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Medicine

Study of Clinical Profile and Outcome of Acute Respiratory Distress Syndrome in Intensive Care Unit

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Abstract: Acute respiratory distress syndrome (ARDS) is a clinical syndrome of severe dyspnea of rapid onset, hypoxemia and diffuse pulmonary infiltrates leading to respiratory failure. ARDS is associated with significant morbidity and mortality. A prospective study to evaluate the clinical features, etiology, factors influencing survivors and non survivors, predictors of outcome of patients with ARDS admitted in ICU of tertiary care hospital this study encompassed 100 cases of ARDS admitted to ICU as per AECC guidelines. Patients excluded were with cardiac failure, significant underlying lung disease, and age below 14 years. There were more males 52% than females 48% with a total mortality of 61 %. In the present study the main etiological factor for ARDS was infective 84%. Most common cause being sepsis 45(53%). ARDS due to noninfective cause accounted for 16% of cases. Sepsis with multiorgan failure was seen in 26% with mortality of 61.5%. APACHE II score among survivors was 12.3 ± 5.3 compared to non survivors 18.9 ± 5.7.APACHE III score among survivors was 53.6 ± 14.9 compared to non survivors 94.1 ±19.8. The PaO2/FiO2 at admission was109.9 ± 35.5 for survivors compared to 75.5 ± 36.3 for non survivors. Dengue, Malaria, pneumonia, scrub typhus and undiagnosed fever were the main etiologies. PaO2/ FiO2 ratio, APACHE II and III score at the time of admission were significant predictors of the outcome. Sepsis, acidosis, hypotension, and multiorgan failure were individual predictors of mortality in patients with ARDS.
Keywords: ARDS, Mechanical ventilation, Sepsis, Multiorganfailure, APACHE

INTRODUCTION

Acute respiratory distress syndrome (ARDS) is a clinical syndrome of severe dyspnea of rapid onset, hypoxemia and diffuse pulmonary infiltrates leading to respiratory failure. It is a devastating clinical disorder that is seen in critically ill patients with variable clinical manifestations. This syndrome can occur even without primary damage to lung parenchyma and thus they are more often classified as ARDS due to pulmonary and extra-pulmonary causes [1]. Mortality estimates ranges from 26 to 44 % in different studies [2]. The criterion used for diagnosis is based on American/European consensus statement for definition of ARDS [3].

There are very few studies on the pattern of ARDS seen in our country. Thorough literature search has shown few studies on ARDS in Indian population which are mainly on ARDS with various tropical infections like dengue, malaria and tuberculosis infections. There are retrospective studies on clinical course and outcome of ARDS and very few prospective studies in Indian literature. This is a prospective study where an attempt is made to evaluate the clinical features and etiology of ARDS, assess mortality and its causes. Factors influencing survivors and non survivors, predictors of outcome of patients with ARDS of patients admitted in ICU of tertiary care hospital of North Karnataka.

METHODS AND MATERIALS

This was a one year prospective observational study carried out on patients who were diagnosed of ARDS in ICU of tertiary care Hospital during November 2016 to October 2017.

Inclusion criteria

Is based upon criteria used for diagnosis of ARDS American/European consensus statement for definition of ARDS which includes:

1. Acute onset 2. Bilateral infiltrates on chest radiographs 3. Absence of clinical signs of left atrial hypertension, left heart failure or if PA catheter is present then pulmonary capillary wedge pressures <18mmHg 4. Pa02: Fi02 <200.

Exclusion criteria

Clinical or investigatory features suggestive of left sided cardiac dysfunction 2. Significant underlying lung disease 3. Age < 15 years. 4. Discharge against medical advice

Consecutive patients were assessed, investigated, and treated as per the existing practices without disturbing their routine protocol. Institute's Ethics committee approval was obtained for this study. The enrolled patient's demographic data including sex, address, occupation, marital status were noted. Patient's premorbid illness was noted including history of alcohol abuse and smoking. Patient's history and detail examination was done.

Investigations needed for diagnosis, assess severity and to identify risk factors were done according to clinical picture. Blood culture was sent for all patients and other site cultures were sent based of clinical picture.

