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Evaluation of Oxygenation Index, PEEP, PaFiP as an Outcome Predictor of Patients with New Onset Acute Respiratory Failure Receiving Invasive Mechanical Ventilation

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ABSTRACT

The present prospective study was conducted on 61 patients in the department of emergency medicine, Narayana Medical College and Hospital, Nellore, over a period of two years. Respiratory failure characterized by inadequate blood oxygenation or carbon dioxide removal. "Adequacy" is defined by tissue requirements for oxygen uptake and carbon dioxide elimination. In AHRF where PaO_2/FiO_2 <200 mm of Hg where mechanical ventilation is used to reduce the hypoxemia and delay the consequences of the disease process. OI is used as a simple prognostic tool in identifying the high risk individuals who were on mechanical ventilation. The males and females were 54.1% and 45.9%. Mortality in the study population was 63.9% survivors and 36.1% non survivors. Mean pH among survivors and non survivors were 7.28 and 7.21 at day 1, 7.34 and 7.207 at day 3. Mean PaO_2/FiO_2 among survivors and non survivors were 200.6 and 134.1mm of Hg at day 1, 312.345 and 148.9 mm of Hg day 3. Mean PEEP among survivors and non survivors were 8.385 and 10.545 at day 1, 6.923 and 12.2 at day 3. Mean PaFip among survivors and non survivors were 2.23 and 1.764 at day 1,2.73 and 1.81 at day3. Mean OI among survivors and non survivors were 8.416 and 13.33 at day 1,5.15 and 12.914 at day 3. Mean SOFA among survivors and non survivors were 7.69 and 10.95 at day 1,7.23 and 11.33 at day 3. OI, PaFip has significant correlation in identifying the high risk group among the study population in comparison with SOFA. In the study population values of AUC of OI , PaFip and SOFA were 0.838,0.163,0.888 respectively. The SOFA score on day 3 and OI day 3 were compared and found that both the AUC was 0.947 and 0.957 respectively which were statistically significant. In mechanical ventilation patients with AHRF, OI can be used as a better prognostic outcome variable in identifying the high risk group. OI is a simplified bedside tool which can be compiled from ventilator parameters and blood gas analysis. Considering the limitations of the study, simplicity and feasibility of use of OI and determining the change in OI from day 1 to day 3 gives an outcome predictability similar to SOFA score and is more specificity. PaFip is also a variable showing the statistical significance in the study when compared with PaO_2/FiO_2 ratio alone.

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Key Words

Acute respiratory failure, PEEP, PaFiP, mechanical ventilation, SOFA score

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INTRODUCTION

Respiratory failure characterized by inadequate blood oxygenation or carbon dioxide removal. "Adequacy" is defined by tissue requirements for oxygen uptake and carbon dioxide elimination. In the absence of bedside techniques for direct measurement of these metabolic parameters, clinicians must rely on arterial blood gas values. As expected, mortality in hypoxemic respiratory failure depends on the underlying cause. Several studies have addressed the outcome in patients with ARDS[1,2]. Mortality in ARDS appears to have improved in recent years, but it remains high in the elderly., for those 85 years of age or older, mortality is 60%. Patients who develop sepsis after trauma have lower mortality than do patients with sepsis that complicates medical disorders. Notably, patients with pre-existing lung disease, higher FiO_2 or PEEP requirements, or a lower PaO_2 may not necessarily have a more reduced chance of survival[3]. In earlier studies, which indicated many patients who survived an episode of ARDS manifested some impairment of pulmonary function, like obstructive and restrictive defects, reduction in diffusing capacity, one or more years after recovery, more recent data show good preservation of lung function five years following survival from ARDS. Lung function is usually normal or near-normal, especially in young patients. Despite the recovery of pulmonary function, many survivors of ARDS have persistent functional disabilities after discharge, related primarily to muscle wasting and weakness. Many survivors of ARDS have neurocognitive findings at hospital discharge and in a significant number, the deficits persist long term. The AHRF is a potential morbid condition where hypozeugma which can be corrected with O2 therapy by either flow devices or noninvasive ventilation measures. When these measures fail, i.e., PaO_2/FiO_2<200mm Hg and requiring mechanical ventilation lead to acute life-threatening events. Hypoxemia, when not appropriately managed, can cause hypoxic hypoxia and, finally, cardiac arrest. As per the AHA, hypoxia is a reversible cause of death, which can be prevented by invasive mechanical ventilation in case of a life-threatening event caused by hypoxemia alone. The treatment strategy employed in AHRF is mechanical ventilation[4]. The variables from the ventilator where the compliance of the lung can be determined where V/Q mismatch occurs and usage of OI as a bedside tool in predicting the mortality among these patients.

