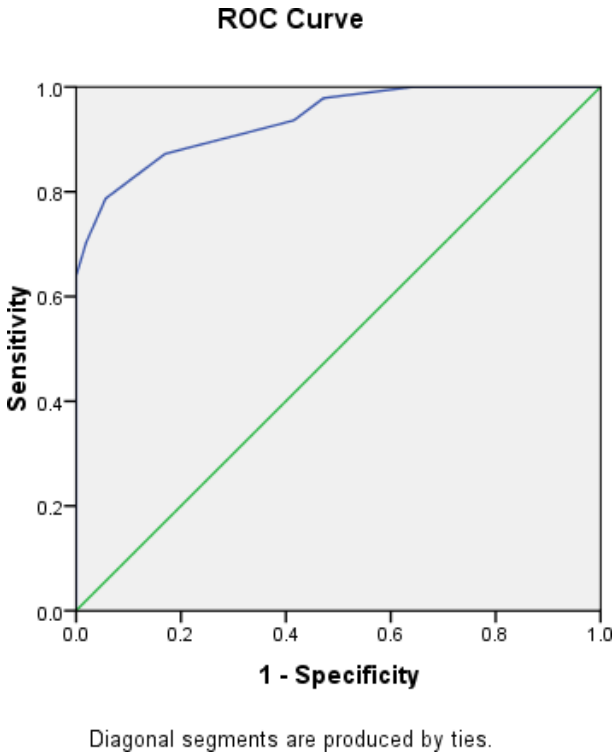
SOFA SCORE	No. OF NON-SURVIVORS
7-10	0
11-14	7
15-18	20

At 48hrs, the minimum SOFA score observed among the study population is 7. Hence the table starts with a SOFA score >=7.

The area under the curve

Test results variables: SOFA 24hrs

Area	Std.Error	p-value	95% CI	
			Lower bound	Upper Bound
0.99	0.13	0.04	0.8	0.9

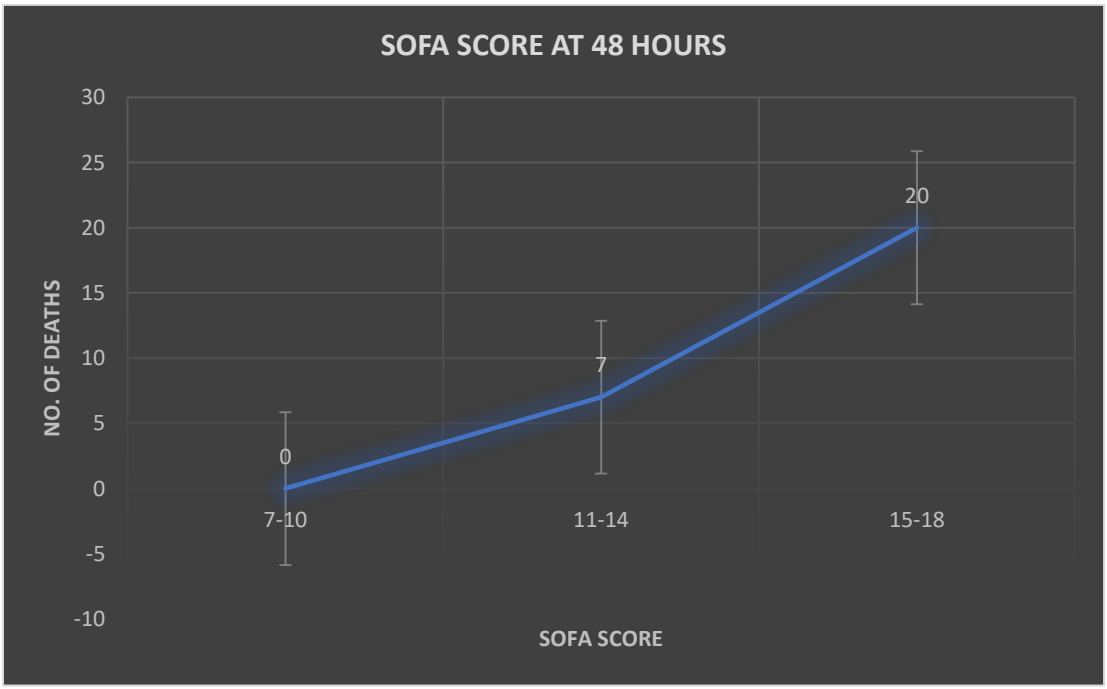


The area under the curve is 0.99. The sensitivity of the SOFA score at 48hrs is 99% which is significant with a p-value<0.05. SOFA admission has at least one tie between the positive actual state group and the negative.

ROC CURVE FOR ADMISSION 24hrs

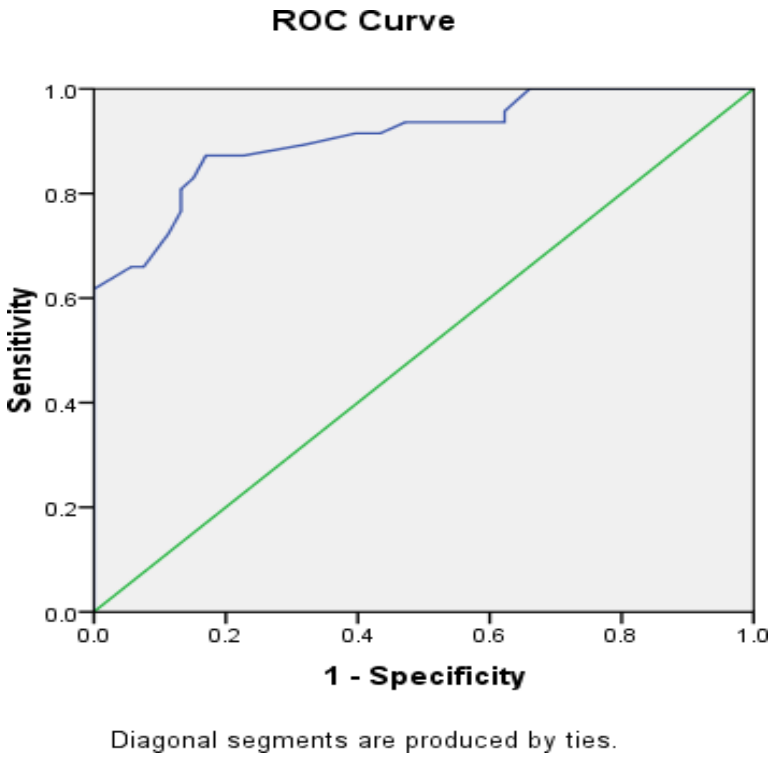
The LINE graph shows a comparison between the SOFA score at 48hrs and the number of deaths.

The line graph shows that several deaths increases as patients fall into SOFA score 15-18. The following diagram shows that 20people succumbed, with SOFA scores around 15-18.



MEAN SOFA

Mean SOFA calculates the average value of the prognostic score during the entire hospital stay of patients



Area Under the Curve

Area	Std.Error	p-value	95% CI		Curve Coordinate
			Lower bound	Upper Bound	13
0.89	0.23	0.03	0.85	0.9	

The area under the curve is 0.89. The sensitivity of the mean sofa score is 85% which is significant with a p-value<0.05.The smallest cut-off value is the minimum observed test value minus 1, and the most considerable cut-off value is the maximum observed test value plus1. The above table shows that a mean SOFA score of 13 and above is an excellent predictor of mortality; above this given cut-off, the number of no survivors increase.

TOTAL SOFA

The total score gives the sum of all the scores obtained from an individual patient during his hospital stay. It tells us about the severity of the illness since it provides the complete worst score of all organs.

