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A study on the clinical profile of acute respiratory distress syndrome in short duration fever

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Abstract
Aims and Objectives: To analyze the clinical and biochemical profile of Acute Respiratory Distress Syndrome (ARDS) in patients with short duration fever of less than 2 weeks. To determine the SIRS score, Acute Lung Injury score, Multiorgan Dysfunction Score and APACHE II Score in patients with ARDS with short duration fever.
Materials and Methods: This prospective study was undertaken among patients admitted in Dr SM CSI Medical College, Karakonam. Dr SM CSI Medical College and hospital is a tertiary care referral center which during the monsoon seasons has a large influx of fever cases many of whom develop acute respiratory distress syndrome (ARDS). For the study sixty consecutive patients with history of acute febrile illness of short duration (less than 2 weeks) satisfying the American/European consensus statement for definition of ARDS were chosen.
Results and Conclusion: Based on the statistical analysis of the clinical profile of 60 cases of ARDS with short duration fever of less than 2 weeks admitted in a tertiary care 1CU in Karakonam, the following conclusions were made. The mean age of the survivor group was 38.45 $\pm$ 10.7 years while in the early death was 39.91 $\pm$ 11.7 years and in the late death group was 48.44 $\pm$ 8.1 years. There was a statistically significant increase in mortality with age.

Keywords: Fever, duration, systemic, respiratory, distress, acute

Introduction
Acute Respiratory Disease Syndrome (ARDS) is a clinical syndrome of severe dyspnea of rapid onset, hypoxemia and diffuse pulmonary infiltrates leading to respiratory failure. Acute Lung Injury (ALI) is a less severe disorder but has the potential to evolve into ARDS [1]. The pathologic hallmark of ARDS is diffuse alveolar damage, but lung tissue rarely is available for a pathologic diagnosis [2]. Therefore, diagnosis is made on clinical grounds, according to the following criteria set forth by the American-European Consensus Conference:

- Acute onset
- Bilateral alveolar or interstitial infiltrates
- Pulmonary capillary wedge pressure $\leq$ 18 mm Hg or no clinical evidence of left atrial hypertension.
- PaO2/FIO2 ratio less than 200 mm Hg (ARDS) of less than 300 mm Hg (ALI).

According to western literature the annual incidences of ALI and ARDS are estimated to be 30/100000 and 10/100000 respectively. The common cause of ARDS include severe sepsis, bacterial pneumonia, trauma, drug overdose and multiple transfusions. Increased APACHE 2 score $\geq$ 16 in trauma patients is associated with a 2.5-fold increase in risk of developing ARDS [1]. Many clinical variables are known to influence the final outcome in patients with ARDS, they include, older age, chronic alcohol abuse, chronic smoking, metabolic acidosis, chronic liver disease, chronic kidney disease, chronic immunosuppression, direct lung injury, need for ventilation, presence of sepsis, presence of multiorgan failure and use of methylprednisolone.
In the topics the most common causes of ARDS in the medical wards are sepsis, pneumonia, leptospirosis, malaria, dengue fever and other infections. Usual presentation is a short duration fever followed by rapid onset of breathlessness heralding ARDS.

Such outbreaks are especially common during the monsoon season coinciding with the surge in infectious diseases.
Recent mortality estimates for ARDS range from 1 to 65%, with sepsis and non- pulmonary organ failure accounting for the majority of cases [1]. The number of ARDS patients admitted to different intensive care units (ICUs) reports, from may differ based on the type of ICU, criteria for admission, and the disease bias of the admitting unit. Pulmonary infections or sepsis are the most frequent causes of ARDS at most centers in India [3]. In a retrospective study of patients who died of ARDS it was detected that primary pulmonary infection was the most common cause of death and multiorgan dysfunction was a significant cause of mortality in patients with ARDS [4].
The present study aims to chart out the clinical profile of ARDS in patients presenting with short duration fever of less than 2 weeks admitted in Dr SM CSI Medical College, Karakonam, which is a tertiary care center. The mortality, etiology, complications and need for ventilation and clinical patterns of involvement are assessed using various scoring systems such as Acute Lung Injury score (ALI), APACHE 2 (Acute Physiology and Chronic Health Score). Multi Organ Dysfunction Score (MODS). Clinical and biochemical features at admission are assessed to look for possible risk factors for mortality.