Aims: This prospective observational study was to evaluate the value of oxygenation index PaFiP as early predictors of outcome of patients who underwent invasive mechanical ventilation.

MATERIALS AND METHODS

Study Design: The present study was a prospective study on traumatic patients admitted in the Emergency Department (ED) for Narayana Medical College and Hospital, Nellore District, Andhra Pradesh. WRITTEN Informed consent was taken from all the patients/guardians of the patients for participation in the study.

Study Population: This prospective observational study will be conducted on patients presenting to ER with acute respiratory failure and admitted to ICU between November 2017 to October 2019 in the department of Emergency Medicine in Narayana Medical College and Hospital Nellore.

Methodology: All the patients were clinically examined and demographic information such as age, sex, residence and other information on signs and symptoms, case history, past medical history, complaints, etc., was collected and recorded in the proforma prepared for this study purpose. Pulse rate, heart rate, temperature, Blood Pressure and respiratory rate were also recorded. ABG samples were collected and if PaO_2 <60 mm Hg on room air and who were requiring mechanical ventilation were enrolled by taking informed consent from the patient/guardian. Radiological examinations, including ultrasound, were also performed whenever needed. Once mechanical ventilation was started for the patient, subsequent data was collected from the ventilator parameters and ABG samples from day 1 and day 3. The Oxygenation index and PaFiP and SOFA scores were recorded and compared with the outcomes of the patient during the treatment. The details of the cases who recovered (Survivors) and died (Non-Survivors) were also recorded.

Subjects: The patients who fulfilled the following conditions were only included for the study.

Inclusion Criteria: The Inclusion Criteria of the patients were as follows:

- Age >18 years and <80 years.
- Patients were invasive mechanically ventilated if PaO_2<60mmHg and SaO2 did not reach 90% with oxygen therapy and non-invasive mechanical ventilation.
- Patients giving written informed consent.

Exclusion Criteria: The following were the exclusion criteria applied:

- Pneumonia was.
- (A) An expected terminal event i.e VAP etc.
- (b) Distal to bronchial obstruction.
- Patients with TB, bronchiectasis, solid organ, or hematological malignancies COPD.
- Patients who had been in a hospital within the previous 14 days.
- Patients were known to be cardiac, diabetic or had chronic liver or renal diseases (5) Patients with trauma.

Statistical Analysis: The data has been entered into MS-Excel and statistical analysis has been done by using IBM SPSS Version 25.0.0. For categorical variables, the data values are represented as numbers and percentages. To test the association between the groups, chi-square test was used. For continuous variables, the data values are shown as mean and standard deviation. To test the mean difference between two groups, Student's t-test was used. To test the correlation between the groups, Pearson's correlation test was used. To test the mean difference between three or more groups, ANOVA test was used. To represent a sensitivity/specificity pair corresponding to a particular decision, Receiver Operating Characteristic (ROC) curve was used and to measure how well a parameter can distinguish between two diagnostic groups, the area under the ROC curve (AUC) was used. All the p values having <0.05 are considered as statistical significant.

RESULTS AND DISCUSSIONS

Age and Sex: Age distribution among the patients studied were about 61 out of which 7 cases were 18-30 years and accounts for about 11.5% of the study population and 30-50 years age Study population 18 cases and 29.5% and 36 patients were 50-80 years age Study population which comprises of 59%. The mean and standard deviation of Age in years is 53.246± 16.405. The median Age in years is 55 and the range is 67 (18-85). The inter-quartile range is 19 which we get from Q1 (45) and Q3 (64). Out of the 61 patients study population which comprised of 54.1% were male predominantly and 45.9% were females.