The parameters defined for organ failure were: Circulatory failure as systolic BP<90 mmHg, hematologic involvement as platelet count <100000, hemoglobin of <8.0 mg/dl, renal failure as serum creatinine >2 mg/dl, acidosis (pH < 7.25, bicarbonate <20 meq/l), and hepatic failure as total bilirubin >2 mg/dl.

Dengue infection was identified by NS1 antigen, IgM antibody. Malarial parasite was identified by peripheral smear and malaria card test. Other sepsis work up HIV, HbSAg, Brucella, Leptospira antibody, Widal and Weil Felix test. Severity of illness was measured by the acute physiology and chronic health evaluation (APACHE 2 and 3) score on the day of onset of ARDS for all patients. The presence of sepsis was assessed by ACCP/SCCM consensus definition on the day of development of ARDS for all patients.

Sepsis was defined as infection (proved or suspicious of infection) plus two or more of the following criteria: Temp >38°C or < 36°C, HR > 90/min, RR> 20 breaths/min (or Paco2 < 32 mm Hg), WBC count> 12,000 cells/ml or < 4,000 cells/ml (or 10% band forms)

STATISTICAL ANALYSIS

The data were analyzed applying χ^2 -test, univariate logistic regression analysis of significance, using the computer-based program SPSS. Chi square test and student t test is used. Data calculated in ms excel 2007, p value is given.

RESULTS

During the study period of one year there were 100 patients included in the study. Total of 9674 admission, 1945 was ICU admissions. 124 fulfilled the criteria of ARDS. 24 were excluded from the study due to cardiac, significant lung disease and discharge against advice

DEMOGRAPHIC DATA

There were 100 patients who satisfied the inclusion criteria during the study period of one year. Out of which 52 were males (52%) and 48 were females (48%) with the ratio of male: female almost 1:1. Most of the patients were between 21-40 years. The minimum age was 16 years and maximum was 77 years. The mean age of the patient was 41.7 ± 16.8.

The most common symptoms were fever, cough and breathlessness in majority of the patients. Out of the 100 patients, 45 patients had pre-morbid illness most common being diabetes and hypertension. 2 were HBsAg positive. 1 each had HIV, cirrhosis, CVA, old PTB, hypothyroidism. Smoking and tobacco chewing were the most common risk factors associated with ARDS. Multi organ involvement with > 3 organ involvement was found in 33 patients with significant mortality.

ETIOLOGICAL FACTORS OF ARDS

The most common etiological factor found in our study was sepsis 45% based on the sepsis definition. 14 cases of dengue, 16 of primary pulmonary infection and 10 of undiagnosed acute febrile illness were seen. Scrub typhus, Chikungunya, abdominal surgery and pancreatitis was seen 2 cases each. 1 each cases of snakebite, drowning, polytrauma and complicated malaria.

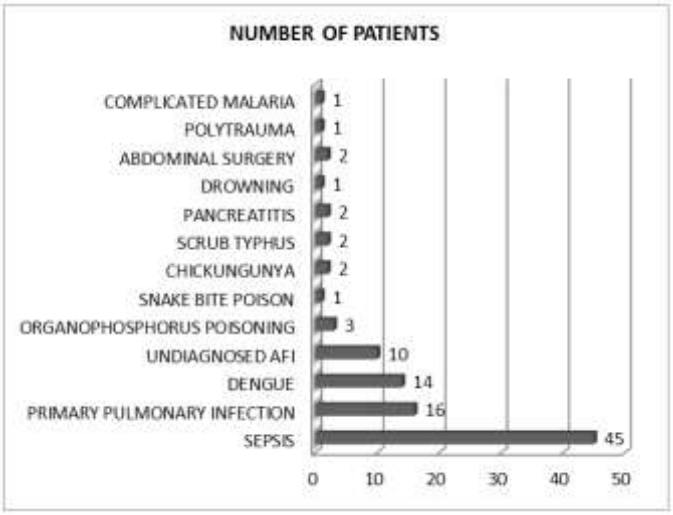

Fig-1: Etiological factors causing ARDS

The most common growth from various cultures was seen in endotracheal culture followed by sputum, blood, urine and wound. ET culture most common growth was Acinetobacter and non-fermenting gram negative bacilli (15 cases each), followed by pseudomonas, Klebsiella, staphylococcus (8 cases each) and streptococcus in 3 cases. Blood culture was positive in 13 patients and most common organism grown was staphylococcus. Wound culture was positive in one snake bite patient were pseudomonas was grown and one from cellulitis patient were citrobacter was grown. UTI was seen in 3 patients and 2 patients E coli were grown and one patient had gram negative bacilli.