Materials and Methods
This prospective study was undertaken among patients admitted in Dr SM CSI Medical College, Karakonam. Dr SM CSI Medical College and hospital is a tertiary care referral center which during the monsoon seasons has a large influx of fever cases many of whom develop acute respiratory distress syndrome (ARDS). For the study sixty consecutive patients with history of acute febrile illness of short duration (less than 2 weeks) satisfying the American/European consensus statement for definition of ARDS were chosen.

The criteria included
1. Acute onset
2. Bilateral infiltrates on chest radiographs
3. Absence of clinical signs of left atrial hypertension or if PA catheter is present then pulmonary artery opening pressures <15 mmHg.
4. PaO2: FiO2 ratio $\leq$ 200

The patient demographic data consists of age, sex, associated major illness in the past, clinical disorders associated with ARDS, length of hospital stay, use and duration of mechanical ventilation and the presence of sepsis and organ failure defined by ACCP/SCCM consensus conference definition. Severity of illness is measured by the acute physiology and chronic health evaluation II (APACHE II) scores. Severity of ARDS by ALI Score. The multiple organ dysfunction (MOD) score is determined on the day of onset of ARDS for all patients.
Systemic Inflammatory Response Score (SIRS) was defined using guidelines developed by the American College of Chest Physicians and Society of Critical Care Medicine Consensus Conference: 2 or more of the following conditions if present, SIRS was considered[1]
1. Oral temperature >38 °C or <36 °C;
2. Heart rate 90 beats/min;
3. Respiratory rate >20 breaths/min;
4. WBC count >12,000/mm3 or <4,000/mm3; or >10% immature (band) forms on the peripheral blood smear.

The SIRS composite score (SIRS score) was calculated at admission and daily by assigning one point to each one of the four SIRS criteria. In each patient, maximum score was defined as the highest SIRS score attained during the course of ARDS, and mean SIRS score over time was defined as the sum of the daily SIRS score divided by the number of measured days.
The diagnosis of sepsis was defined using recently developed guidelines and required at least two SIRS criteria and microbiologic documentation of infection using strict diagnostic criteria. Specific diagnostic criteria for pneumonia are not defined. Rather, patients are assigned this predisposing factor on the basis of each investigator's clinical judgment. All patients who have satisfied the criteria for ARDS who have a documented temperature >37.2 °C and fever of less than 2 weeks at admission are eligible to be enrolled in the study.
The patients clinical profile included age, sex, premorbid conditions, addictions, clinical symptoms and signs at presentation. Detailed history was taken to probe for the etiology of the illness. Presence of bleeding manifestations, signs of renal or hepatic dysfunction was elicited and history to rule out cardiac cause of dyspnea was emphasized. A thorough physical examination including the vital signs (hypotension, tachycardia, tachypnea or fever), bleeding manifestations, presence of pallor, jaundice, body mass index, mean blood pressure, organomegaly, any focus of infection, signs of meningeal irritation, signs of fluid overload, and crepitations on chest examination was carried out. Signs of left heart failure such as S3 or S4 and signs of right heart failure like elevated jugular venous pressure and pedal edema were excluded in every patient. The lab parameters assessed at admission include complete blood counts including platelet count, liver function tests, renal function tests, serum electrolytes, urinalysis and blood sugars. Arterial blood gas analysis was done for all patients at admission and where possible at 4th day of admission. Chest Xray was taken for all patients and the number of quadrants involved was ascertained and the acute lung injury score was determined. In all cases myocarditis was ruled out either by ECG, CPK, CPK-MB, Troponins or by Echo. Echo was done to rule out cardiac pathology (myocarditis, pericardial effusion and heart failure). Ultrasound and CT chest were done in indicated cases. Coagulation parameters were done and when abnormal DIC was ruled out by ascertaining the d-dimer value. Renal Failure was defined as a serum creatinine $\geq$ 1.6 mg%, jaundice as bilirubin > 2 mg% and thrombocytopenia when platelet count was <1 lakh/mm [3].
In all cases, blood and relevant specimen was send for gram stain and microbiological culture. A thorough search for an etiological agent was pursued in all case. All patients were screened for presence of IgM antibodies against Leptospira. The test employed was a qualitative enzyme immunoassay (EIA) for detection of lgM antibodies against Leptospira biflexa serovar Patoc. The advantage of this was that it was reactive against a broad range of serovars. The disadvantage was that only genus detection was possible. The infecting serotype could not be detected. The kits used were those of VIRION/SERION (Virion Institute, Germany) and PANBIO kits (Queensland, Australia). Only in seropositive cases, was