Hypertension: Out of 61 patients study population there were 32 cases which accounts to about 52.5% had hypertension and 29 were non hypertensive i.e 47.5%.

Study Population: Out of 61 patients majority of them were Survivors (63.9%). 36.1% of patients were Non Survivors. Independent 't' test results shows that there is no significant difference in mean of Age in years with respect to the study population (p=0.305) and mean age among the survivors and non survivors were 51.6 years and 56.1 years. The chi-square test shows that there is no significant difference between the survivors and non survivors with respect to Sex (p=0.958).

The chi-square test shows that there is no significant difference between the Study population with respect to Hypertension (p=0.773) among survivors and non survivors. Out of the 61 patients the independent 't' test results shows that there is a significant difference in mean of pH (Day 1) with respect to the study population (t value=2.223, P=0.03) among survivors and non survivors. The independent 't' test results shows that there is a significant difference in mean of PaO_2 (Day 1) with respect to the study population (P< 0.001) among survivors and non survivors. Out of the 61 patients the independent 't' test results shows that there is no significant difference in mean of FiO2 (Day 1) with respect to the study population (t value=-1.865, P=0.067) among survivors and non survivors. Out of 61 patients the independent 't' test results shows that there is a significant difference in mean of PaO_2/FiO_2 (Day 1) with respect to the study population (t value=3.898, P<0.001) among survivors and non survivors. Out of the 61 patients the independent 't' test results shows that there is a significant difference in mean of PEEP (Day 1) with respect to the study population (t value=-3.756, P<0.001) among survivors and no survivors. Out of the 61 patients the independent 't' test results shows that there is a significant difference in mean of PiP (Day 1) with respect to the study population (t value=-3.424, P=0.001) among survivors and non survivors. Out of the 61 patients the independent 't' test results shows that there is a significant difference in mean of mPaw (Day 1) with respect to the study population (t value=-3.744, P<0.001) among survivors and non survivors. Out of the 61 patients the independent 't' test results shows that there is a significant difference in mean of OI (Day 1) with respect to the study population (t value=-5.216, P<0.001) among survivors and non survivors. Out of the 61 patients the independent 't' test results shows that there is a significant difference in mean of PaFiP (Day 1) with respect to the study population (t value=4.922, P< 0.001) among survivors and non survivors. Out of the 61 patients the independent 't' test results shows that there is a significant difference in mean of SOFA (Day 1) with respect to the study population (t value=-6.289, P<0.001) among survivors and non survivors. Out of the 61 patients the independent 't' test results shows that there is a significant difference in mean of pH (Day 3) with respect to the Study population (t value=3.255, P=0.002) among survivors and non survivors. Out of the 61 patients the independent 't' test results shows that there is a significant difference in mean of PaO2 (Day 3) with respect to the Study population (t value=3.765, P<0.001) among survivors and non survivors. Out of the 61 patients the independent 't' test results shows that there is a significant difference in mean of FiO_2 (Day 3) with respect to the study population (t value=-5.011, P<0.001) among survivors and non survivors. Out of the 61 patients the independent 't' test results shows that there is a significant difference in mean of PaO_2/FiO_2 (Day 3) with respect to the Study population (t value=4.094, P< 0.001) among survivors and non survivors. Out of the 61 patients the independent 't' test results shows that there is a significant difference in mean of RR (Day 3)