SEVERITY OF ILLNESS

Sepsis with multiorgan failure was seen in 26% with mortality of 61.5%. APACHE II score among survivors was 12.3 ± 5.3 compared to non survivors 18.9 ± 5.7.APACHE III score among survivors was 53.6 ± 14.9 compared to non survivors 94.1 ±19.8. The PaO2/FiO2 at admission was109.9 ± 35.5 for survivors compared to 75.5 ± 36.3 for non survivors. The mortality in our study was 61 out of 100 patients (61%). 39 patients survived.

DISCUSSIONS

Acute respiratory distress syndrome extrapolated incidence in India is 5,87,355 (estimated population 1,065,070,607).

Table-1: Incidence, Design and reference population

Study	Design	Reference population	Screened population and period	ARDS patients	Reported incidence
Elisa Estrensoro *et al*. [4]	Prospective	3050 ICU admissions	4 ICU 15 months	235	7.7% of all admissions
Thomosen& Morris	Prospective	1,720,000 residents	6 ICU 1 year	110	4.8-8.3/100000/yr
Esteban *et al*. [5]	Prospective	4153 ICU admissions	412 ICU 1year	130	8% of ventilated population
Present study	Prospective	1945 ICU admissions	1 ICU 1 year	100	5.14% of all admissions

PATIENT DETAILS

This study comprised of 100 patients, 52 males (52%) and 48 females (48%). The National Heart, Lung and Blood Institute ARDS Clinical Trials Network had 60% males, while a cohort study, the King County Lung Injury Project (KCLIP), Washington had 61% males [6]. Although Indian studies by Aggarwal and Gupta [7] in 2005, reported the female gender as a risk factor for mortality. Hudson *et al.* [8] found that gender had no effect on development of ALIARDS and the mortality rate was similar.

Table-2: Patient details sex distribution comparision

Study	Patients	Male	Female	Mean age
Gupta *et al.* [7]	28	18	10	29.5±15.4
Ritesh Agarwal [9]	180	103	77	
Bhagade [10]	58	43	15	37.9
Vigg *et al.* [11]	98	51	47	39.2±2.5
Present study	100	52	48	41.7 ± 16.8

The reason behind predominant involvement of males (52%) and young patients (15-40 years, 54%) in this study would be higher environmental exposure in working males, causing more vector borne tropical infections such as dengue, malaria, scrub typhus and undiagnosed febrile illnesses-in them with ALI/ARDS as a complication.

ETIOLOGICAL FACTORS FOR ARDS

The most common etiological factor found in our study was sepsis 45% based on the sepsis definition. 14 cases of dengue, 16 of primary pulmonary infection and 10 of undiagnosed acute febrile illness were seen. Scrub typhus, Chikungunya, abdominal surgery and pancreatitis was seen 2 cases each. 1 each cases of snakebite, drowning, polytrauma and complicated malaria. Hence the presence of sepsis was one of the most important aspect of the outcomes in patients presenting with ARDS (*P*=<0.01).

In study by Gupta *et al.* [7] showed Sepsis (28.6%), followed by malaria (21.4%), and were the commonest risk factors. Bhagade *et al.* [10] found in his study found malaria (27.6%), leptospirosis (20.7%), malaria with dengue (5.2%), and undiagnosed fever (27.6%), while pneumonia (13.8%), urinary tract infections (3.4%) and pancreatitis (1.7%) contributing to the remaining.

In an analysis of 160 deceased patients in Mumbai, due to monsoon-related illnesses in September 2008, Bajpai *et al.* [12] noticed a male:female ratio of 4:1 with a mortality of 22% due to malaria, 22% due to leptospirosis, and 54% due to undiagnosed fevers. A three and half year retrospective study of 98 patients died of ARDS at Apollo Hospital during January 1999 to June 2002, Dr. Avanti Vigga and Dr. S. Mantri [11] found that the primary pulmonary infection was associated with ARDS in 25% of patients and sepsis was a significant risk factor. Polytrauma (12 patients), postabdominal surgery, and pancreatitis (10 patients each) were other etiologies.