the etiological agent considered as leptospirosis. Weakly positive or intermediate results were included under the diagnosis of leptospirosis. In all patient's malaria was ruled out either by Rapid malarial antigen detection test or by peripheral smear. Serology for dengue IgM and IgG and ELISA for HIV were done for all patients. In indicated cases, vasculitis workup was done, and in suspected tuberculosis, sputum and Mantoux test were done.

The patients were followed up for their duration of hospital stay and the outcome was noted as either as death or survivors. In survivors, the duration of their hospital stays, ICU stay and Acute lung injury score at fourth day of admission were taken as indicators of short term morbidity in ARDS.

Apache II (Acute Physiology and Chronic Health Evaluation II) Score [1]

Score	4	3	2	1	0	1	2	3	4
Temp °C	≥ 41	39.0-40.9		38.5-38.9	36.0-38.4	34.0-35.9	32.0-33.9	30.0-31.9	≤29.9
Mean BP, MM Hg	≥160	130-159	110-129		70-109		50-69	40-54	≤ 39
Heart Rate	≥ 180	140-179	110-139		70-109		55-69	40-54	≤ 39
Respiratory Rate	≥ 50	35-49		25-34	12-24	10-11	6-9		≤ 5
Arterial pH	≥ 7.70	7.60-7.69		7.50-7.59	7.33-7.49		7.25-7.32	7.15-7.24	< 7.15
Serum Na (meq/lt)	≥ 180	160-179	155-159	150-154	130-149		120-129	111-119	≤ 110
Serum K (meq/dl)	≥ 7.0	6.0-6.9		5.5-5.9	3.5-5.4	3.0-3.4	2.5-2.9		< 2.5
Creatinine (mg/dl)	≥ 3.5	2.0-3.4	1.5-1.9		0.6-1.4		<0.6		
Haematocrit	≥ 60		50-59.9	46-49.9	30-45.9		20-29.9		< 20
WBC Count, 10^3/ml	≥ 40		20-39.9	15-19.9	3-14.9		1-2.9		< 1

Glasgow Coma Score

Eye opening	Verbal (nonintubated)	Verbal (intubated)	Motor activity
4 – Spontaneous	5 – Orientated and talks	5 – Seems able to talk	6 – Verbal command
3 – Verbal stimuli	4 – Disorientated and talks	3 – Doubtful ability to talk	5 – Localises to pain
2 – Painful stumuli	3 – Inappropriate words	1 – Generally unresponsive	4 – Withdraws to pain
1 – No response	2 - Incomprehensible words		3 – Decorticate
	1 – No response		2 – Decerebrate
			1 – No response

For GCS component of Acute Physiology score, subtract GCS from 15 to get points assigned

Age

Age (years)	Score
<45	0
45-54	2
55-64	3
65-74	5
≥ 75	6

Chronic Health Score

Assign 1 point for each chronic health condition

Liver cirrhosis with portal hypertension or encephalopathy, Class 4 angina, Chronic hypoxemia or hypercapnia, polycythemia, ventilator dependent, chronic renal failure, immunocompromised host.

The Multiple Organ Dysfunction Score

	Score				
Organ system	**0**	**1**	**2**	**3**	**4**
[a]Respiratory (PaO_2/FIO_2 ratio)	>300	226-300	151-225	76-150	≤ 75
[b]Renal (serum creatinine in mg%)	≤ 1.1	1.1-2.3	2.3-4.0	4.0-5.7	> 5.7
[c]Hepatic (serum bilirubin in mg%)	≤ 1.2	1.2-3.5	3.5-7.0	7.0-14	> 14
[d]Cardiovascular (PAR)	≤ 10.0	10.1-15.0	15.1-20.0	20.1-30.0	> 30.0
[e]Hematologic (platelet count)	> 120	81-120	51-80	21-50	≤ 20
[f]Neurologic (Glasgow Come Score)	15	13-14	10-12	7-9	≤ 6