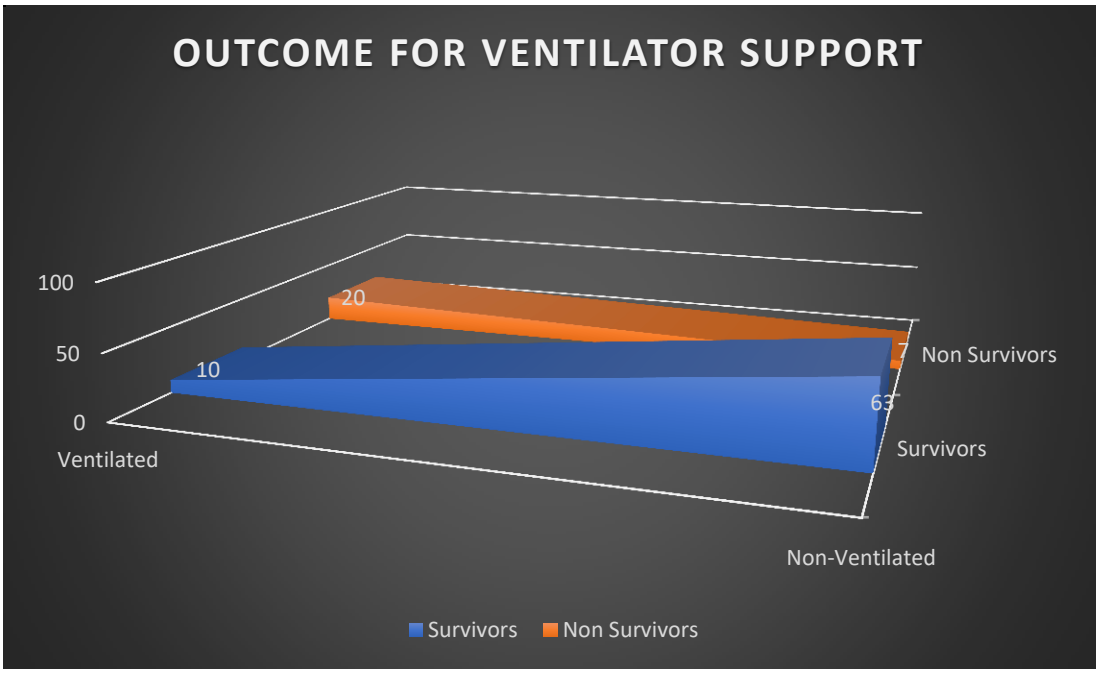
AREA UNDER THE CURVE

Area	Std.Error	p-value	95% CI		Coordinate Curve
			Lower bound	Upper Bound	35
0.91	0.22	0.01	0.81	0.9	

The area under the curve is 0.91. The sensitivity of the total sofa score is 87% which is significant with a p-value<0.05. The smallest cut-off value is the minimum observed test value minus 1, and the most considerable cut-off value is the maximum observed test value plus1. The above table shows that a total SOFA score of 35 and above is an excellent predictor of mortality; above this given cut-off, the number of deaths increase.

DEMOGRAPHIC VARIABLES

Mechanical Ventilation status	Survivors	Non Survivors	P-Value
Ventilated	10	20	0.04
Non-Ventilated	63	7	

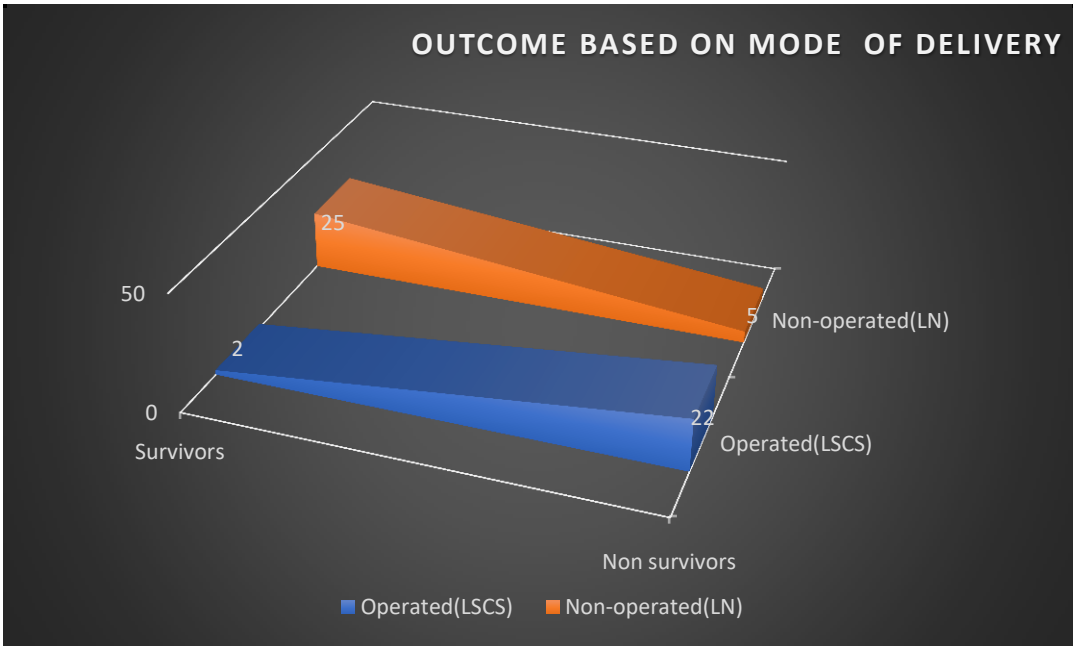


This area chart represents among the 30 patients ventilated, 67% of them expired, and out of 70 patients without ventilator support, 10% of them passed. There is a significant association between patients under ventilator support and patient ending up with death or surviving which is substantial with a p-value <0.05

OUTCOME BASED ON MODE OF DELIVERY

Mode of Delivery	Operated (LSCS)	Non-operated(LN)	P_Value
Survivors	2	25	0.02
Nonsurvivors	22	5	

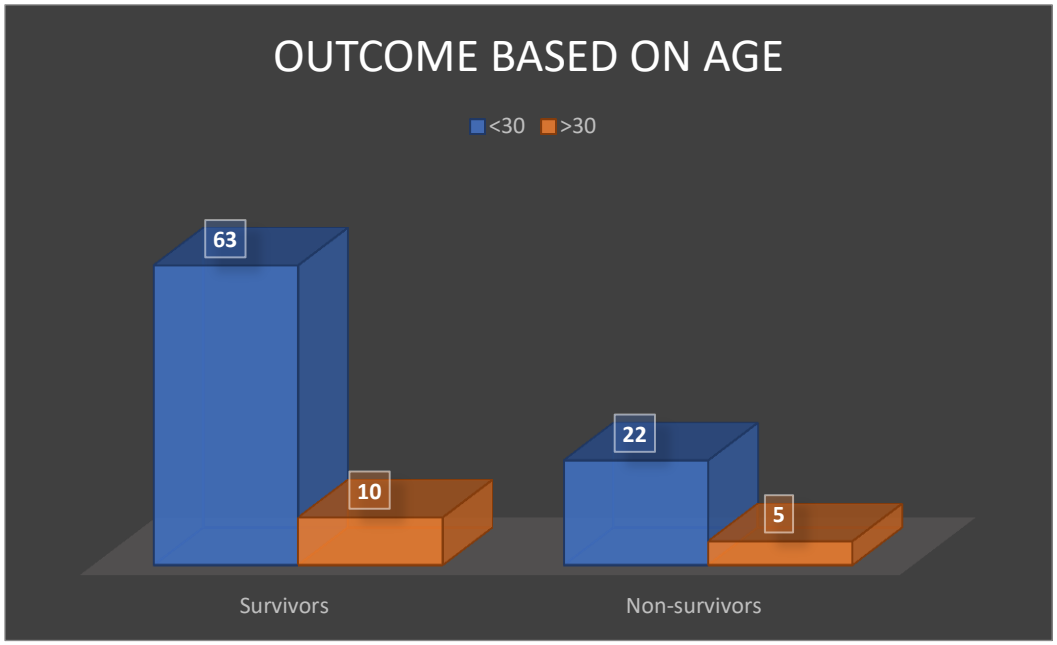
There is a significant association between a patient having an expected delivery and cesarean with a patient ending up with death or surviving, which is substantial with a p-value <0.05.