Pepe *et al.* [13], Fowler *et al.* [14]. Have documented sepsis as a major etiological and prognostic factor, ranging from 38% to 75% of the cases

Table-3: Clinical characteristics of patients with ARDS-comparison between non survivors and survivors

Variable	Non-survivors (n=61)	Survivors (n=39)	P-value
Age	43.7 ± 15.6	43.9 ± 16	>0.05
APACHE III	94.1± 19.8	53.6±14.5	< 0.001
PaO2/FiO2 admission	75.9 ± 36.4	109 ± 35.5	< 0.01
Duration of mechanical ventilator	3.6 ± 2.3	5.7± 4.2	>0.05
Duration of hospital stay	4.4±2.9	11.6±5.8	<0.05

Similar to our study Gupta *et al.* [7] has compared between survivors and non survivors. He found significant difference among non survivors with higher APACHE III score (98.9±35.6). They also found significance in SAPS II score, lung injury score. The PaO2/FiO2 at admission for non survivors was 110±32.1 which was comparable with our study.

Hence lower PaO2/FiO2 at admission, higher SAPS II, APACHE III are associated with significant mortality.

Table-4: Univariate analysis of factors influencing mortality

Variable	No of patients died/identified with this condition	Relative risk	P-value
Age> 50	18/35	0.5	0.33
Comorbidities	26/44	0.8	0.72
ETIOLOGY:-			
Sepsis	30/45	1.5	<0.01
Dengue	9/11	2.1	0.28
Scrub typhus	4/4	-	0.10
Malaria	2/2	-	0.25
Pulmonary infection	2/17	0.05	0.004
others	2/5	0.4	0.32
Non infective	12/16	2.1	0.21

Gupta *et al*. [7] compared factors influencing mortality in patients with ARDS. Significant p value was obtained in sepsis group. The other etiological factors like malaria, aspiration and pneumonia did not show any significance among survivors and non survivors.

In our by study >3 organs was involved with significant mortality similar to the study by Gupta *et al*. we also found significant mortality in patients with admission hypotension and with lower platelets which was not found in other studies. We believe that hypotension and sepsis are individual predictors of mortality.

In our study acidosis was present in 56 % of patients with a mortality of 86%. Therefore, acidosis was an individual predictor of mortality. Mean hemoglobin in this study was 8.66 mg/dl, which was not significant as a mortality predictor. Thrombocytopenia (platelet count <1 lakh per cumm) was present in 70% patients with mortality of 60 %.

In Bhagade *et al*. study acidosis was present in 63.8% of patients (37 out of 58 patients), with a mortality of 70.2%. Thrombocytopenia (platelet count was present in 81% (47) patients with PaO_2/FiO_2 <200, out of which 41% (24) patients expired; however, there was no correlation with development of ARDS. Renal failure was observed in 22 patients, of which 14 (63.6 %) expired, as compared with 28 patients without renal involvement, out of which 15 (53.5%) patients expired. In this study, 14 patients (70 %) out of 20 with hypotension expired, as compared to 15 patients out of 30 (50%), without hypotension. Hepatic involvement was present in 38 patients out of whom 23 expired (60.5%).

Table-5: Mortality comparison

STUDY	MORTALITY	STUDY PERIOD
Bhagade *et al*.	57% (33/58)	1 year
Elisa Esternssoro	58% (126/217)	1year
Gupta *et al.*	42.9%	2 years
Present study	61%(61/100)	1 year

The mortality in present study inspite of the best of efforts and treatment was 61%. This was comparable with other studies from India.

LIMITATIONS OF THE STUDY

Pulmonary capillary wedge pressure could not be assessed. Incidence of present study may not reflect the exact incidence due to limited resources. There is a possibility of inadvertent selection bias. Due to limited availability of intensive care beds the sample size of the current study was less.

CONCLUSION

Sepsis is associated with very poor outcome and dengue was important risk factor. Dengue and pulmonary infection were identifiable etiological factors. Age> 50 years, comorbid illness associated with increased mortality Low PaO2/FiO2 ratio at admission and higher APACHE II and APACHE III score significantly increases the risk of mortality. Sepsis, hypotension and multiorgan failure were individual predictors of mortality. The mortality of present study was 61%.

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