

An observational prospective study to detect the role of leptospirosis and malaria in etiopathogenesis of ARDS/ALI

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Abstract

Background: Acute respiratory distress syndrome (ARDS) is common outcome in patients with critical underlying diseases. The mortality rates of ARDS/ALI are generally reported to exceed 50% and range from 10 to 90%. Tropical disease like leptospirosis, dengue and malaria play role in the etiopathogenesis of ALI/ARDS.

Methodology: It was an observational prospective study to detect the role of tropical diseases in etiopathogenesis of ARDS/ALI. Patients with diagnosis of ARDS/ALI having age more than 12 years and given written and informed consent were recruited in the study.

Results: 37 cases of ARDS/ALI were enrolled in this observational prospective study. 3/4th patients were suffering from ALI and 1/4th patients were suffering from ARDS. Dyspnea and fever were common finding in these patients. Almost all patients had dyspnea and half of the patients had fever and almost 30% of the patients had hemoptysis.

Conclusions: Leptospirosis play significant etiological role lead to ARDS/ALI and malaria is another tropical disease responsible for the same.

Keywords: ARDS; ALI; Leptospirosis; Malaria.

Introduction

Acute respiratory distress syndrome (ARDS) is common outcome in patients with critical underlying diseases. Acute inflammatory reaction in the lung which causes injury to the endothelial cells and alveolar epithelium are main pathological changes that may occur in ARDS. This leads to pulmonary edema which eventually causes respiratory failure in these patients.¹ Patients presents with tachypnea, dyspnea and hypoxemia and reduction in pulmonary compliance. Chest radiograph show bilateral diffuse infiltrates [1,2]. Disease with lesser severity is known as acute lung injury (ALI). Mortality rate corresponds to the severity of underlying disease and it ranges from 10% to 90% [2-5].

Pneumonia, septicemia, major trauma, injury to lungs and tropical diseases are common causes of ARDS [6]. Tropical diseases having high prevalence in India. Tropical disease like leptospirosis, dengue and malaria have significant role in the etiopathogenesis of ALI/ARDS and provide another dimension in the prevention and management of it. In 20% to 70% cases of leptospirosis alveolar epithelium and endothelial cells of lungs are affected. In severe cases patients develop ARDS and sometimes it lead to multi organ failure [7,8]. ALI/ARDS develop in both complicated (20-30%) and uncomplicated (5%) falciparum malaria and malaria cause by *P. vivax* and *P. ovale*. But the incidence is higher in patients with falciparum malaria [9,10]. The prognosis and initial assessment in ALI/ARDS patients due to these diseases are not well studied as compared to the other etiologies of ALI/ARDS.

The newer modalities of treatment aim at providing improving gas exchange and preventing structural lung injury due to the ventilator. These include the use low tidal volumes, the application of high levels of positive end-expiratory pressure (PEEP), cyclic prone positioning, permissive hypercapnia and nitric oxide inhalation. Other measures

include surfactant therapy, liquid ventilation, extra corporeal membrane oxygenation (ECMO). All these treatment modalities aim at not only to reduce the mortality but also the long-term effects of mechanical ventilation in survivors [2-5]. So this study was planned to find out the etiological role of tropical diseases in ARDS and to evaluate different treatment modalities in its management.

Material and Methods

This was a prospective cohort (analytical epidemiology) study conducted in compliance with the protocol, after Institutional Ethics Committee (IEC) approval, informed consent regulations, as per Declaration of Helsinki and the ICMR guidelines for Biomedical Research on Human Subjects. All the survived cases of ARDS/ALI attending tertiary health care center in the year of 2008 were enroll in the study. All patients were screened for the diagnostic criteria of ARDS according to American European consensus definition (1994). Patients with diagnosis of ARDS/ALI having age more than 12 years and willing to take part in the study and given consent were recruited. Patients having contraindication for Pulmonary function test, history of recent myocardial infarction and active hemoptysis were not included in the study. All patients willing to participate and give an informed consent were screened for eligibility. Baseline evaluation included recording of demographic details, medical history, general and systemic examination, and laboratory investigations, which included complete haemogram, PFT (using Jaeger PFT machine), DLCO and chest X-ray. Further investigations were peripheral smear for malaria and tri-dot test for leptospirosis.

Objectives of the study were

1. To find out the different risk factors leads to ALI/ARDS.
2. To detect the role of tropical disease in etio-pathogenesis of ALI/ARDS.

3. To evaluate the different management options in patients with ALI/ARDS.

The data was entered into Microsoft Excel from case record form for analysis and data analyzed by SPSS 14 statistics programmer.

Results

37 cases of ARDS/ALI were enrolled in this observational prospective study. 3/4th patients were suffering from ALI and 1/4th patients were suffering from ARDS (Table 1). Dyspnea and fever were common finding in these patients. Almost all patients had dyspnea and half of the patients had fever and almost 30% of the patients had hemoptysis (Table 2). 59.45% patients had leptospirosis and 13.51% patients had mixed infections. Salmonella typhi and malaria were present in 8.1% and 5.4% of patients respectively (Table 3).

