Scholars Journal of Applied Medical Sciences (SJAMS) **ISSN 2320-6691 (Online)**
Sch. J. App. Med. Sci., 2016; 4(2B):438-441 **ISSN 2347-954X (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com DOI: 10.36347/sjams.2016.v04i02.026

Original Research Article

Different Shades of Acute Respiratory Distress Syndrome

Anand Verma[1], Yogesh Ajnar[2], Vinod Porwal[3], Ashwin Porwal[4]

[1]Associate Professor, Department of Medicine, Sri Aurobindo Medical College and Post Graduate Institute, Indore, India

[2]Junior Resident, Department of Medicine, Sri Aurobindo Medical College and Post Graduate Institute, Indore, India

[3]Associate Professor, Department of Medicine, Sri Aurobindo Medical College and Post Graduate Institute, Indore, India

[4]Junior Resident, Department of Medicine, Sri Aurobindo Medical College and Post Graduate Institute, Indore, India

***Corresponding author**
Dr. Yogesh Ajnar
Email: yogeshajnar@yahoo.co.in

Abstract: This observational study was planned to identify the major etiological factors associated with ARDS. A total of 40 patients admitted in Intensive care unit of Sri Aurobindo Medical College and PG institute, Indore and developed ARDS were recruited for the study. A detailed pre structure proforma was filled for each patient at the time of discharge. Infection was the main cause of ARDS in present study in the form on Sepsis(17), Pulmonary Infection(9) and H1N1 infection(8). 17 patients were died during the hospital stay. There was no significant association of etiology of ARDS and mortality. Candida and gram negative bacilli bacteria was the commonest organism identified in culture. No significant association of mortality was observed with Positive end-expiratory pressure (PEEP) and $PaO2/FiO_2$. ARDS is mainly caused due to the infection.
Keywords: ARDS, sepsis, pulmonary infections.

INTRODUCTION

The name acute respiratory distress syndrome for such clinical scenarios was established for the first time in the year 1967 but it had been documented and possibly to some extent described prior to the 20th century. Over the last century the nomenclature for ARDS has passed through various changes which include: shock lung, wet lung, DaNang lung, fat embolism, congestive atelectasis, oxygen toxicity, stiff lung syndrome, white lung syndrome, and pump lung, to mention a few [1, 2, 3].

During the last two decades the incidence of ARDS has been reported to be as low as 1.5 to 3.5 cases or as high as 75 cases per 100,000 populations per year by various study groups [4, 5]. This is partly due to differing diagnostic criteria as well as the lack of consistent definitions. To bring uniformities and consistency in the research work, the American-European Consensus Conference (AECC) on ARDS convened in 1994 to establish a uniform definition and criteria for diagnosis of acute lung injury (ALI) and ARDS and concluded that the condition should be referred to as acute, not adult, respiratory distress syndrome, due to its occurrence in children as well [6]. ARDS is a huge burden on medical facilities the world over as on an average the patients spend 20 days on the ventilator , 22 days in the intensive care unit (ICU), and 32 days in the hospital and there are heavy charges incurred during hospitalization [7]. There are very few studies on the pattern of ARDS seen in our country. Though there are anecdotal reports of ARDS in Indian literature associated with different tropical diseases [8, 9, 10, 11] and certain rare metabolic disorders [12]. The exact association of these life threatening disorders with ARDS is not clearly described .The incidence of ARDS in the at-risk populations is not certain, but prospective global estimates range from 1.5 to 12.9 cases per 100000 people per year depending on the diagnostic criteria [13].

The major categories of ARDS risk / etiology discussed by the AECC(American European consensus conference) subcommittee were as follows: Aspiration, Diffuse pulmonary infection (e.g., bacterial, viral, Pneumocystis infection,), Near-drowning, Toxic inhalation, Lung contusion, Sepsis syndrome, Severe

non-thoracic trauma, Hypertransfusion for emergency resuscitation, Cardiopulmonary bypass (rare).