OUTCOME-BASED ON AGE

AGE	Survivors	Non-survivors	P-VALUE
<30	63	22	0.98
>30	10	5	

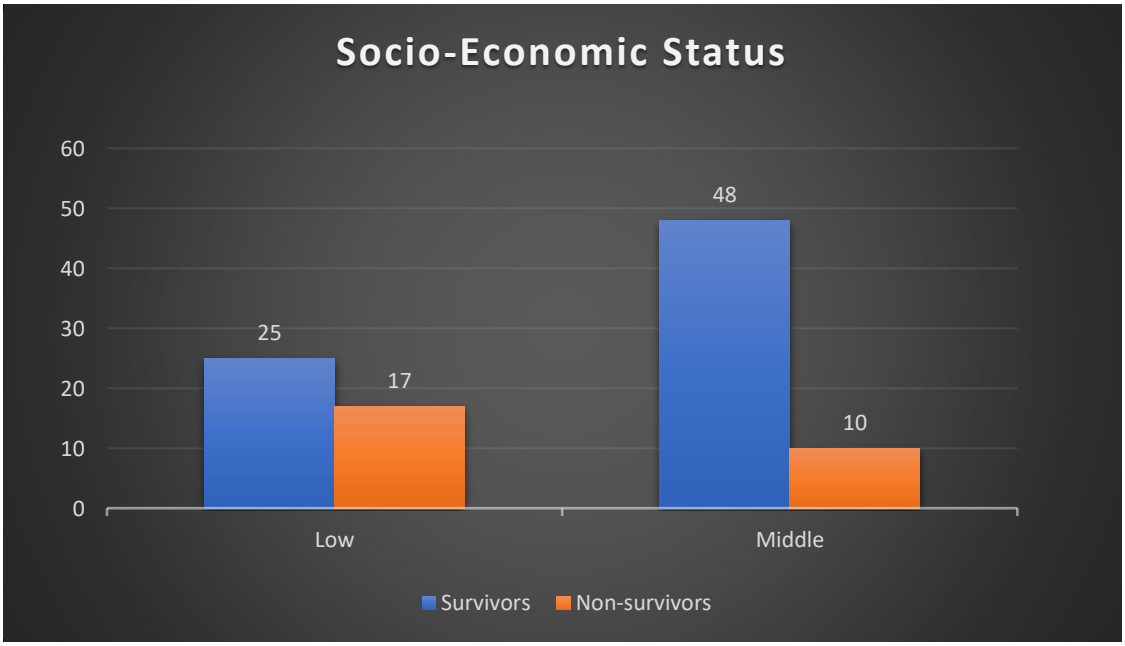
There is no significant association between age and patient death or surviving, which is substantial with a p-value >0.05. 81% of non-survivors are aged < 30.



OUTCOME-BASED ON SOCIO-ECONOMIC STATUS

Socio-economic status	Survivors	Non-survivors	P-VALUE
Low	25	17	0.7
Middle	48	10	

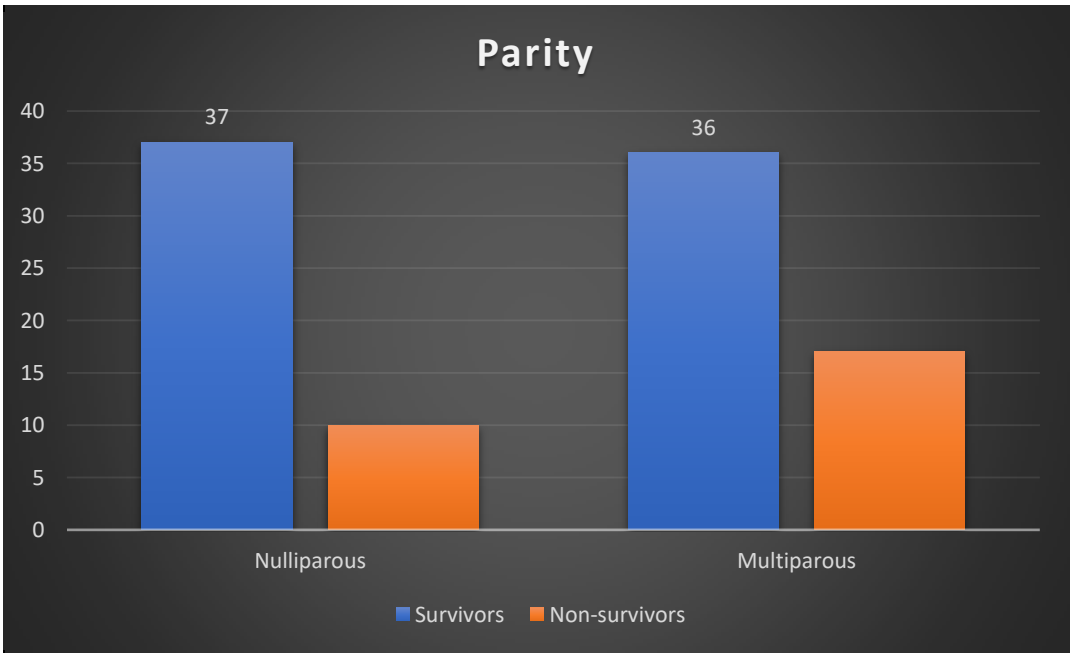
There is no significant association between socioeconomic status and patient death or surviving, which is substantial with a p-value >0.05. 63% of people from low economic rate expired, and around 37% of middle financial status people passed.



OUTCOME-BASED ON PARITY

Parity	Survivors	Non-survivors	P-VALUE
Nulliparous	37	10	0.03
Multiparous	36	17	

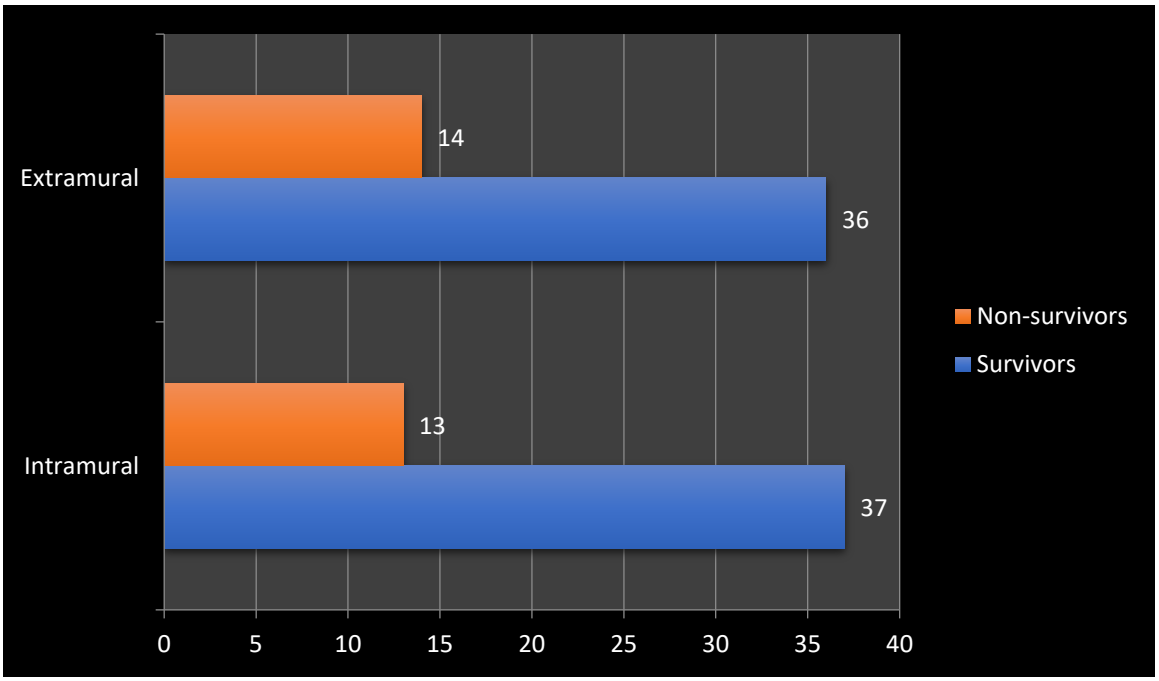
There is a significant association between parity and patient ending up with death or surviving, which is substantial with a p-value <0.05.



