European Journal of Molecular & Clinical Medicine

ISSN 2515-8260 Volume 09, Issue 03, 2022

ORIGINAL RESEARCH

A Hospital Based Observational Study to Assess the Clinic-Etiological Profile and Prognostic Indicators in Critically Ill Patients who Develop Acute Respiratory Distress Syndrome (ARDS) in Medical Intensive Care Unit

[1]Suman, [2]V.B. Singh, [3]Deepak Kumar

[1]Senior Resident, Department of Anaesthesia, PDU Medical College, Churu, Rajasthan, India
[2]Senior Professor, Principal& Controller, Department of Medicine, JLN Medical College, Ajmer, Rajasthan, India
[3]Assistant Professor, Department of Medicine, PDU Medical College, Churu, Rajasthan, India

Correspondence:
Deepak Kumar
Assistant Professor, Department of Medicine, PDU Medical College, Churu, Rajasthan, India
Email: dr.deepak.2786@gmail.com

ABSTRACT

Background: Aspiration pneumonia and pneumonia are the most common cause of ARDS in direct lung injury whereas sepsis is the most common cause of ARDS in Indirect lung injury. The aim of this study to assess the clinic-etiological profile and prognostic indicators in critically ill patients who develop acute respiratory distress syndrome (ARDS) in medical intensive care unit.

Materials& Methods: A hospital based prospective study done on 50 ARDS patients those were admitted in the medical ICU over a period of one year at SMS Medical College, Jaipur, Rajasthan, India. Baseline characteristics including comorbidities, routine investigations, initial SOFA Scores & APACHE II (Acute Physiology & Chronic Health Evaluation) score was evaluated. Descriptive & Statistical analysis and interpretation of the data collected is done by using SPSS version 22.0 with mean and standard deviations computed.

Results: Among 50 patients, 27 patients represent the male group and 23 patients represent the female group. Diabetes mellitus (36%) and SHT (20%) having a higher prevalence. Breathlessness and fever were the most common symptoms. Gender comparison of mean Fio2/Pao2 ratio, MAP, Initial SOFA and APACHE II scores are shown in table 4 showing a higher Fio2 requirement in female group when compared to the male group and more or less equal with the remaining variables. The mean duration of hospital stay was longer in the female group when compared to the male group (table 4). The mortality rate in our study was 16.0% (8 patients).

Conclusion: The incidence of ARDS studies in India are very few and lacking. Early identification and etiology work up for ARDS with timely administration of antibiotics/ antivirals or antimalarial drugs is necessary for the improvement in survival rates in view of increased morbidity and mortality associated with ARDS.

Keywords: Clinic-Etiological Profile, Prognostic Indicators, Acute Respiratory Distress Syndrome (ARDS), Intensive Care Unit.

INTRODUCTION

ARDS is associated with high mortality and timely management of a critical team in the aspect of intensive invasive monitoring, sepsis control, requirement of ventilator support like prone ventilation sometimes is beneficial and can improve the patient outcome.[1]

Aspiration pneumonia and pneumonia are the most common cause of ARDS in direct lung injury whereas sepsis is the most common cause of ARDS in Indirect lung injury. Malaria, dengue, leptospirosis are some other causes of ARDS due to infections in the tropical region.[2,3]

ARDS is a progressive inflammatory lung injury in patients with hypoxemic respiratory failure. Patients are detected by acute respiratory failure refractory to oxygen supply, bilateral lung infiltrates with decreased lung compliance in absence of cardiac failure according to the American –European Consensus Conference.[4] ALI/ARDS results from various direct/ indirect lung injuries and have a high mortality rate. Northern, South and Western parts of India have mortality rates of 47.8%, 36.6% and 57% accordingly.[5]

ARDS involves a complex and combined reaction of local and systemic factors. Diffuse alveolar damage consists of endothelial injury and neutrophilic activation causing non - cardiogenic pulmonary oedema and atelectasis.[6]

The main differential diagnosis of ARDS include cardiogenic pulmonary oedema, acute eosinophilic pneumonia and acute interstitial pneumonia sometimes make it undifferentiated from ARDS mimicking condition such as acute cryptogenic pneumonia which is usually uncommon. Extra pulmonary ARDS causes are also co-existent which are diverse in nature and presents during the onset of illness.[7]

Non -invasive ventilation is successful in most of the patients of ARDS and may or may not require depending on the clinical or lab results.[8] The aim of this study to assessed the clinic-etiological profile and prognostic indicators in critically ill patients who develop acute respiratory distress syndrome (ARDS) in medical intensive care unit.