The aim of present study is to identify the major etiological factor of ARDS.

MATERIAL AND METHODS

Patients diagnosed with ARDS in the Intensive care unit of Sri Aurobindo Medical College & Post Graduate Institute Indore included in the study. All patients fulfilling the Berlin modification of AECC definition of ARDS included in the study. A detailed history was noted and a physical examination was performed on all patients. Patients with ALI/ARDS were identified based on history, physical examination, chestradiography, and arterial blood gas analysis. All patients had central venous pressure monitoring at admission and echocardiography was performed in all patients during their ICU stay to rule out cardiogenic causes of respiratory distress. Statistical analysis was done using Graphpad (Demo version) Software.

RESULTS

A total of 40 (17 male and 23 female) patients that met the Berlin definition of ARDS were studied. The mean age was 42.00 ± 16.65 years. The mean hospital stay in days was 9.28 ± 9.00 days.

This study show 42.5% patients who had sepsis, 22.5% had pulmonary infection, 20% patients had H1N1 infection(Table 1). Among the comorbidities cardio vascular disorder and hypertension was observed in 8 (20%) patients each, 5 patients had respiratory disorder and 3 patients had diabetes.

Blood transfusion was required in 16 (40%) of the patients and rest 24 (60%) patients did not require any blood transfusion.

Culture was not done in 16 (40%) of the patients. Cultures showed no growth in 32.5% of the patients. 12.5% each had candida and gram negative bacilli, 5% had *Pseudomonas Aeruginosa*, while the rest 2.5% each had *Klebsiella pneumonia, Micrococcus luteus, Enterococcus faecium, Staphylococcus hominis, E. coli and Staphylococcus aureus*(table 2). In 6 patients , 2 or more organism were identified. Bacterial or viral pneumonia was the most common cause of ARDS.

Of the 40 patients in our study, 17 (42.5%) had expired, while 23 (57.5%) had survived. No significant association was observed between survival status and organism identified in culture (p =0.439) .Our study did not show any statistically significant association between etiology and mortality(p =0.654).

Positive end-expiratory pressure (PEEP) value for survived patients (6.83 ± 1.99) was almost similar to that of death cases (7.29 ± 1.83)(P=0.760).The mean PaO2/FiO2 value for survived patients was 230.56 ± 44.83, while in the death cases it was 217.92 ± 67.55. There was no significant difference in mean PaO2/FiO2 in between two groups(p= 0.711).

Table- 1: Distribution of patients according to etiology

Etiology	Survival Status		
	Death	Survived	Total
Acute pancreatitis	1	0	1
Complicated malaria	1	1	2
H1N1 infection	5	3	8
Pulmonary infection	3	6	9
Sepsis	6	11	17
Transfusion related ALI	0	1	1
Trauma	1	1	2
Total	17	23	40

Table-2: Distribution of patients according to organism

Organism	Survival Status		
	Death	Survived	Total
Not done	9	7	16
No growth	4	9	13
Candida	2	3	5
Gram negative bacilli	2	2	4
Pseudomonas aeruginosa	0	2	2
Klebsiellapneumoniae	0	2	2
E. coli	0	1	1
Enterococcus faecium	1	0	1
Micrococcus luteus	0	1	1
Staphylococcus aureus	1	0	1
Staphylococcus hominis	0	1	1
Total	19	28	47

DISCUSSION

Our study had focused on the etiology of ARDS. Longitudinal epidemiologic studies have shown consistent differences in mortality amongst ARDS patients as a group. Males with ARDS have a persistently higher mortality rate than females with ARDS. Data would also suggest that African-American males with ARDS have a higher mortality rate than males of other racial backgrounds. Similarly, females of African-American race have a higher ARDS mortality rate than females of other racial backgrounds[14].