[a] The PaO_2/FiO_2 ratio is calculated without reference to the use or mode of mechanical ventilation, and without reference to the use or level of positive end-expiratory pressure

[b] the serum creatinine concentration is measured in mg%, without reference to the use of dialysis

[c] the serum bilirubin concentration is measured in mg%

[d] the pressure-adjusted heart rate (PAR) is calculated as the product of the heart rate (HR) multiplied by the ratio of the right atrial (central venous) pressure (RAP) to the mean arterial pressure (MAP): PAR = HR x RAP/mean BP

[e] the platelet count is measured in platelets/mL 10^{-3}

[f] the Glasgow Coma Score is preferably calculated by the patient's nurse, and is cored conservatively (for the patient receiving sedation or muscle relaxants, normal function is assumed, unless there is evidence of intrinsically altered mentation).

Calculation of the lung injury score

Chest radiograph

No alveolar consolidation	0
Alveolar consolidation confined to I quadrant	1
Alveolar consolidation confined to 2 quadrants	2
Alveolar consolidation confined to 3 quadrants	3
Alveolar consolidation confined to 4 quadrants	4

Hypoxaemia score

PaO2/FiO2	>300	0
PAO2/FiO2	225-229	1
PaO2/FiO2	175-224	2
PaO2/FiO2	100-174	3
PaO2/FiO2	<100	4

PEEP score (when mechanically ventilated)

<5 cm H2O	0
6-8 cm H2O	1
9-11 cm H2O	2
12-14 cm H2O	3
>15 cm H2O	4

The score is calculated by adding the sum of each component and dividing by the number of components used.

No lung injury	0
Mild to moderate lung injury	0.1-2.5
Severe lung injury (ARDS)	>2.5

Statistical Analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 10. Quantitative or parametric data were expressed as mean $\pm$ S.D., while qualitative or nonparametric data were expressed in its frequency and percentage. To compare the different parameters analysis of variance (One-way ANOVA) was employed as the parametric test and Chi Square (X^2) test was used as a nonparametric test. For all statistical evaluations a two-tailed probability of value, <0.05 was considered significant.

Results and Analysis

Age and Sex Distribution of Cases

Table 1: Age Distribution of Cases

Age in years	Number	Percentage
<20	1	1.7
20-29	9	15
30-39	19	31.7
40-49	17	28.3
50-59	13	21.7
≥ 60	1	1.7
Total	60	100

Of the 60 cases of ARDS included in the study, the age distribution was as shown above. Only I (1.7%) patient was <20 years of age. 9 (15%) were of the 20-29 age group, 19 (31.7%) were in the 30-39 age group, 17 (28.3%) were in the 40-49 age group, 13 (21.7%) were in the 50-59 age group and 1 (1.7%) was above 60 years.

Table 2: Sex Distribution of Cases

Sex	Number	Percentage
Male	47	78.3
Female	13	21.7
Total	60	100

Of the 60 patients studied, 47 (78.3%) were male and 13 (21.7%) were female.

Table 3: Etiology of Ards

Cause	Frequency	percentage
Pulmonary infection	34	56.7
Leptospirosis	8	13.3
Dengue	9	15.0
E. coli	2	3.3
Others	7	11.7
Total	60	100

Of the 60 patients studied primary pulmonary infection or pneumonia accounted for 34 (56.7%) cases. Leptospirosis accounted for 8 (13.3%) cases and Dengue fever 9 (15%) cases. Other less common cases included HIV infection, Staphylococcal infection, *E. coli*, Tuberculosis and Interstitial lung disease.

Mechanical Ventilation – Requirement and Duration in ARDS Cases

Table 4: Mechanical Ventilation

	Frequency	Percentage
Ventilated	37	61.7
Non Ventilated	23	38.3
Total	60	100

Table 5: Duration of Ventilation

	Frequency	Percentage
< 3 days	11	47.8
3-6 days	11	47.8
6-9 days	1	4.3
Total	23	100

Mechanical Ventilation was required in 23 (38.3%) cases and 37 (61.7%) cases improved with high flow oxygen. Of the 23 cases ventilated 11 (18.3%) cases either expired or weaned off ventilator by the third day. The rest of the 12 (20%) cases either expired or was weaned off the ventilator after the third day of admission.