MATERIALS & METHODS

A hospital based prospective study done on 50 ARDS patients those were admitted in the medical ICU over a period of one year at SMS Medical College, Jaipur, Rajasthan, India.

INCLUSION CRITERIA

1. Patients fulfilling the American-European Consensus Conference criteria for Acute Respiratory Distress Syndrome
- Acute onset of bilateral infiltrates on chest X ray.
- PaO2 / FiO2 < 200.
- No Left Ventricular dysfunction ruled out by Echocardiograph.

2. Mechanically ventilated patients > 48 Hours.
3. Patients age >20 years.

EXCLUSION CRITERIA

- Patients < 20 years of age.
- Trauma and burns.
- Known previous lung pathology.

METHODOLOGY

Patients fulfilling the AECC (American-European Consensus Conference) criteria were selected. History, physical examination, chest radiographs and arterial blood gas analysis will be collected along with echocardiography.

SEVERITY SCORES

The data collected was used to calculate the severity scores. The severity scores used in our study were as follows:

1. Acute Physiology and Chronic Health Evaluation (APACHE) II
2. APACHE III.
3. Sequential Organ Failure Assessment score (SOFA).

- APACHE II: APACHE II is a point score system based on the initial values of 12 routine physiologic measurements along with age and chronic health points. It provides a general measure of severity of disease and is used in the assessment of critically ill
- APACHE III: APACHE III scoring system uses 17 physiological and biochemical parameters along with age and comorbidities to assess the severity of the disease. The score can be used for predicting the risk of hospital mortality in critically ill patients
- SOFA score: The SOFA score is a simple and effective method to describe organ failure in critically ill patients. Regular scoring enables the clinician to assess patient condition and response to treatment.

STATISTICAL ANALYSIS

Baseline characteristics including comorbidities, routine investigations, initial SOFA Scores & APACHE II (Acute Physiology & Chronic Health Evaluation) documentation in Microsoft excel sheet. Descriptive & Statistical analysis and interpretation of the data collected is done by using SPSS version 22.0 with mean and standard deviations computed.

RESULTS

In this study about 50 patients were admitted with ARDS and classified based on American European Consensus Criteria Conference based on the inclusion and exclusion criteria. Among 50 patients, 27 patients represent the male group and 23 patients represent the female group. Diabetes mellitus (36%) and SHT (20%) having a higher prevalence. Breathlessness and fever were the most common symptoms (table 1).

Table 1: Characteristics of patients

Characteristics	No. of patients (N=50)	Percentage
Sex		
Male	27	54%
Female	23	46%
Co morbidities		
Diabetes mellitus	18	36%
SHT	10	20%
Thyroid disorder	5	10%
Seizure disorder	2	4%
Malignancy	3	6%
Smoking	1	2%
Alcohol	4	8%
Tobacco chewing	7	14%
Presenting complain		
Breathlessness	47	94%
Fever	43	86%
Cough	27	54%
Others	18	36%

Majority of the cases in this study were of infective origin (47 /50). Infective etiology with H1N1 infection with 18 patients, culture positive organisms in 16 patients, dengue infection in 8 patients and scrub typhus infection in 5 patients (table 2,3).

Table 2: Etiology of patients

Etiology		No. of patients (N=50)	Percentage
Infective	**Dengue**	8	16%
	H1N1	18	36%
	Scrub typhus	5	10%
	Culture positive	16	32%
Non-infective		3	6%

Table 3: Direct and indirect causes of lung injury

Causes		No. of patients (N=50)	Percentage
DIRECT INJURY			
Dengue		8	16%
H1N1		18	36%
Scrub typhus		5	10%
Candida		2	4%
Hospital acquired pneumonia	**Acinetobacter Baumanni**	5	10%
	K. Pneumoniae	8	16%
	P. Aeuroginosa, K. Pneumoniae	1	2%
INDIRECT INJURY			
Sepsis	**E. coli**	2	4%
	Enterococcus Faecium	2	4%
	K. Pneumoniae	6	12%
	Staph, Enterococcus Faecium	2	4%

Gender comparison of mean Fio2/Pao2 ratio, MAP, Initial SOFA and APACHE II scores are shown in table 4 showing a higher Fio2 requirement in female group when compared to the male group and more or less equal with the remaining variables. The mean duration of hospital stay was longer in the female group when compared to the male group (table 4).