This study show 42.5% patients who had sepsis, 22.5% had pulmonary infection, 20% patients had H1N1 infection. Bakowitz *et al.* found that in patients developing ARDS, the rate of pneumonia approached 50% with crude mortality of 19%. Patients spent on average 20 days on the ventilator, 22 days in the ICU, and 32 days in the hospital[15].

A 2006 retrospective review of trauma ICU data at the University of Southern California showed an overall complication rate of 43% in patients with ARDS. Complications included pneumonia, DVT, pulmonary embolism, ARF, and DIC. Evidence clearly illustrates that early transfusion of packed red blood cells (PRBCs) is an independent predictor of ARDS and increases with increasing units of transfused blood [16,17]. Fresh frozen plasma (FFP) has also been independently associated with a greater risk of developing ARDS, whereas platelets and cryoprecipitate were not[18]. Pre-storage leukoreduction has been attempted in an effort to minimize the pro-inflammatory effects of residual leukocyte contamination of stored PRBCs, with the hopes of decreasing post-transfusion ARDS rates. However, randomized controlled trials have failed to show any difference in the risk of ALI or ARDS in patients receiving leukoreduced versus standard PRBCs at 28 days[19].

Cultures showed no growth in 32.5% of the patients, 12.5% each had candida and gram negative bacilli, 5% had pseudomonas aeruginosa, while the rest 2.5% each had *Klebsiella pneumonia, Micrococcus luteus, enterococcus faecium, Staphylococcus hominies, E. coli* and *Staphylococcus aureus*. Bacterial or viral pneumonia is the most common cause of ARDS.

Sepsis due to non-pulmonary infections, aspiration of gastric contents, and major trauma with shock also commonly precipitate the injury. Less commonly, acute pancreatitis, transfusions, drug reactions, and fungal and parasitic lung infections are linked to ALI and ARDS. A study conducted by Vigg *et al*[20] shows that with Primary pulmonary infection being the most common etiology of ARDS.

No statistically significant association between etiology and mortality was observed in present study. There (42.5%) patients who had sepsis, (22.5%) had pulmonary infection, (20%) patients had H1N1 infection, (5%) had complicated malaria, (5%) had trauma, (2.5%) each had TRALI and acute pancreatitis. Majority of the patients had etiology of sepsis, pulmonary infection or H1N1 infection. No association could be established between survival status and organism. Survival status was independent of the organism seen on culture.

A total of 42.5% patients expired in this study. our study is similar to study done in Spain which shows that despite use of lung-protective ventilation, overall ICU and hospital mortality of ARDS patients was higher than 40%[21]. ICU mortality rates ranged between 33 and 55% among participating centers in the ALIEN study.

Phua *et al*. [22] found that the pooled mortality for ARDS from 1994 to 2006 was 44%. They also found that the definition of ARDS was not an independent predictor of mortality and that this mortality rate is consistently higher than that reported in randomized control trials 105.In a review published of 101 cases of ARDS the average mortality was 50 %, with reported mortality varying from 30 to 70 %[23]. A study conducted in North India noted a mortality rate of 47.8%[24]. The group of patients, who developed ARDS due to sepsis, had a significantly higher mortality when compared to the group in whom the etiology factors other than sepsis[24].

In the patients who survived, 13.0% patients had a hospital stay of 1-3 days, 39.1% had a hospital stay of 4-7 days, 34.8% patients had a hospital stay of 7-14 days, 8.7% patients had a hospital stay of 14-21 days and 4.3% patients had a hospital stay of more than 21 days. Most of the patients had a hospital stay of 1-14 days in our study. No association could be established between survival status and etiology. Survival status is independent of the etiology (p-0.654) and so is duration of hospital stay (p-0.223).

In analysis performed by Kraft *et al*[25] showed that statistical comparisons of the PaO2/ FiO2 ratio of survivors and non survivors were not significant on the ARDS. In our study $PaO2/FiO_2$ ratio in both the survived and death are comparable (P=0.481) and statistically not significant.

In conclusion sepsis and pulmonary infections are the major cause of ARDS

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