with respect to the Study population (t value=-2.997, P=0.004) among survivors and non survivors. Out of the 61 patients the independent 't' test results shows that there is a significant difference in mean of Ti (Day 3) with respect to the Study population (t value=2.912, P=0.006) among survivors and non survivors. Out of the 61 patients the independent 't' test results shows that there is a significant difference in mean of Ttot (Day 3) with respect to the study population (t value=2.895, P=0.006) among survivors and non survivors. Out of the 61 patients the independent 't' test results shows that there is a significant difference in mean of PEEP (Day 3) with respect to the study population (t value=-7.536, P<0.001) among survivors and non survivors. Out of the 61 patients the independent 't' test results shows that there is a significant difference in mean of PiP (Day 3) with respect to the study population (t value=-7.151, P< 0.001) among survivors and non survivors. Out of the 61 patients the independent 't' test results shows that there is a significant difference in mean of mPaw (Day 3) with respect to the Study population (t value=-8.164, P<0.001) among survivors and non survivors. Out of the 61 patients the independent 't' test results shows that there is a significant difference in mean of OI (Day 3) with respect to the study population (t value=-6.956, P<0.001) among survivors and non survivors. Out of the 61 patients the independent 't' test results shows that there is a significant difference in mean of PaFiP (Day 3) with respect to the study population (t value =5.473, P<0.001) among survivors and non survivors. Out of the 61 patients the independent 't' test results shows that there is a significant difference in mean of SOFA (Day 3) with respect to the study population(t value=-5.533, P<0.001) among survivors and non survivors.

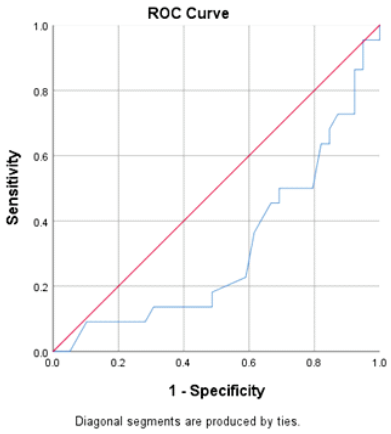

Fig. 1:ROC Analysis of P_H (Day 1) and Study Populations

Cut-off is 7.275. The AUC was 0.316 with a standard error of 0.071 and statistically significant (p=0.018) with 95% confidence interval and cut off was 7.275.

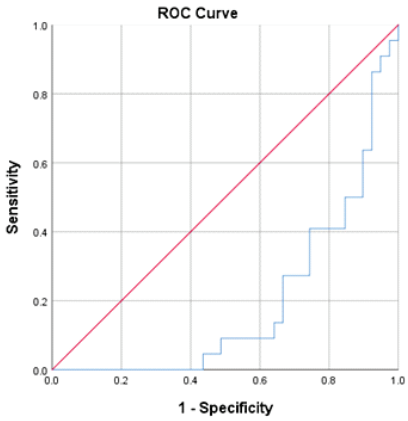

Fig. 2: ROC Analysis of PaO_2 (Day 1) and Study Populations

Cut-off is 112.15. The AUC was 0.195 with standard error of 0.055 and is statistically significant (p =0.000) with 95% confidence interval and cutoff PaO_2. Cut-off is 0.75 for FiO_2 (Day 1).

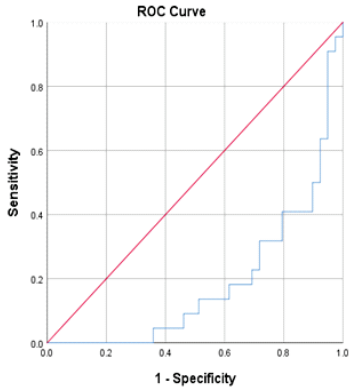

Fig. 3: ROC Analysis of PaO_2/FiO_2 (Day 1) and Study Populations

The AUC of PaO_2/FiO_2 was 0.186 with standard error of 0.055 and is statistically high significant (p=0.000) and cut off was 149.375.