MODE OF ADMISSION

Admission	Survivors	Non-survivors	P-VALUE
Intramural	37	13	0.93
Extramural	36	14	

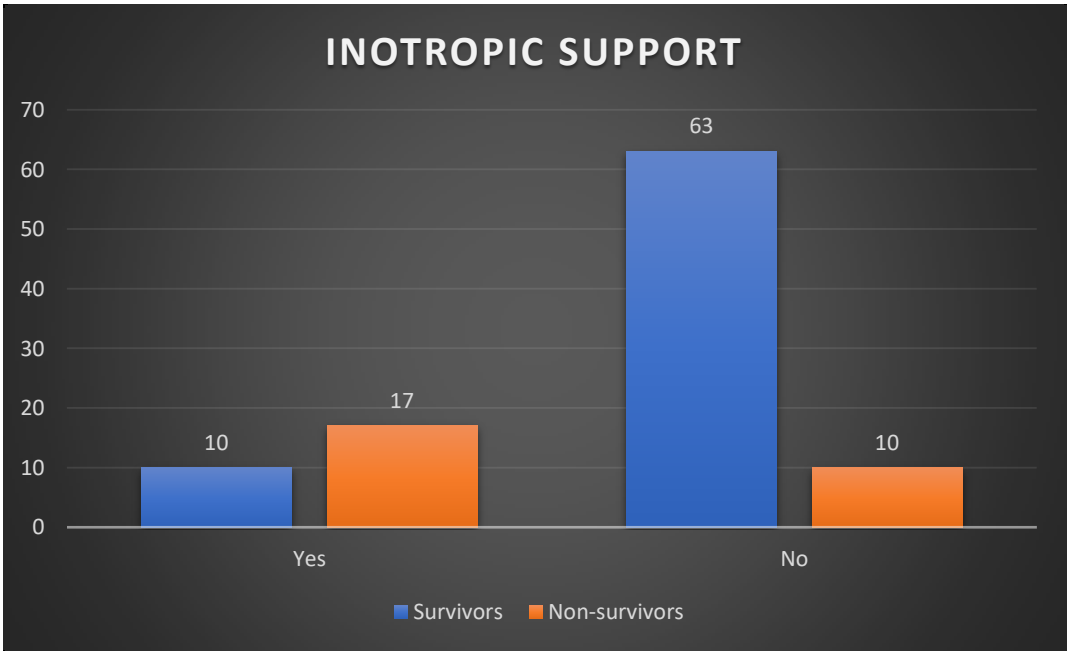
There is no significant association between mode of admission and patient ending up with death or surviving, which is substantial with a p-value >0.05.



INOTROPIC SUPPORT

INOTROPIC SUPPORT	Survivors	Non-survivors	P-VALUE
Yes	10	17	0.03
No	63	10	

There is a significant association between Inotropic support and patients ending up with death or surviving, which is substantial with a p-value >0.05.



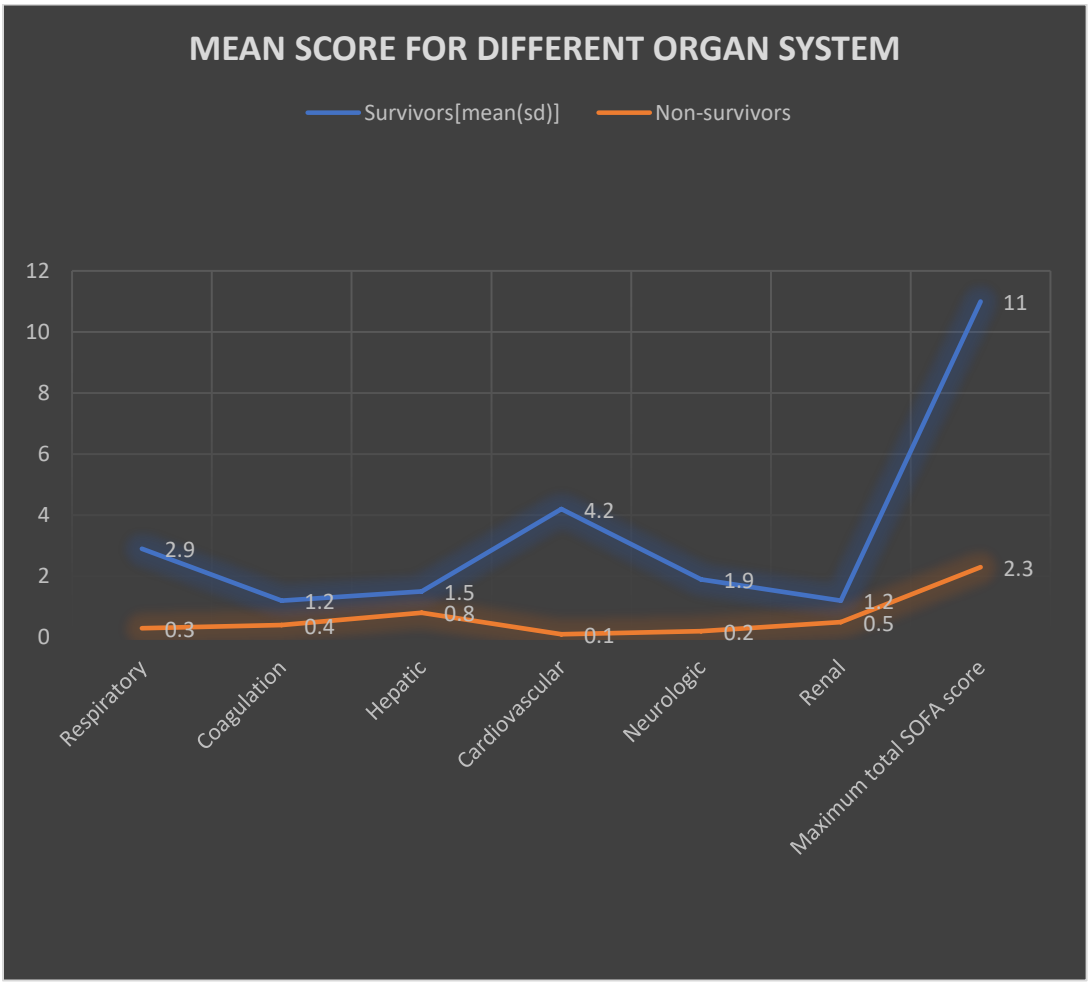
Organ or system evaluated

Mean, and standard deviation of maximum sequential organ failure assessment(SOFA) score for each organ or system evaluated admitted to an obstetric intensive care unit

Organ or system evaluated	Survivors[mean(sd)]	Non-survivors	P-VALUE
Respiratory	2.9(1.2)	0.3(0.9)	0.03
Coagulation	1.2(1.4)	0.4(1)	0.02
Hepatic	1.5(1.9)	0.8(1.9)	0.01
Cardiovascular	4.2(1.9)	0.1(0.9)	0.009
Neurologic	1.9(1.8)	0.2(0.7)	0.03
Renal	1.2(3)	0.5(0.1)	0.02
Maximum total SOFA score	11.0(5.4)	2.3(1.9)	0.01

There is a significant mean difference between survivors and non-survivors when compared with different organ systems with a

p-value <0.05. From the above table, it is evident that the cardiovascular system and respiratory organ helps in predicting maternal morbidity.