Table 6: Duration of ICU Stay

Number of days	Number of cases	Percentage
< 3 days	21	35.0
3-6 days	24	40.0
6-9 days	13	21.7
9-12 days	2	3.3
Total	60	100

The duration of ICU stay was less than 3 days in 21 (35%) cases, between 3 and 6 days in 24 (40%) cases the rest of the cases were admitted in ICU for more than 6 days. A less than 3 days duration of ICU correlates with an early death in some cases as well as rapid improvement in cases of mild ARDS. The variable duration of ICU stay has also been influenced by deaths, decision of the consulting physician as well as response to treatment.

Table 7: Mortality

	Number of cases	Percentage of cases
Survived	40	66.7
Early death (≤3 days)	11	18.3
Late death (>3 days	9	15
Total	60	100

Of the 60 cases studied, 40 (66.7%) cases survived, early death was noted in 11 (18.3%) cases and late death in 9 (15% cases).

Table 8: Premorbidities

Premorbidities	Frequency	Percentage of cases
None	35	58.3
CAD	2	3.3
Hepatitis	1	1.7
Hypertension	3	5
Diabetes	2	3.3
HT + DM	2	3.3
CAD + Jaundice	1	1.7
Others	14	23.3
Total	60	100

The age of patients ranged from 14 years to 61 years (men age 40.22 years). Only 1.7% of the case belonged to <20 years of age, 15% were of the 20-29 age group, 31.7% were in the 30-39 age group, 28.3% were in the 40-49 age group, 21.7% were in the 50-59 age group and 1.7% was above 60 years. The mean age of the survivor group was 38.45 $\pm$ 10.7 years while in the early death was 39.91 $\pm$ 11.7 years and in the late death group was 48.44 $\pm$ 8.1 years. The result was statistically significant (p value <0.05).

In the present study 47 (78.3%) were male and 13 (21.7%) were female. Male to female ratio was 2:1. According to a study by Johnston *et al.* [25] it was found that the males accounted for 72.3% of all ARDS cases in trauma patients. The fact that ARDS in patients with short duration fever probably reflect that men are more likely to be exposed to environmental conditions at risk for contracting infections which can lead to ARDS. Besides in the present study, ARDS was found to be associated with statistically significant increased incidence in males. This probably reflects the increased incidence of addictions like smoking and alcohol in males as well as the premorbid conditions like chronic liver disease which are more common in males.

In literature from North India[3], malaria, typhoid and miliary tuberculosis were referred to as common causes. But in the present study such cases were rare, probably reflecting the lower incidence of malaria in Kerala. Besides the efficacy of RNTCP programme in Kerala may be the reason why miliary TB was a less common diagnosis. A case of ARDS was detected in a HIV patient with low CD4 count and he was empirically started on treatment with Cotrimoxazole with the presumptive diagnosis of Pneumocystis Carinii pneumonia. Two cases of ARDS were attributed to ILD based on CT Chest findings, however biopsy confirmation was not pursued in these patients.

Sepsis is a well-documented cause for ARDS but isolation of an organism was only possible in a few cases. The reasons may be antibiotic therapy prior to admission and also poor isolation techniques. The organisms isolated included Staphylococcus in case of Osteomyelitis following surgery, *E. coli* in a case of UTI and a case of Klebsiella pneumonia.

Mechanical Ventilation was required in 23 (38.3%) cases and 37 (61.7%) cases improved with high flow oxygen or noninvasive ventilation. Of the 23 cases ventilated 11 (18.3%) cases either expired or weaned off ventilator by the third day. The rest of the 12 (20%) cases either expired or was weaned off the ventilator after the third day of admission. Studies in ARDS suggest that high tidal volumes (12 ml/kg) with high plateau pressure (more than 30-35 cm H2O) are deleterious and that a strategy aimed at preventing overdistension by decreasing tidal volume to 6 ml/kg and limiting plateau pressure to <30 cm H2O is associated with lower mortality.

In the present study it was found that ARDS persons once ventilated have increased risk of death, this high association can be attributed to the fact that all cases of severe ARDS were ventilated prior to their death whereas milder cases of ARDS did not require ventilation and improved with high flow oxygen or noninvasive ventilation with BIPAP (Bilevel positive airway pressure ventilation). The duration of ventilation was not found to have any statistically significant effect on the mortality of patients admitted with ARDS. In a study by Vigg *et al.* [4] the duration of mechanical ventilation was less than seven days in 80 patients and more than seven days in 18 patients who expired due to ARDS. This concurs with our study where the mean duration of ventilation was 2.826 $\pm$ 1.53.