Table 4: The comparison of mean value of severity scores in male and female

Severity scores	Male (N=27)	Female (N=23)	P-value
Fio_2/PAo_2 ratio	92.33±8.92	101.54±7.86	<0.05*
Mean Arterial pressure (MAP)	76.82±6.48	74.63±5.73	>0.05
Initial SOFA Score	8.66±1.24	8.43±1.12	>0.05
Initial APACHE II Score	17.28±2.56	14.35±2.73	>0.05
Duration of Hospital stay (Days)	14.23±2.27	17.57±2.92	>0.05

The mortality rate in our study was 16.0% (8 patients) (table 5).

Table 5: Outcome

Outcome	No. of patients (N=50)	Percentage
Death	8	16%
AMA	8	16%
Improved	34	68%

DISCUSSION

Majority of ARDS cases greater than 80% are caused by severe sepsis syndrome, bacterial pneumonia about 50 percent, trauma, aspiration of gastric contents, multiple transfusions and drug overdose. Surgical causes of ARDS are pulmonary contusions, multiple bone fractures, flail chest. Other uncommon causes are head injury, near drowning, toxic inhalation and

burns. Direct causes of ARDS are primary from lung origin, examples – viral pneumonia or aspiration of gastric contents. Indirect causes of ARDS are sepsis, ingested toxins, hypotension.

In this study conducted with 50 patients, 27 patients were male and 23 were female. One such study conducted in Vanderbill university medical centre, Nashville showed predominance in male group of about 75% in that study. Gender categorization were taken into account for immunologic variation.[9] In one Indian study done by Agarwal et al during 2005[2] revealed female gender as a risk factor for mortality. In another study conducted by HUDSON et al showed no effect of gender association in patients presenting with ARDS.

In one study conducted, showed diabetes mellitus as a protective factor in development of ARDS.[10] In our study diabetes was not associated as a protective factor in the development of ARDS.

In an Egyptian study presence of hypothyroid in patients with respiratory failure was related to prolonged stay and increased period of intubation.[11] In our study 5 patients had thyroid disorders.

In another study Data from 14 ICU s were collected and showed that malignancies were associated with ARDS and 90% patients shared an infection related etiology with 1/3rd of them having fungal infections.[12]

In our study 47 of the 50 patients had an infective etiology of ARDS and the remaining 3 patients had non-infective causes.

H1N1 ARDS was seen in majority of the patients and contributed to 18 of 50 patients in the study, followed by culture positive, dengue and scrub typhus ARDS with 16, 8 and 5 patients respectively. In another ICU study a higher incidence of ARDS wasnoted in 65.4%.[13] In an Indian study of $H_1N_1$from Kumar et al in 2012 showed 32patients having ALI and ARDS.[14]

In our study there were 8 patients diagnosed as dengue related ARDS and it has a vast burden in the tropical countries with increased mortality.[15,16]

Acinetobacter Baumanni and klebsiella pneumoniae were the commonest organisms causing Hospital acquired pneumonia in our study. Escherichia coli (ESBL), enterococcus species, klebsiella pneumoniae and Acinetobacter species were the gram negative organisms causing sepsis and ARDS in our study.

The mean Fio2/Pao2 ratio, Mean arterial pressure, initial SOFA and APACHE II scores were done and categorized by gender basis. In the male group Mean Fio2/Pao2 ratio, mean arterial pressure, initial SOFA and APACHE II scores were 92.23, 77.82, 8.66, 17.28 and in the female group were 101.54, 74.63, 8.43 and 14.35 respectively. The mortality rate in our study was 16.0% (8 patients) and factors related to mortality were male gender, diabetes mellitus, H1N1 infection, severe sepsis and MODS.