LINE GRAPH shows the mean score of maximum SOFA score for each organ evaluated according to the cases of severe maternal morbidity admitted to an obstetric intensive care unit.

DISCUSSION

The current study looked at all the facts of the SOFA score to see if it could be used and predicted in obstetric cases admitted to the ICU. At the time of admission, 24hrs, 48hrs, the total SOFA score, the total mean SOFA score, and the total SOFA score at the time of entry.

The highest SOFA scores and total SOFA scores distinguished excellent sensitivity and specificity for survivors and non-survivors. The SOFA score's usage to designate organs was validated in this study; near-miss obstetric patients needing intensive care had the highest dysfunction rate. This conclusion is in line with the findings of a Brazilian investigation [1] that the SOFA score could be an effective tool for determining the severity of a problem, significant maternal morbidity, and prognosis.

Although a SOFA score coefficient and AUC for the obstetric population has not yet been produced, SOFA scores are less likely to be affected by physiological changes during pregnancy than other scoring systems since SOFA incorporates a small number of variables. FOR EXAMPLE, the SOFA score only covers two variables altered by pregnancy. In addition, SAPS II and APACHE II consider the age and the existence of chronic illnesses. Because obstetric patients are typically young and do not have chronic conditions, SAPS II and APACHE II overestimate mortality in this group. After adjusting for changed maternal physiology, Lapinsky et al. [2] observed no improvement in the predictive accuracy of APACHE II and SAPS II. The calibration of the APACHE II score in the obstetric population was unsatisfactory in research conducted by Harrison et al. [3]. These researchers stated that developing a co-efficient tailored to this demographic could help overcome the overestimation made by another scoring system. Nevertheless, they acknowledged the lack of data due to this cohort's low frequency of deaths. The SOFA

score has become a bedside tool because of its easy applicability and ease of use.

The present study investigated sequential organ dysfunction scores among 100 patients admitted to obstetric ICU over three-time points. This study aimed to evaluate the performance of the total maximum SOFA score for cases with complications or any women admitted to ICU, which revealed the excellent performance of this score in the patient population. The women with possible life-threatening conditions and near maternal miss who survive.

The study results showed that the minimum SOFA score was two at admission, and then there was a slight increase at the next time point, i.e., seven at 24hrs and 11 at 48hrs. There was a statistically significant increase in mortality rate when the SOFA score was above 14. There is a steep rise in the ROC curve when the value reaches 14 or above. There is a statistically significant difference between survivors and non-survivor when compared to SOFA score at admission, 24hrs and 48hrs with p-value<0.05. The

sensitivity of the SOFA score is 97% that means 97% of the time SOFA score is capable of predicting mortality which is significant with a p-value of 0.01 with the ROC curve.

Mean SOFA score values also showed that they are independent predictors of mortality. A deal greater than 13 indicated a sharp rise in mortality. The total SOFA score is also statistically significant in predicting mortality irrespective of the disease state. A total SOFA score greater than 35 is related to an increase in mortality which is 87% sensitive; the value is significant with a p-value<0.05.

In the study, age, socio-economic status, and mode of admission of patients admitted do not play an essential role in influencing mortality. The morbidity and mortality are purely related to the other underlying complications that patients are going through.

The need for mechanical ventilation predicted mortality of patients as patients who were ventilated proved a higher side of mortality rate than those who did not require ventilation, which is significant with a p-value <0.05. Most of the women who had to undergo emergency cesarean section scummed compared to women who had expected delivery, which was statistically significant. 87% of the women who had multiparous parity ended with death which is evident with a p-value of 0.03. Hence these are the factors that showed a significant role in influencing mortality. There was a substantial relationship between organ dysfunction/failure with mortality of women, which was statistically significant. According to the study results, Respiratory failure and Cardiovascular organ dysfunction will predict mortality almost when compared to another organ.

These study results are supported by Antonio Oliveria et al. [4], i.e., SOFA score is an excellent predictor of mortality and can be applicable for obstetric patients. According to the SOFA score, the organ dysfunction evaluation is simple, easily standardized, and requires low complexity laboratory resources. Another study by Shruti Jain et al. [5] also shows similar results. The maximum discriminatory power in this study was observed for neurological and cardiovascular systems followed by respiratory organ failure. The discriminatory power of the hepatic and hematological systems was poor in both studies. The study had solid clinical relevance as it proved the discriminatory power of a simple measure that patients admitted to the ICU can be noted [5].

Another study by D Goffman et al. [6] can be taken as reference for present study results, which supports the fact that women aged>30, obese, women's race and ethnicity, the number of previous pregnancies, the presence of a medical condition and the prior cesarean delivery were all predictors of near-miss

morbidity. Traditional risk variables were ineffective in explaining racial disparities in the outcome, as they are in many medical illnesses. It will be challenging to overcome the problems of maternal morbidity and death. Education and public health measures should be used to address potentially modifiable risk factors.

CONCLUSION

Finally, the total SOFA score at admission may be valuable for predicting mortality in the obstetric population. The current study's findings support the use of organ failure as a criterion for detecting near-miss situations. The results of a study presented by Antonio Oliveria et al. [4] were discussed in a meeting of the WHO working group on maternal mortality and morbidity, which was held in Geneva, Switzerland in 2008, and WHO considered using organ dysfunction failure markers as its official criteria for a maternal near-miss, which is presently being tested in the field.

From the study done, we can summarize that the SOFA score is instrumental in predicting mortality in obstetric patients. There is a strong relationship between the rise in the SOFA score and maternal mortality from admission to 48^{th} hour. The mean SOFA score and the total SOFA score are independent predictors of maternal mortality. Using the score, mortality can be predicted early, which helps make suitable changes in the management plan.

In this study, out of 100 patients considered, 27 succumbed, of which the SOFA score was high among 25 patients, and 73 were survivors. Few patients whose SOFA scores were low also expired due to the influence of other factors.

Hence, it is evident that using the SOFA score can improve the overall prognosis and prevention of mortality at a very early stage. The total maximum SOFA score was found to be capable of assessing the severity and prognosis of this patient population, and its discriminatory capacity appears to have been unaffected by pregnancy's physiological changes.

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PROFORMA

Name: Age: Occupation

Address:

Date of admission to ICU/LR: Date of Discharge:

Date of transfer in to ICU:

Inpatient number:

Obstetric score:

History of presenting complaints:

Mode of transport:

Treatment history for present complaints:

Marital History:

Menstrual History:

L.M.P E.D.D

Obstetric History:

Antenatal care:

If postpartum patient DELIVERY DETAILS

Intrapartum care:

Past obstetric history:

Past History:

Medical : Diabetes, Hypertension, Renal disease, Cardiac illness, Asthma, Epilepsy.