The duration of ICU stay was less than 3 days in 21 cases, between 3 and 6 days in 24 cases the rest of the cases were admitted in ICU for more than 6 days. A less than 3 days duration of ICU correlates with an early death in some cases as well as rapid improvement in cases of mild ARDS. According to a study by Vigg *et al.* [4] in patients who died due to ARDS the length of ICU stay was less than 10 days in 58 patients whereas in 40 patients the length of ICU stay was more than 10 days. The shorter duration of ICU stay obtained in cases can attributed to early death or rapid improvement in patients with short duration fever who develop ARDS. The higher duration in the study by Vigg *et al.* may be attributed to the fact that the study include cases of posttraumatic, surgical, burns and other cases which require prolonged ICU Stay necessitated by the underlying condition itself. The treating physician in a private sector where the study was conducted can provide ICU care for a longer duration, whereas in the government sector like ours, the shortage of ICU beds prompt a premature discharge from the ICU.

Of the 60 cases 55 (91.7%) cases were culture negative. Of the 5 cases which were culture positive the organisms isolated included E. coli, Klebsiella and Staphylococcus species. In a study by Vigg *et al.* [4] microbiological diagnosis was obtained in 49 out of 98 patients (49%). The maximum yield was from blood cultures followed by endotracheal secretions culture. The commonest organism isolated from various blood cultures was Pseudomonas species followed by Klebsiella. The reason for the higher isolation rates of Klebsiella and Pseudomonas was because cases of ARDS occurred in the hospital setting following nosocomial infections in sepsis patients with polytrauma, peritonitis or buns. In 28.3% of our study population, the etiological agent was Dengue virus or Leptospira, which are better diagnosed by serological methods rather than by microbiological culture. The general lower rate of isolation

of organism in patients with sepsis in our setting due to technical reasons may have also contributed to the lower rate of culture positive cases.

In our study 44 (73.3%) cases had no evidence of myocarditis, whereas 16 (26.7%) had evidence of myocarditis. Patients with ARDS who developed myocarditis were found to be at increased risk of death. The increased occurrence of fatal arrhythmias is responsible for the death in cases of myocarditis. The long term outcome in acute myocarditis is good, with only few patients having any residual cardiac dysfunction once the acute condition is overcome.

In the present study 30 (50%) cases had no evidence of renal failure, whereas de remaining 30 (50%) had evidence of renal failure. Of those 30 patients who had renal failure dialysis was required in 10 (33.33%) cases whereas 20 (66.67%) cases did not require dialysis. Patients with ARDS who developed renal failure especially those requiring dialysis were found to be at increased risk of death.

In the present study only 5 (8%) cases was there evidence of polyserositis, the remaining 55 (92%) had no evidence of polyserositis and in only 13 (21.7%) cases was there evidence of DIC, the remaining 47 (78.3%) had no evidence of DIC. DIC was associated with increased risk of mortality whereas polyserositis did not show any correlation with mortality. In a study by Vigg *et al*. [4] severe sepsis with multiorgan failure was seen in 18 patients who died of ARDS and all these patients had overt disseminated intravascular coagulation (DIC). The fact that DIC is associated with increased mortality in ARDS in our present study correlates well with previous studies on increased mortality in ARDS patients with coagulation failure.[51] Changes of endothelial cell activation and damage markers, such as circulating endothelial cells (CECs), plasma coagulation and fibrinolysis index, to some extent reflect severity of illness and lung injury in ARDS.

In the present study 33 (55%) cases have never smoked, 4 (6.7%) cases were former smokers stopped for more than 1 year. Current cigarette smokers (still, at least five cigarettes per week) but <20 cigarettes/day include 22 (36.7%) cases. Heavy smokers (those >20 cigarettes/day) accounted for 1 (1.7%) case only. The higher proportion of nonsmokers with ARDS is due to the lower incidence of smoking in females of Kerala. In our study there was no statistically significant correlation between smoking and mortality in patients with ARDS. In a 15 year cohort study it was found that there was an independent dose-response association between current cigarette smoking and the subsequent hospital presentation of ARDS [29]. Our study did not confer to the previous studies, but a study in a larger population with matching for variables is required before the effect of smoking on mortality in ARDS can be ascertained statistically.