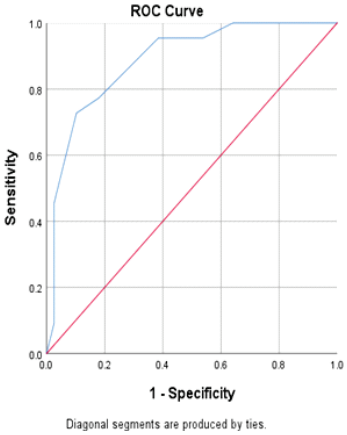

Fig. 4: ROC Analysis of SOFA (Day 1) and Study Populations

The mean values of OI among survivors and non survivors were 8.416 and 13.333. The mean airway pressure among survivors and non survivors were 14.595 and 17.185. The PaO_2/FiO_2 among survivors and non survivors were 200.661 and 134.137 respectively on Day 1. The mean values of FiO_2 among survivors and non survivors were 0.744 and 0.782. The mean values of PaO_2 among survivors and non survivors were 144.879 and 104.027 respectively on Day 1 and is significant (p=<0.001). The mean values of OI among survivors and non survivors were 5.15 and 12.914. The mean airway pressure among survivors and non survivors were 12.846 and 19.014. The PaO_2/FiO_2 among survivors and non survivors were 312.345 and 148.903 respectively on Day 3. The mean values of FiO2 among survivors and non survivors were 0.597 and 0.8. The mean values of PaO_2 among survivors and non survivors were 174.71, 119.122 respectively on Day 3.

- **FiO_2:** fraction inspired oxygen, mPaw: mean airway pressure, OI: oxygenation index, PaO_2: arterial oxygen tension, PEEP: positive end-expiratory pressure.
- Continuous variables were analyzed by Student's t-test, and categorical data by chi-square test.
- Variables are expressed as mean (standard deviation) and categorical data are expressed as number (percentage).

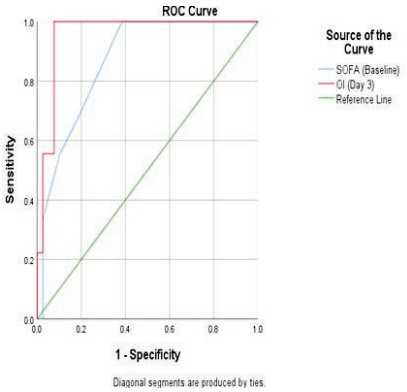

Fig. 5: ROC Curve Analysis for Predictability of Hospital Mortality Between Day 3 OI and SOFA

Acute hypoxemic respiratory failure is life-threatening when strategies like supplemental oxygen therapy or noninvasive ventilation failed to meet the patient ventilatory support to prevent hypoxemia causing hypoxic hypoxia. Hypoxia is a reversible cause of cardiac arrest, as stated in the ACLS guidelines cardiac arrest algorithm. In a study by Vidyasagar[5] out of 95 patients, 34 subjects (42.5%) admitted in ICU, 32.5% of subjects required ventilator support. These studies emphasize the role of mechanical ventilation in acute respiratory failure. The current study is a hospital-based prospective observational study of 61 patients admitted to the emergency department in a tertiary care hospital. Patients were evaluated with special reference to acute hypoxemic respiratory failure who require invasive mechanical ventilation and shifted to ICU for further management. In ICU settings, SOFA is commonly used as a prognostic tool for the outcome of the patient, which uses the organ-specific score. AHRF patients whose primary goal was to correct the pulmonary gas change through mechanical ventilation in whom other strategies failed. During the invasive mechanical ventilation, the ventilatory parameters are dependent on patient blood gas analysis. In this study with a point of care test and measuring the airway resistance parameters, the OI can be known by a simple equation i.e., Which can be used in the prognosis of the patient in comparison with the SOFA. In the present study age distribution among the patients studied were about 61 out of which 7 cases were 18-30 years and accounted for about 11.5% of the study population and 30-50 years were 18 cases and 29.5% and 36 patients were 50-80 years age Study population which comprises of 59%. The majority of patients were 50-80 years (59%). Out of the 61 patients study, the population comprised 54.1% were male predominantly and 45.9% were females. In the present study, 54.1% were males and 45.9% were females. In the present study, 54.1% were males and 45.9% were females, 32 cases, which accounts for about 52.5% had hypertension and 29 were non-hypertensive, i.e., 47.5% and correlates with the present study and showing slight male preponderance for the disease. In the present study, the mean age among survivors and non survivors are 51 and 56 years not significant, but among survivors, the age >56 are at increased risk for mortality. In a study done by Gillet[6] found that overall mortality was 56% and median survival time was 10 days among patients with severe necrotizing community-acquired pneumonia due to Staphylococcus aureus. In a study by Hu[7] studied the overall mortality in patients with severe CAP needing mechanical ventilation and documented about 55.9% of them died. In a study by Hsu-Ching Kao[8], the mortality was about 38%. In the present study, acute hypoxemic respiratory failure mortality was approximately 36.1% who underwent mechanical ventilation for AHRF. The factors likely to be noted in those who did not survive were likely to be because of the high SOFA, high FiO_2, low PaO_2/FiO_2 at Day 1, high OI on Day 3, high PEEP requirement on day 3, high MAW on day 3, increasing OI from day 1 to day 3.