CONCLUSION

The incidence of ARDS studies in India are very few and lacking. Early identification and etiology work up for ARDS with timely administration of antibiotics/ antivirals or antimalarial drugs is necessary for the improvement in survival rates in view of increased morbidity and mortality associated with ARDS.

REFERENCES

1. Singh P, Ramasethu R, Sharma A. Prone ventilation and critical care management of severe ARDS and multiorgan failure in a young patient. Medical journal, Armed Forces India. 2014 Jan;70(1):85.
2. Agarwal R, Aggarwal AN, Gupta D, Behera D, Jindal SK. Etiology and outcomes of pulmonary and extrapulmonary acute lung injury/ARDS in a respiratory ICU in North India. Chest Journal. 2006 Sep 1;130(3):724-9.

3. George T, Viswanathan S, Karnam AH, Abraham G. Etiology and outcomes of ARDS in a rural-urban fringe hospital of south India. Critical care research and practice. 2014 Feb 10:1-7.
4. Bhadade RR, De Souza RA, Harde MJ, Khot A. Clinical characteristics and outcomes of patients with acute lung injury and ARDS. Journal of postgraduate medicine. 2011 Oct 1;57(4):286.
5. Kumar SS, Chettiar KS, Nambiar R. Etiology and Outcomes of ARDS in a Resource Limited Urban Tropical Setting. Journal of the National Medical Association. 2018 Aug;110(4):352-357.
6. Johnson ER, Matthay MA. Acute lung injury: epidemiology, pathogenesis, and treatment. Journal of aerosol medicine and pulmonary drug delivery. 2010 Aug 1;23(4):243-52.
7. Ferguson ND, Fan E, Camporota L, Antonelli M, Anzueto A, Beale R, Brochard L, Brower R, Esteban A, Gattinoni L, Rhodes A. The Berlin definition of ARDS: an expanded rationale, justification, and supplementary material. Intensive care medicine. 2012 Oct 1;38(10):1573-82.
8. Sinuff T, Cook DJ, Keenan SP, Burns KE, Adhikari NK, Rocker GM, Mehta S, Kacmarek R, Eva K, Hill NS. Noninvasive ventilation for acute respiratory failure near the end of life. Critical care medicine. 2008 Mar 1;36(3):789-94.
9. Heffernan DS, Dossett LA, Lightfoot MA, Fremont RD, Ware LB, Sawyer RG, May AK. Gender and ARDS in critically injured adults: a prospective study. The Journal of trauma. 2011 Oct;71(4):878.
10. Singla A, Modrykamien AM. Diabetes Mellitus: Protective in Development of ARDS. J Pulmon Resp Med 2012;2:7.
11. Kitazawa C, Aoki S, Takahashi T, Hirahara F. Acute respiratory failure due to thyroid storm developing immediately after delivery. Clinical case reports. 2015 Dec 1;3(12):997-9.
12. Azoulay E, Lemiale V, Mokart D, Pène F, Kouatchet A, Perez P, Vincent F, Mayaux J, Benoit D, Bruneel F, Meert AP. Acute respiratory distress syndrome in patients with malignancies. Intensive care medicine. 2014 Aug 1;40(8):1106-14.
13. Van,,t Klooster TM, Wielders CC, Donker T, Isken L, Meijer A, Van den Wijngaard CC, Van der Sande MA, Van der Hoek W. Surveillance of hospitalisations for 2009 pandemic influenza A (H1N1) in the Netherlands, 5 June-31 December 2009. Euro Surveill. 2010 Jan 14;15(2):19461.
14. Kumar TC, Shivakumar NS, Deepak TS, Krishnappa R, Goutam MS, Ganigar V. H1N1-infected patients in ICU and their clinical outcome. North American journal of medical sciences. 2012 Sep;4(9):394.
15. Wang CC, Liu SF, Liao SC, Lee K, Liu JW, Lin AS, Wu CC, Chung YH, Lin MC. Acute respiratory failure in adult patients with dengue virus infection. The American journal of tropical medicine and hygiene. 2007 Jul 1;77(1):151-8.
16. Belagavi AC, Sunil HS, Sudhir U, Punith K. Adult respiratory distress syndrome in Dengue-a case report. Al Ameen Journal of Medical Science. 2011;4:405-7.