Past surgical history:

Family history:

Personal history:

General examination:

Weight:

Height:

Weight gain during pregnancy:

BMI:

On admission: GCS

VITALS: Temperature:

Pulse rate:

Blood pressure:

Mean arterial pressure:

Respiratory rate:

Spo2:

Urine output:

Bedside urine albumis/sugar:

Bedside ultrasound findings:

Systemic examination:

Cardio vascular system:

Respiratory system:

Per abdomen:

Inspection:

Palpation- Height of uterus, State of uterus relaxed/contracting, Abdominal girth (cms),

Symphysio fundal height (cms)

Fundal grip

Umbilical grip

First pelvic grip

Second pelvic grip

Auscultation

Per vaginal examination:

If postpartum patient: per abdomen: uterus contracted/relaxed/involuting

Per vaginal examination:

Breast examination:

Baby details:

SOFA score variables:

PaO2/FiO2 (mmhg):

Mean arterial pressure(mmhg):

GCS :

Platelets (X10*3/ul):

Bilirubin (mg/dl) :

Creatinine (mg/dl) :

Urine output (ml/dl) :

Admission SOFA score:

INFORMATION SHEET:

TITLE:

EFFICACY OF SEQUENTIAL ORGAN FAILURE ASSESSMENT (SOFA) SCORE IN PREDICTING MORTALITY AND MORBIDITY IN OBSTETRIC INTENSIVE CARE UNIT

Name of the investigator: Dr.R.NITHIYA

Name of the Participant:

Purpose of Research:

Study Design: Prospective Observational study

Study Population: The study would include Women admitted to the obstetric ICU and the labour room in morbid conditions during pregnancy or up to 42 days postpartum requiring ICU admission

Possible Risks: No risks to the patient

Confidentiality of the Information obtained from you: The privacy of the patients in the research will be maintained throughout the study.

In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared.

Can you decide to stop participating in the study?

Taking part in this study is voluntary. You are free to decide whether to participate in this study or to withdraw at anytime.

How will your decision to not participate in the study affect you?

Your decision will not result in any loss of benefits to which you are otherwise entitled.

Signature of Investigator

Signature of Participant

Date:

Place:

PATIENT CONSENT FORM:

Patient/patient relative or attendant may check **( )** these boxes:

( )I confirm that I have understood the purpose of procedure for the above study. I have the opportunity to ask questions and all my questions and doubts have been answered to my complete satisfaction.

( )I understand that my/my relative participation in the study is voluntary and that I/my relative am/is free to withdraw at anytime without giving reason, without my/my relative legal rights being affected.

( )I understand that sponsor of the clinical study, others working on the sponsor's behalf, the Ethics committee and the regulatory authorities will not need my/my relative permission to look at my/my relative health records, both in respect of current study and any further research that maybe conducted in relation to it, even if I/my relative withdraw from the study I agree to this access.

( ) However, I understand that my/my relative identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from this study.

Study title:

"EFFICACY OF SEQUENTIAL ORGAN FAILURE ASSESSMENT (SOFA) SCORE IN PREDICTING MORTALITY AND MORBIDITY IN OBSTETRIC INTENSIVE CARE UNIT"

Study Centre: MMC,Chennai

Patient's Name:

Patient's Age:

In Patient Number:

I/my relative agree to take part in the above study and to comply with the instructions given during the study and faithfully cooperate with the study team and to immediately in form the study staff if I/my relative suffer from any deterioration in my health or well being or any unexpected or unusual symptoms.

I/my relative hereby consent to participate in this study.

I hereby give permission to undergo complete clinical examination and diagnostic tests including hematological, biochemical, radiological tests and to undergo treatment.

Signature/Thumb impression of the patient/patient attendant

Patient's Name and Address:

Signature of Investigator

(Dr.R.NITHIYA)

அனுமதியுடனான ஒப்புதல் படிவம்:

-இந்த ஆய்விற்கான செயல்முறையின் நோக்கத்தை நான் புரிந்துள்ளேன் என்பதை உறுதிப்படுத்துகிறேன். எனக்கு கேள்விகளை கேட்க வாய்ப்பு உள்ளது. என்னுடைய எல்லா கேள்விகளும் சந்தேகங்களும் என் முழு திருப்திக்கு பதில் அளித்துள்ளன.

-ஆய்வில் எனது/ என் உறவினர் பங்கேற்பு தன்னார்வமாக இருப்பதையும், என்/ என் உறவினர் சட்ட உரிமைகள் பாதிக்கப்படாமல், காரணத்தைத் தெரிவிக்காமல் எப்போது வேண்டுமானாலும் விலக்கிக்கொள்ளலாம் என்பதையும் நான் புரிந்து கொள்கிறேன்.

-ஆய்வில் இருந்து நான் விலகி வந்தாலும் கூட, ஆராய்ச்சிக்கு பொருந்தக்கூடிய என் / என் உறவினர் உடல்நல ஆவணங்களைப் பார்க்க என் / என் உறவினர் நெறிமுறைக் குழு மற்றும் ஒழுங்குமுறை அதிகாரிகளுக்கு எனது அனுமதி தேவையில்லை என்பதை நான் புரிந்து கொள்கிறேன். இந்த அணுகலை நான் ஏற்கிறேன்.

-இருப்பினும், சட்டத்தின் கீழ் தேவைப்பட்டாலன்றி, மூன்றாம் தரப்பினருக்கு வெளியிடப்பட்ட அல்லது வெளியிட்ட எந்த தகவலிலும் என்/ என் உறவினர் அடையாளத்தை வெளிப்படுத்த முடியாது என்பதை நான் புரிந்து கொள்கிறேன். இந்த ஆய்விலிருந்து எழும் எந்தவொரு தரவு அல்லது முடிவுகளின் பயன்பாட்டைக் கட்டுப்படுத்துவதை நான் ஏற்றுக்கொள்கிறேன்.

ஆய்வின் தலைப்பு:

மகப்பேறியல் தீவிர சிகிச்சை பிரிவில் இறப்பு மற்றும் நோயுற்ற தன்மையைக் கணிப்பதில் SEQUENTIAL ORGAN FAILURE ASSESSMENT (SOFA) SCORE இன் செயல்திறன்.

ஆய்வு மையம்: எம்.எம்.சி, சென்னை
பங்கேற்பாளரின் பெயர்:
பங்கேற்பாளரின் வயது:
நோயாளி எண்:

மேலே உள்ள படிப்பில் கலந்து கொள்ளவும், ஆய்வின் போது கொடுக்கப்பட்ட அறிவுறுத்தல்களுக்கு இணங்கவும், ஆய்வுக் குழுவோடு ஒத்துழைக்கவும், என்/ என் உறவினர் உடல்நலம் அல்லது நலம் அல்லது எந்தவொரு எதிர்பாராத அல்லது அசாதாரண அறிகுறிகளிலும் நான்/ என் உறவினர் பாதிக்கப்படுகையில் உடனடியாக ஆய்வு ஊழியர்களுக்கு தெரிவிக்கவும், இந்த ஆய்வில் பங்கேற்க ஒப்புக்கொள்கிறேன்.
நான்/ என் உறவினர் இதனுடன் முழுமையான மருத்துவ பரிசோதனை மற்றும் நோயறிதல் சோதனைகள் இரத்தம், உயிர்வேதியியல், கதிரியக்க சோதனைகள் உட்பட சிகிச்சைக்கு உட்படுத்த அனுமதிக்கிறேன்.

நோயாளியின்/ நோயாளியின் உறவினர் கையொப்பம்

நோயாளியின் பெயர் மற்றும் முகவரி:

ஆராய்ச்சியாளரின் கையொப்பம்:

PLAGIARSM CERTIFICATE

This is to certify that this dissertation work titled **"EFFICACY OF SEQUENTIAL ORGAN FAILURE ASSESSMENT (SOFA) SCORE IN PREDICTING MORTALITY AND MORBIDITY IN OBSTETRIC INTENSIVE CARE UNIT - A PROSPECTIVE OBSERVATIONAL STUDY"**. of the candidate **Dr. R.NITHIYA, REG. NO. 221916875,** for the award of M.S in the branch of **OBSTETRICS AND GYNAECOLOGY**. I personally verified the urkund.com website for the purpose of plagiarism check. I found that the uploaded thesis file contains from introduction to conclusion pages and the result shows 17% of plagiarism in the dissertation (D126604900)

Signature and Seal of the Guide

Prof. Dr. V.Kasthuri M.D., D.G.O,

Professor,
Institute of Obstetrics & Gynaecology,
Madras Medical College, Chennai.