In the present study, 60% cases have never consumed alcohol, 5% cases were former drinkers stopped for more than 1 year. Current alcoholics who consumed <3 drinks per day; include 31.7% cases. Heavy drinkers (those $\geq$ 3 drinks/day) accounted for 3.3% cases only. There was no statistical correlation between the amount of alcohol consumed and incidence of ARDS. In one study it was found that there was no association between alcohol consumption and ARDS incidence [29]. Another study has demonstrated that a prior history of chronic alcohol abuse increases the risk of developing ARDS in patients with an identified clinical at-risk diagnosis.

Of the 60 cases admitted with ARDS 39 (65%) cases were not treated with methylprednisolone whereas 21 (35%) were given methylprednisolone. High doses of glucocorticoids do not prevent the development of ARDS in patients with sepsis. In addition, randomized, controlled clinical trials did not show beneficial effects when high doses of glucocorticoids were administered to ALI/ARDS patients early in their course. Several case series reports however suggested that glucocorticoids could lower mortality in some patients with severe ALI/ARDS when administered several days after ALI/ARDS onset.

In the present study ALI Score at admission of the survivor group was 2.51$\pm$ 0.43 while in the early death was 2.86 $\pm$ 0.32 and in the late death group was 2.83 $\pm$ 0.35. The result was statistically significant with higher ALI score at admission correlating with increased mortality. In most studies the initial oxygenation abnormality defined by the PaO2/FiO2 ratio did not predict mortality unless it was grossly abnormal [9].

ALI score on the 4th day of admission of the survivor group was 1.21 $\pm$ 0.69 nd in the late death group was 1.5 $\pm$ 1.32. This correlates with a study where the ALI score measured after 4 days predicted a complicated clinical course [9].

SIRS Score at admission of the survivor group was 2.64 $\pm$ 0.70 while in the early death was 2.77 $\pm$ 0.72 and in the late death group was 2.89 $\pm$ 0.33. SIRS Score on 4th day of admission of the survivor group was 1.66 $\pm$ 0.52 while in the early death was 1.95 $\pm$ 0.57 and in the late death group was 1.72 $\pm$ 0.26. The SIRS score on the first day or the mean SIRS score did not correlate well with the mortality.

In the present study MOD Score on day of admission of the survivor group was 6.33 $\pm$ 2.03 while in the early death was 9.28 $\pm$ 2.05 and in the late death group was 10 $\pm$ 1.32. The result was very highly significant statistically. The study result showed that with increasing MODS score at admission there was increased mortality. In a study by Vigg *et al*. [4] where only patients who died of ARDS was considered, the mean MODS score was found to be 9 $\pm$ 2.0 which correlates closely with statistical data of expired cases of ARDS in our study. The MODS score at admission was significantly lower in the survivors.

In the present study APACHE II Score on day of admission of the survivor group was 7.3 $\pm$ 4.22 while in the early death was 12.18 $\pm$ 5.39 and in the late death group was 9.67 $\pm$ 2.0. The study result showed that with increasing APACHE II score at admission there was increased mortality. In a study by Vigg *et al.* the mean APACHE II score was 28 $\pm$ 3.0. In a study of ARDS from 1993 to 1997, the mean APACHE score for survivors and nonsurvivors was (12.2 $\pm$ 0.6 versus 15.8 $\pm$ 0.9). In all the studies higher APACHE II score correlated with increased mortality. The degree of elevation of APACHE II score was not as high as in other studies, probably as only cases with short duration fever were considered for the study. This may also be the reason for the better mortality statistics obtained in our study.

The present study showed a correlation with increased BMI and mortality which is statistically significant, but more sample size will be needed before ascertaining the degree of significance of BMI on mortality. In a one year study in patients with ALI there was no mortality difference in any of the abnormal BMI groups compared to normal-weight patients.

In the present study, the Systolic BP of the survivor group was 104.15 $\pm$ 26.26 while in the early death group was

86.36 ± 5.05 and in the late death group was 92.22 ± 6.67. The Diastolic BP of the survivor group was 66.98 ± 16.81 while in the early death group was 54.55 ± 5.22 and in the late death group was 62.22 ± 6.67. The Mean BP of the survivor group was 79.58 ± 19.15 while in the early death group was 65.1 ± 4.37 and in the late death group was 72.22 ± 6.67. A lower systolic, diastolic or mean BP at presentation correlated with increased mortality and early death in patients with ARDS. In a study of ARDS in blunt trauma it was found that hypotension on admission was an independent predictor of mortality in ARDS.