In a study conducted by Horovitz and colleagues[9], a ratio of PaO_2/FiO_2 was introduced to overcome the limitations of alveolar-arterial (A-a) O2 pressure gradient and arterial alveolar (a-A) oxygen tension ratio (a/A ratio). It enables the evaluation of PaO_2 at varying FiO_2. OI measures the functional status of the lung, which is altered by mPaw alone. For the same reason,

Table 1. Correlation Between Hypertension and Study Population

			Study population		
			Survivors	Non Survivors	Total
Hypertension	**Yes**	Count	21	11	32
		% within Hypertension	65.6%	34.4%	100.0%
	No	Count	18	11	29
		% within Hypertension	62.1%	37.9%	100.0%
Total		Count	39	22	61
		% within Hypertension	63.9%	36.1%	100.0%

Chi-Square Value=0.083, P value=0.773, Not Significant

Table 2. Relation Between pH (Day 1) and Study Population

Study population	N	Mean	SD	t Value	P Value
Survivors	39	7.288	0.127	2.223	0.03*
Non Survivors	22	7.210	0.140		

*Significant

Table 3. Relation Between PaO_2 (Day 1) and Study Population

Study population	N	Mean	SD	t Value	P Value
PaO_2 (Day 1)					
Survivors	39	144.879	42.402	4.260	< 0.001*
Non Survivors	22	104.027	19.524		
FiO_2 (Day 1)					
Survivors	39	0.744	0.088	-1.865	0.067
Non Survivors	22	0.782	0.050		
PEEP (Day 1)					
Survivors	39	8.385	2.347	-3.756	< 0.001*
Non Survivors	22	10.545	1.766		
mPaw (Day 1)					
Survivors	39	14.595	2.806	-3.744	< 0.001*
Non Survivors	22	17.185	2.160		
SOFA (Day 1)					
Survivors	39	7.692	2.142	-6.289	< 0.001*
Non Survivors	22	10.955	1.527		
pH (Day 3)					
Survivors	39	7.341	0.120	3.255	0.002*
Non Survivors	9	7.207	0.058		
PaO_2/FiO_2 (Day 3)					
Survivors	39	312.345	118.496	4.094	< 0.001*
Non Survivors	9	148.903	17.759		

*Significant

Table 4: Relation Between RR (Day 3) and Study Population

Study population	N	Mean	SD	t Value	P Value
Survivors	39	16.410	1.650	-2.997	0.004*
Non Survivors	9	18.222	1.564		
PEEP (Day 3)					
Survivors	39	6.923	2.070	-7.536	< 0.001*
Non Survivors	9	12.222	0.667		
mPaw (Day 3)					
Survivors	39	12.846	2.164	-8.164	< 0.001*
Non Survivors	9	19.014	1.325		
PaFiP (Day 3)					
Survivors	39	2.730	0.497	5.473	< 0.001*
Non Survivors	9	1.810	0.129		

Table 5.ROC Analysis of PH (Day 1) and Study Populations

Area Under the Curve

Test Result Variable(s): PH (Day 1)

			Asymptotic 95% Confidence Interval	
Area	Std. Error	Asymptotic Sig.	Lower Bound	Upper Bound
.316	.071	.018*	.176	.456

*-Significant

Table 6. ROC Analysis of PaO_2 (Day 1) and Study Populations

Area Under the Curve

Test Result Variable(s): PH (Day 1)

			Asymptotic 95% Confidence Interval	
Area	Std. Error	Asymptotic Sig.	Lower Bound	Upper Bound
.195	.055	.000*	.087	.303

*-Significant

Table 7. ROC Analysis of and Study Populations

Area Under the Curve

Test Result Variable(s): FiO_2 (Day 1)

			Asymptotic 95% Confidence Interval	
Area	Std. Error	Asymptotic Sig.	Lower Bound	Upper Bound
.605	.073	.174	.463	.748

Table 8. ROC Analysis of PaO2/FiO2 (Day 1) and Study Populations

Area Under the Curve
Test Result Variable(s): PaO_2/FiO_2 (Day 1)

			Asymptotic 95% Confidence Interval	
Area	**Std. Error**	**Asymptotic Sig.**	**Lower Bound**	**Upper Bound**
.186	.055	.000*	.079	.294

Cut-off is 149.375.