Table 1: Demographic details of patients

Total no of patients with ARDS/ALI			
S.No		Frequency	Percentage
1.	ARDS	9	24.3
2.	ALI	28	75.7
Total		37	100
Age distribution (in Years)			
S.No	Age of patients	Frequency	Percentage
1.	Below 25	20	54.05
2.	26-35	9	24.32
3.	36-45	4	10.8
4.	46-55	3	8.1
5.	56-65	1	2.7
Total		37	100
Sex distribution			
S.No	Gender of patients	Frequency	Percentage
1.	Female	12	32.4
2.	Male	25	67.6
Total		37	100

Table 2: Clinical features in Patients with ADS/ALI

Fever			
S. No	Fever duration in days	Frequency	Percent
1.	<2	3	8.1
2.	2 to 4	17	45.9
3.	>4	17	45.9
Total		37	100
Hemoptysis			
S. No	Presence of hemoptysis	Frequency	Percent
1.	Yes	11	29.7
2.	No	26	70.3
Total		37	100
Pallor			
S. No	Presence of pallor	Frequency	Percent
1.	Yes	13	35.1
2.	No	24	64.9

Total		37	100
Icterus			
S. No	Presence of icterus	Frequency	Percent
1.	Yes	9	24.3
2.	No	28	75.7
Total		37	100
Petechiae			
S. No	Presence of petechiae	Frequency	Percent
1.	Yes	14	37.8
2.	No	23	62.2
Total		37	100

Table 3: Various infections in ARDS/ALI Patients

S. No	Type of infection	Frequency	Percent
1.	Dengue	1	2.7
2.	Dengue & Leptospirosis	2	5.4
3.	Influenza	1	2.7
4.	Leptospirosis	22	59.5
5.	P. Falciparum & Leptospirosis	1	2.7
6.	P. Falciparum	1	2.7
7.	P. Vivax	1	2.7
8.	P. Vivax, P. Falciparum & Leptospirosis	1	2.7
9.	Widal test	3	8.1
10.	Widal test & P. Falciparum	1	2.7
11.	Unknown	3	8.1
Total		37	100

Table 4: Type of ventilation

S. No	Type of Ventilation	Frequency	Percent
1.	Venturi mask	5	13.5
2.	NIV	20	54.1
3.	Intensive	12	32.4
Total		37	100

Table 5: PFT at discharge

S. No	PFT at Discharge	Frequency	Percent
1.	Mid restriction	2	5.4
2.	Normal	35	94.6
Total		37	100

Table 6: DLCO at discharge

S. No	DLCO at discharge:	Frequency	Percent
1.	Low DLCO	21	56.8
2.	Normal DLCO	16	43.2
Total		37	100

Discussion

ARDS is a manifestation of increased micro vascular permeability localized to the lung and it is a part of a generalized inflammatory disorder [11-13]. An increase in vascular permeability and subsequent interstitial and air space edema are initially major consequences of the acute inflammatory response, the injury involves severe damage to

endothelial cells in multiple organs especially in the setting of sepsis and trauma [13,14]. The data from previous studies identified sepsis as the most common risk factor developing ARDS, followed by aspiration pneumonia, pneumonia, trauma, and multiple transfusions.

It observed that infectious diseases were the main risk factor leads to ARDS/ALI. The common risk factor were leptospirosis 59.45%, mixed infections that is patient having more than one infection and it account for more than 10% cases. *S. typhi* and malaria were other important infections causing ALI/ARDS. Malaria as a single infection responsible for 5.4% cases.

In the study by Vigg et al.,[15] the common risk factors for ALI/ARDS were pneumonia (30%), recent surgery in abdomen (10%), septicemia with MOF (18%), and trauma (12%). Other significant causes were pancreatitis, thermal burns > 40% (6%), peritonitis, falciparum malaria and poisoning. Similar findings were also find in the studies by Zilberberg et al.,[16] and Jerng et al [17].

When we compare the risk factors in our study with other studies a certain differences were noticed. Because in our tertiary health care center patients usually came for the acute febrile illnesses and mainly due to seasonal diseases. The data of different studies were mainly came from western side of world having different set of etiology.

Basic pathological change which leads to ALI/ARDS in leptospirosis is alveolar hemorrhage. Respiratory dysfunction present in both anicteric and icteric cases of leptospirosis. Patients usually presented with breathlessness, cough, chest pain and hemoptysis [18-22]. Presence of dyspnea, pulmonary hemorrhage and alveolar infiltrates on chest X-ray indicate the chances of poor prognosis [20,23].

Patients with falciparum malaria can suffer from ALI/ARDS anytime irrespective of the duration of disease. *P. vivax* and *P. ovale* also causes pulmonary dysfunction but less frequent than in falciparum malaria [9,10]. The main pathological changes that occur in malaria and lead to ALI/ARDS are alteration in alveolar permeability, obstruction to airflow, disturbed ventilation, decrease in gas transfer, and enhanced pulmonary phagocytic activity [10].

Duration of cough related with the outcome of disease. Prognosis was better in patients with duration of cough less than 10 days. At the time of discharge pulmonary function test in patient show 56.75% had low, 40.54% had normal and 2.7% had raised DLCO. Anemia and thrombocytopenia were common finding. Systemic abnormalities were found in majority of cases in the form of hematological, renal and liver dysfunction. These finding in our study show similar pattern as in the study carried out by Zilberberg et al. [16].

86.5% patients managed with mechanical ventilation from which 54.1% required non-invasive ventilation. 32.4% managed with invasive ventilation using ACMV (assist control mechanical ventilation) of control mode and a lung protective strategy with tidal volume of 6ml/kg was given and PEEP whenever needed. Venture mask were used to supply oxygen in 13.5% patients.

Conclusions

Leptospirosis play significant role in etiopathogenesis of ARDS/ALI and both icteric and anicteric form of disease leads to it. Malaria is another tropical disease which leads to ARDS/ALI and it can develop more commonly in falciparum malaria than other type of malaria.

Conflict of interests: None declared.

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