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI 600 003

EC Reg.No.ECR/270/Inst./TN/2013/RR-16
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CERTIFICATE OF APPROVAL

To
Dr.R.NITHIYA,
Post Graduate – MS (Obstetrics and Gynaecology),
Madras Medical College,
Chennai-600003.

Dear Dr. R.NITHIYA,

The Institutional Ethics Committee has considered your request and approved your study titled **"EFFICACY OF SEQUENTIAL ORGAN FAILURE ASSESSMENT (SOFA) SCORE IN PREDICTING MORTALITY AND MORBIDITY IN OBSTETRICS INTENSIVE CARE UNIT- A PROSPECTIVE OBSERVATIONAL STUDY"- NO.20012021.** The following members of Ethics Committee were present in the meeting held on **19.01.2021** conducted at Madras Medical College, Chennai 3.

1. Prof.P.V.Jayashankar :Chairperson
2. Prof.N.Gopalakrishnan,MD.,DM., FRCP, Director, Inst.of Nephrology,MMC,Ch. : Member Secretary
3. Prof. K.M.Sudha, Prof. Inst. of Pharmacology,MMC,Ch-3 : Member
4. Prof. Alagarsamy Jamila ,MD, Vice Principal, Stanley Medical College, Chennai : Member
5. Prof.Rema Chandramohan,Prof.of Paediatrics,ICH,Chennai : Member
6. Prof.S.Lakshmi, Prof. of Paediatrics ICH Chennai :Member
7. Tmt.Arnold Saulina, MA.,MSW., :Social Scientist
8. Thiru S.Govindasamy, BA.,BL,High Court,Chennai : Lawyer
9. Thiru K.Ranjith, Ch- 91 : Lay Person

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary – Ethics Committee

MEMBER SECRETARY
INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE
CHENNAI-600 003.

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Sources included in the report

W	URL: https://files.asprtracie.hhs.gov/documents/aspr-tracie-sofa-score-fact-sheet.pdf Fetched: 2021-10-22T06:47:35.5530000	13
W	URL: https://www.sciencedirect.com/science/article/pii/S0020729215007055 Fetched: 2022-01-31T06:49:41.4970000	1
W	URL: http://repository-tnmgrmu.ac.in/4901/1/220100716sharath.pdf Fetched: 2021-03-30T06:59:21.4670000	19
W	URL: https://1library.net/document/7qvp190q-sequential-assessment-assessing-incidence-severity-dysfunction-predicting-surgical.html Fetched: 2020-11-05T06:07:45.1700000	1
W	URL: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3811929/ Fetched: 2019-12-19T20:25:32.9170000	1
J	URL: 9fdcccf1-336c-4292-8e4e-b36bae90c727 Fetched: 2019-03-14T09:47:11.1470000	5
W	URL: https://www.researchgate.net/publication/221979541_Sequential_Organ_Failure_Assessment_Score_for_Evaluating_Organ_Failure_and_Outcome_of_Severe_Maternal_Morbidity_in_Obstetric_Intensive_Care Fetched: 2019-12-16T01:03:23.3700000	3
W	URL: https://www.worldwidejournals.com/indian-journal-of-applied-research-(IJAR)/recent_issues_pdf/2020/August/prediction-of-maternal-mortality-using-msofa-score-in-obstetric-icu-in-a-tertiary-care-centre_August_2020_1596270250_6902486.pdf Fetched: 2021-11-09T08:35:36.1970000	1

Name	Age	SOFA SCORE ON ADMISSION	SOFA SCORE AT 48 HOURS	SOFA SCORE AT 96 HOURS	OUTCOME	VENTILATOR SUPPORT	OPERATED	Married since	BMI	mode of conception	Medical complications	Obstetrics complications	Pregnancy outcome	mode of delivery	Gestational age @ delivery	Baby outcome	birth weight in s	Congenital abnormalities
AMUDHA	6	10	6	6	A	NO	YES	20.8	A	4	3	3	LSCS	1	1	2.7	N	N
BALAMANI	8	8	6	6	A	NO	NO	23.8	D	6	1	1						N
BHUAMA	4	14	12	12	A	NO	NO	17.8	D	3	3	4	LN	3	2	2.2	N	Y
CHANDRA	3	13	12	13	B	YES	YES	19.2	B	5	2	4	LN	3	1	2.2,1.7	N	Y
DEVI	7	6	6	6	A	NO	NO	18.4	C	3	4	4	LSCS	1	1	1.3, 1.1	Y	N
GOMATHI	4	20	22	22	B	YES	YES	24.1	B	5	4	4	LSCS	3	2	2.5, 2.3	Y	N
GOWRI	4	10	10	9	A	NO	YES	19.4	B	4	1	3	LSCS	1	2	1.6	N	Y
GOWRIYAMMAL	5	6	7	7	A	NO	NO	23.8	A	5		2						N
HARSHINI	3	8	10	10	A	NO	YES	21.2	B	4	4	3	LN	1	1	1.3	N	y
HYRUN	5	8	6	6	A	NO	NO	23.2	C	1	1	3	LSCS	1	2	1.8	N	Y
JAYA	8	10	12	13	A	NO	YES	24.9	C	2	2	3	LSCS	2	2	2.2	Y	N
JENCY	3	16	12	12	A	NO	NO	22.9	A	5	1	3	LN	2	3	1.8	N	N
KANNAMA	4	20	18	18	B	YES	YES	22.8	B	5		2						N
KATHIJA	4	8	8	8	B	YES	YES	19.6	A	3	2	4	LSCS	2	2	2.7,2.5	N	Y
KARUPPAMMAL	5	12	14	14	A	NO	NO	18.5	C	2	3	3	LN	2	1	1.7	N	N
LAKSHMI	4	8	8	6	A	NO	YES	23.2	C	2	1	3	LSCS	3	1	1.2	N	Y
KRISHNAVENI	10	18	16	16	B	YES	NO	19.2	E	3	4	3	LN	1	1	1.5	Y	N
SELVAKUMARI	10	9	10	10	A	NO	NO	21.2	E	3	3	3	LN	3	1	2.3	N	Y
KUMAARI	5	12	12	10	B	NO	NO	22.2	C	2		2						y
LAKSHMI	2	10	8	8	A	YES	NO	19.2	B	4	4	3	LSCS	3	2	2.6	Y	y
MANIMEGALAI	7	12	16	16	B	YES	NO	20.2	A	2	3	3	LSCS	3	2	2.9	N	N
MARIAMMAL	8	6	8	9	B	YES	NO	22.1	E	3	3	3	LN	3	1	1.2	N	Y
MOHAMMED RIFFA	4	8	8	7	A	NO	YES	24.2	B	3	3	3	LSCS	2	1	2.5	N	N
ANNAMMAL	30	13	14	14	B	NO	YES	5	25	c	2		1					