Table 9. ROC Analysis of PEEP (Day 1) and Study Populations

Area Under the Curve
Test Result Variable(s): PEEP (Day 1)

			Asymptotic 95% Confidence Interval	
Area	**Std. Error**	**Asymptotic Sig.**	**Lower Bound**	**Upper Bound**
.767	.062	.001	.646	.889

Cut-off is 9.

Table 10. ROC analysis of SOFA (Day 1) and Study populations

Area Under the Curve
Test Result Variable(s): SOFA (Day 1)

			Asymptotic 95% Confidence Interval	
Area	**Std. Error**	**Asymptotic Sig.**	**Lower Bound**	**Upper Bound**
.888	.043	.000	.803	.972

Cut-off is 9.5.

Table 11. Mean, Range, Standard Deviation and Statistical Analysis of the SOFA, PaFip and PEEP at Day 1

		Survivors	Non Survivors	t test	p value
SOFA score	Range	4-13	7-13	-6.289	< 0.001*
	Mean±SD	7.692±2.142	10.955±1.527		
PaFip	Range	1.419-3.198	1.446-2.141	4.922	< 0.001*
	Mean±SD	2.230±0.412	1.764±0.214		
PEEP	Range	5-14	6-12	-3.756	< 0.001*
	Mean±SD	8.385±2.347	10.545±1.766		

*-Significant

Table 12. Mean, Range, SD and Statistical Analysis of the SOFA, PaFip PEEP Day 3

		Survivors	Non Survivors	t test	p value
SOFA score	Range	4-13	10-13	-5.533	< 0.001*
	Mean±SD	7.231±2.158	11.333±1.000		
PaFip	Range	1.605-3.473	1.62-2.036	5.473	< 0.001*
	Mean±SD	2.730±0.497	1.810±0.129		
PEEP	Range	5-12	12-14	-7.536	< 0.001*
	Mean±SD	6.923±2.070	12.222±0.667		
	Mean±SD	5.150±3.231	12.914±1.679		

*-Significant

Table 13: Respiratory and Ventilator Parameters of Survivors and Non Survivors on Day 1 and Day 3 of Mechanical Ventilation

Day 1 and day 3 Respiratory and ventilator parameters	Survivors Mean(SD)	Non Survivors Mean(SD)	P values
FiO_2 day1	0.744 (0.088)	0.782 (0.05)	0.067
PaO_2 day 1 (mmHg)	144.879 (42.401)	104.027 (19.524)	< 0.001*
PEEP day 1 (mmHg)	8.385 (2.347)	10.545 (1.765)	< 0.001*
mPaw day 1 (mmHg)	14.595 (2.806)	17.185 (2.16)	< 0.001*
PaO_2/FiO_2 day 1 (mmHg)	200.661 (76.66)	134.137 (29.591)	< 0.001*
OI day 1	8.416 (3.789)	13.333 (3.022)	< 0.001*
FiO_2 day 3	0.597 (0.12)	0.8 (0)	< 0.001*
PaO_2 day 3 (mmHg)	174.71 (43.438)	119.122 (14.207)	< 0.001*
PEEP day 3 (cmH2O)	6.923 (2.07)	12.222 (0.667)	< 0.001*
mPaw day 3 (cmH2O)	12.846 (2.164)	19.014 (1.325)	< 0.001*
PaO_2/FiO_2 day 3 (mmHg)	312.345 (118.496)	148.903 (17.759)	< 0.001*
OI day 3 (cmH2O/mmHg)	5.15 (3.23)	12.914 (1.679)	< 0.001*
OI change from day 1 to day 3(cmH2O/mmHg)	-3.266 (2.736)	0.45 (2.969)	0.001*