Conclusions

Based on the statistical analysis of the clinical profile of 60 cases of ARDS with short duration fever of less than 2 weeks admitted in a tertiary care 1CU in Karakonam, the following conclusions were made.

- The mean age of the survivor group was 38.45 ± 10.7 years while in the early death was 39.91 ± 11.7 years and in the late death group was 48.44 ± 8.1 years. There was a statistically significant increase in mortality with age.
- 47 (78.3%) were male and 13 (21.7%) were female. Male to female ratio was 2:1. Males were found to have a statistically significant increased incidence of mortality compared to females.
- The underlying cause of ARDS was primary pulmonary infection or pneumonia in 56.7% cases. Leptospirosis accounted for 13.3% cases and Dengue fever 15% cases. Other less common cases included HIV infection, E. coli, Staphylococcal infection, Tuberculosis and Interstitial lung disease.

Malaria a common cause of ARDS in tropics, is a rare cause in our setting

- Mechanical Ventilation was required only in 38.3% cases. A significant increase in mortality was noted in ARDS patients requiring ventilation.
- 66.7% cases survived, early death was noted in 18.3% and late death in 15% cases. A lower mortality rate of 33.3% is noted in short duration fever with ARDS compared with other causes of ARDS.
- The shorter duration of hospitalization in the non-survivor group was noted due to the early deaths which curtailed the hospital stay.
- Only 5 cases were culture positive and the organisms isolated included *E. coli*, Klebsiella and Staphylococcus.
- 26.7% of cases had evidence of myocarditis. Patients with ARDS who developed myocarditis were found to be at increased risk of death.
- 50% cases had evidence of renal failure. Dialysis was required in 33.33% cases of renal failure. Patients with ARDS who developed renal failure requiring dialysis were found to be at increased risk of death.
- 21.7% cases developed DIC and patients who developed DIC were found to be at increased risk of death. Presence of bleeding manifestations at presentation especially hemoptysis in patients correlated with increased mortality in patients with ARDS.
- Only 8% cases had evidence of polyserositis and this was found to have no statistically significant effect on the mortality of ARDS.
- No correlation between smoking or alcohol and mortality in patients with ARDS. A larger sample size with matching for variables is required.
- 35% of cases were given methylprednisolone, but a higher mortality was seen in patients given methylprednisolone. A larger sample which is matched for variables is required before ascertaining the significance, especially since more severe cases of ARDS or cases associated with myocarditis were more likely to have received methylprednisolone.
- ALI Score at admission of the survivor group was 2.51 ± 0.43 while in the early death was 2.86 ± 0.32 and in the late death group was 2.83 ± 0.35. ALI score on the 4th day of admission of the survivor group was 1.21± 0.69 and in the late death group was 1.5 ± 1.32. A higher score at admission and at 4 days correlate with increased mortality.
- SIRS Score at admission of the survivor group was 2.64 ± 0.70 while in the early death was 2.77 ± 0.72 and in the late death group was 2.89 ± 0.33. SIRS Score on 4th day of admission of the survivor group was 1.66 ± 0.52 while in the early death was 1.95 ± 0.57 and in the late death group was 1.72 ± 0.26. There was no correlation between SIRS score and mortality.
- MOD Score on day of admission of the survivor group was 6.33 ± 2.03 while in the early death was 9.28 ± 2.05 and in the late death group was 10 ± 1.32. The study result showed that with increasing MODS score at admission was an independent predictor of increased mortality.
- APACHE II Score on day of admission of the survivor group was 7.3 ± 4.22 while in the early death was 12.18 ± 5.39 and in the late death group was 9.67 ± 2.0. The study result showed that a higher APACHE II score at admission there was associated with increased mortality.
- A lower Systolic BP, Diastolic BP or Mean BP at presentation correlated with increased mortality in patients with ARDS.
- A higher ESR correlated with increased mortality and death in patients with ARDS whereas RBS, albumin and bilirubin values showed no correlation.

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