leelavati	33	12	16	16	B	YES	NO	7	24.4	a	6		2			2		N
ponni	32	8	10	10	A	NO	YES	6	19.2	a	6		2					N
revati	34	16	20	20	B	NO	NO	6	24.3	A	3	3	3	LSCS	1	1	1.3	N
SUMITHRA	22	10	12	10	A	NO	YES	2	23.3	B	5		3		3		2.4	N
ashwini	29	8	6	6	A	NO	YES	5	20.4	a	4	1	3	LSCS	1	1	1.7	Y
deepa	36	14	12	12	A	NO	NO	8	23.4	D	6	2	3	LSCS	2	3	2.7	N
depali	26	11	10	10	A	YES	NO	3	22.2	B	4	1	3	LSCS	1	2	1.4	Y
ashwini	28	15	12	12	A	NO	NO	4	21.2	c	3	3	4	LN	3	2	2.3 , 2.08	N
kumari	40	12	10	10	A	YES	YES	8	22.3	E	3	2	3	LSCS	2	2	2.7	N
kumari	34	6	6	6	A	YES	NO	4	18.5	A	5		2					N
revati	26	12	10	10	A	NO	YES	3	22.3	B	5	3	3	LN	3	1	2.7	N
pragati	32	8	6	6	A	NO	YES	5	17.2	B	2	4	3	LSCS	3	2	2.6	N
pramila	33	13	10	10	A	YES	NO	5	20.2	c	5	2	4	LN	2	2	1.8 ,1.4	N
pragati	30	15	18	18	B	NO	YES	3	22.1	A	5	2	4	LN	3	2	2.2, 1.8	N
meera	32	9	11	15	B	YES	YES	3	18.5	A	5	1	1	LN	3	3	2.8	N
shaku	26	12	10	12	A	YES	NO	3	23.6	B	4		2					
sharmila	35	8	14	14	B	YES	YES	2	18.9	B	5		1					Y
shailu	38	16	18	19	B	NO	NO	7	24.3	E	1	2	4	LSCS	2	2	2.2,1.75	N
ralu	35	8	4	4	A	NO	YES	7	18.4	c	3	2	3	LSCS	2	1	2.2	N
mohini	33	14	16	17	B	YES	NO	5	18.4	C	1	3	3	LN	3	1	2.6	N
mona	35	8	6	6	A	NO	YES	7	24.9	e	2	1	4	LSCS	1	3	1.1, 960	N
ponni	31	8	10	8	A	NO	NO	5	21.2	c	5	4	4	Lscs	3	1	2.7 , 2.5	N
angeli	31	6	6	4	A	NO	YES	4	19.2	B	3	3	3	LSCS	3	1	2.3	N
swetha	38	16	19	20	B	YES	NO	9	22.3	D	3		1					y
uma	34	12	10	10	B	NO	YES	9	18.4	E	1	4	4	LSCS	3	3	2.3,2.25	N
shanti	32	12	16	18	B	YES	NO	5	19.7	c	3	3	3	LN	3	1	2.7	N
keertu	26	15	20	20	B	YES	NO	6	18.8	D	1	4	3	LSCS	1	2	1.7	Y
abirami	34	10	9	8	A	NO	YES	4	18.5	A	3	1	4	LSCS	1	1	1.1, 1	N
sudha	34	10	12	14	B	YES	NO	7	18.6	A	4		2					
vanitha	28	10	14	16	B	NO	YES	3	17.3	B	2		2					Y
nitha	28	8	10	13	B	YES	NO	3	18.4	B	2		1					N
anitha	31	10	8	8	A	NO	YES	6	28.3	c	5	2	3	LN	2	1	2.3	N
Abhinaya	31	15	15	16	B	YES	NO	5	21.2	E	1	3	3	LSCS	3	1	2.2	N

Aishwarya	32	12	10	9	A	NO	YES	8	29.3	D	2	3	3	LN	2	3	2.7	Y
Amita	32	14	15	16	B	YES	YES	4	20.4	A	1		1					
Anita	32	10	12	12	B	YES	NO	5	21.4	B	1	1	3	LSCS	3	1	2.4	N
Annamal	30	13	14	16	B	YES	YES	6	26.6	A	2	2	3	LN	2	1	2.4	N
Ashwini	34	12	10	10	A	NO	NO	5	22.2	c	5	3	3	LSCS	2	3	2.8	N
Bagarathi	28	16	16	18	B	YES	NO	3	19.2	B	6	2	3	LN	2	2	1.8	Y
Barathi	33	8	6	6	A	NO	YES	10	21.2	E	2	4	4	LN	2	3	1.7, 1.4	N
Eva	34	13	10	10	A	NO	YES	8	20.1	D	2	2	4	LSCS	2	3	2.5, 2.2	Y
Evelne	32	12	16	16	B	YES	NO	8	24.3	A	3	1	3	LSCS	2	2	2.2	Y
Karthika	28	8	10	10	B	YES	NO	4	23.2	B	2	1	3	LSCS	2	1	2.24	N
Keerthana	38	11	15	15	B	YES	NO	12	19.4	E	3	2	3	LSCS	2	2	2.6	Y
Partiba	26	8	10	8	A	NO	NO	4	30	c	5	3	3	LSCS	3	2	2.8	N
Partibana	31	8	7	7	A	NO	NO	6	17.2	B	2	2	3	LN	3	2	2.8	N
Praveena	36	13	15	15	B	YES	YES	8	24.2	D	2	1	4	LN	2	2	2.5, 2.2	Y
Praveena	26	13	12	12	B	YES	NO	2	19.6	B	2	3	4	LSCS	2	1	2.4, 1.8	N
Pushpa	37	11	10	10	A	NO	NO	8	22.1	E	1	3	3	LSCS	1	1	1.7	N
Pushya	28	15	18	20	B	NO	YES	4	19.6	B	2		2					N
Ramit	28	12	13	13	B	YES	YES	6	23.8	A	6		1					
Rohini	29	10	6	6	A	NO	YES	4	17.8	B	5	3	3	LN	2	2	2.5	N
Rohita	7	13	10	10	A	NO	NO	17.8	E	3	4	3	LSCS	2	3	2.5	N	y
Sahana	25	11	10	10	A	NO	NO	2	22.1	A	5	1	2	LN	1	3	2.9	N
Sheila	26	12	16	18	B	NO	YES	4	20.2	A	4		2					N
Sumaybegam	36	8	6	6	A	NO	NO	12	28.3	D	3	3	4	LSCS	1	1	1.05, 875	N
Sushila	32	8	14	20	B	YES	YES	6	21.4	A	1	4	4	LN	3	1	2.1,1.8	N
Vasupradha	32	8	8	8	A	NO	NO	6	19.2	C	1	3	3	LN	3	1	1.2	N
Victoria	32	10	8	8	A	NO	YES	8	20.8	c	2	1	3	LN	1	1	1.2	N
MEENA	5	8	8	9	B	NO	NO	23.2	A	2		2						y
MENAKSHI	5	12	12	8	A	YES	YES	17.8	B	5		2						Y
NISHANTHI	3	13	13	12	B	NO	YES	20.4	A	1	4	3	LSCS	1	2	1.3	N	Y
RAJALAKSHMI	7	8	7	7	A	NO	NO	23.6	E	3	2	1						N
SANTHIYA	3	14	14	16	B	YES	NO	19.2	D	1	1	3	LN	3	1	1.3	N	Y
DEVI	12	14	13	13	A	YES	NO	22.2	D	2	3	3	LN	2	2	2.5	N	N
SANGEETHA	4	13	12	12	A	NO	YES	22.1	B	5	2	4	LN	3	2	2.5	N	Y

SELVI	2	16	18	18	B	YES	NO	25.2	B	4	3	4	LN	2	2	2.8, 2.6	N	N
SUMATHI	3	12	14	16	B	YES	NO	20.4	B	5	2	3	LN	3	2	2.23	N	Y
RANJANI	3	13	16	18	B	NO	YES	22.3	A	4		1						Y
SUGANYA	6	12	12	13	B	YES	NO	22.3	C	2	2	4	LSCS	2	3	2.6,2.2	N	Y
LILLA	3	16	18	18	B	N0	YES	17.2	B	4		2						N
SUMATHI	6	7	10	9	A	NO	YES	18.6	A	1	4	3	LN	3	1	3.2	N	N
HARITHA	7	16	16	18	B	NO	YES	23.6	B	4		2						N
VALLIYAMMAL	8	10	8	8	A	NO	YES	19.6	A	1	1	3	LSCS	3	2	2.1	N	N
VIJAYA	6	8	6	6	A	NO	YES	19.4	A	1		2						y
VISNISHA	6	16	12	12	B	YES	NO	24.9	C	1		2						y