*-Significant

Table 14: Comparison of Cutoff Value, Sensitivity, Specificity, AUC and P Values Between OI and SOFA

Factors	Cutoff	Sensitivity	Specificity	AUC	P Values
SOFA Score	10	77.3%	82.1%	0.868	0.001*
Day 3 OI	10.69	40.9%	92.3%	0.957	0.000*

*-Significant

the oxygenation index has been considered far more sensitive than the traditional PaO_2/FiO_2 for assessment of lung injury severity and mortality prediction. PAO_2/FIO_2 ratio, which is used in differentiating the AHRF patients into mild-moderate and Severe, is also an independent factor for the outcome of the patient if there is no multi-organ involvement. In a study by Andres Esteban[10], showed that baseline PaO_2/FiO_2 is an independent prognostic risk factor and have an inverse relationship with mortality. In the present study, PaO_2/FiO_2 at the baseline showed a significant statistical difference on Day 1 and Day 3 among survivors and non survivors. In the present study, the SOFA score mean was 7.692 for survivors and 10.955

for non survivors and is statistically significant. PaO_2/FiO_2 shows different behaviors for a greater or lesser FiO_2, according to the existing shunt fraction[11]. PEEP modifies PaO_2/FiO_2. Accordingly, the same PaO_2/FiO_2 value can be obtained under very different respiratory conditions with very different PEEP values. In the present study, PafiP is statistically significant, with a mean value of 2.23 and 1.76, among survivors and non-survivors which is statistically significant. Oxygenation index is a bedside tool for assessing neonatal respiratory failure 35 to determine the severity of the disease first done in 1988. OI index reflects both the gas exchange and compliance characteristics of the lung. OI was originally developed as an indication for extra corporeal membrane oxygenation and as an entry criterion for a randomized trial of extra corporeal membrane oxygenation in neonatal respiratory failure[12,13]. In the present study OI, AUC was taken for AHRF in which the AUC was 0.975 and is statistically significant in determining the very high mortality groups. In the present study, the SOFA and day 3 OI have AUC values of 0.868 and 0.975, which are statistically significant. In the present study mean SOFA among survivors and non survivors is 7.69 and 10.95, which is statistically highly significant and is correlating with the previous study. In the present study, mean PEEP among survivors and non survivors are 8.38 and 10.545, which is statistically highly significant and is correlating with the previous study.

In the present study, mean OI among survivors and non survivors are 5.15 and 12.91, which is statistically significant and can be a useful bedside tool in differentiating the high-risk patients and low-risk patients. In the present study, mean mPaw among survivors and non survivors are 12.84 and 19.01, which is statistically significant. In the study by Basem I. El-Shafey[14] mean PaO_2/FiO_2 among survivors and non survivors are 200.5 and 135.3, which is statistically significant. In the present study, mean PaO_2/FiO_2 among survivors and non survivors are 312.3 and 148.9, which is statistically significant in differentiating the high-risk patients and low-risk patients. In the present study, the OI of day 3 was 5.15 and 12.9 among survivors and non survivors is statistically significant. In the present study, day 3 was 7.207 and 7.341 among non survivors and survivors and is statistically significant. In the present study OI ,PEEP, PaO_2/FiO_2 ,mPaw day 1 all were statistically significant and not correlating with this study as this study involved heterogenous study population where hypoxemia was present who required mechanical ventilation. In the present study change in OI was -3.266 and 0.45 from survivors to non survivors also similar to the study KaO *et al* and thereby showing the evidence of usage of this simple tool in predicting the mortality of the patients.

CONCLUSION

The following conclusion can be drawn from the present study:

- In mechanical ventilation patients with AHRF, OI can be used as a better prognostic outcome variable in identifying the high risk group.
- OI is a simplified bedside tool which can be compiled from ventilator parameters and blood gas analysis.
- Considering the limitations of the study, simplicity and feasibility of use of OI and determining the change in OI from day 1 to day 3 gives an outcome predictability similar to SOFA score and is more specificity.
- PaFip is also a variable showing the statistical significance in the study when compared with PaO2/FiO2 ratio alone.

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