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CLINICAL PROFILE OF ARDS, PROSPECTIVE STUDY AT TERTIARY HEALTH CENTRE, KOLAR

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ABSTRACT

Background: ARDS is the most common presentation in ICU's worldwide more so in developing countries. Several studies have been published in western literature on incidence, prevalence, clinical course, outcome and mortality in patients with acute respiratory distress syndrome (ARDS). There are very few studies on the pattern of ARDS seen in Indian population. AECC criteria includes PCWP estimation, an invasive procedure for diagnosing ARDS. The aim of the current study is to evaluate the clinical profile and associated risk factors and effect of comorbid condition on ARDS using the criteria without invasive procedure. **Objectives:** 1. To study the clinical profile and in hospital outcome of acute respiratory distress syndrome (ARDS) in adult patients admitted to intensive care unit (ICU). 2. To study risk factors associated with ARDS. 3. To study the influence of co-morbid conditions on the outcome of ARDS. **Materials and Methods:** Total 50 patients aged more than 18years and who gave informed consent, satisfying AECC criteria for ARDS were included. Patients were screened for presence of left atrial hypertension both clinically and by echocardiography and were excluded in its presence.PaO2/FiO2 ratio calculated and appropriate investigations were done and statistical analysis done using SPSS software version 17.0.Means of continuous variable were compared by student t test or Mann X Whitney U test. Discrete variables were compared by chi square and Fisher exact test. **Results:** The parameters showing statistical significance with mortality in our study are pO2 (p=.034), HCO3(p=<0.001), FiO2(P=0.095), PaO2/FiO2(<0.001),PEEP(<0.001), SERUM CREATININE(P=0.035). Use of inotropes and transfusion of blood and blood products was higher in the death patients compared to recovered patients. **Conclusion:** Out of 50 patients included in our study, males are 58% and females 42%. Common age group affected is 30 and less. Causes of ARDS are Pneumonia (38.0%), Sepsis (20.0%), acute febrile illness with MODS (20.0%), Dengue (12.0%), Malaria (6.0%), Pancreatitis (2.0%) and Typhoid (2.0%). Fever and Breathlessness were the commonest presenting features. Risk factors and co-morbidities in our patients of ARDS are Diabetes, Hypertension, Smoking and alcohol, but there is no statistically significant difference on outcome. Mortality in our study is 64%.. Factors showing strong correlation with mortality on outcome of the patient are PEEP, pO2, Acidosis, Pao2/Fio2, renal failure, liver failure, use of inotropes and duration of stay.

KEYWORDS: ARDS, PaO2/FiO2, AECC criteria.

MATERIALS AND METHODS

Patients fulfilling the American-European Consensus Conference (AECC) criteria for ARDS admitted to the ICU of R.L. Jalappa Hospital and Research centre are included in the study. Study was carried out from January 2013 to August 2014.

AECC CRITERIA

1. PaO2/FiO2 $\leq$ 200 mm Hg 2. Bilateral infiltrates on Chest radiograph 3. No clinical evidence of left atrial hypertension.

Inclusion criteria a) Patients age more than 18years. b) Patients fulfilling AECC criteria for ARDS. Exclusion criteria a) Patients less than 18years of age. b) Patients who are not fulfilling the AECC criteria for ARDS. c) Cardiogenic pulmonary edema.

Patient's complete history was taken from the patient or patient's attendees and explained about the study and informed written consent was taken. Patient was examined fully and appropriate investigations like Complete haemogram, Chest X ray-Postero Anterior view, Renal function tests, Serum electrolytes, Blood

sugar level, Electocardiogram, Culture and sensitivity of sputum or tracheal tube aspirate or blood, Arterial blood gas analysis, Echocardiography(to rule out left atrial hypertension) were done.

PaO2 was taken directly from the blood gas values and FiO2 from ventilator generated value. Ratio of PaO2/FiO2 is calculated. Chest radiographs of all the patients were evaluated by experienced radiologists to assure bilateral infiltration as compliance with ARDS criteria. Cardiac function of all included patients was assessed using clinical judgment and echocardiography, and patients with no evidence of left atrial hypertension are included. Patient connected to mechanical ventilatory support and tidal volume(6ml/kg body weight) and PEEP set according to patient's need to maintain oxygen saturation(88-95%), plateau pressures(<30cmh2o) and respiratory rate (<35/min) according to standard ARDS treatment protocol.

RESULTS AND OBSERVATIONS
TABLE 1: Etiology of ARDS patients in the study

	Number of cases	%
DENGUE	6	12.0
MALARIA	3	6.0
FEBRILE ILLNESS WITH MODS	10	20.0
TYPHOID	1	2.0
PANCREATITIS	1	2.0
PNEUMONIA	19	38.0
SEPSIS	10	20.0
TOTAL	**50**	**100.0**

TABLE 2: Showing common presenting symptoms among ARDS patients in this study.

	NO		YES	
	N	%	N	%
FEVER	4	8.0%	46	92.0%
MYALGIA	29	58.0%	21	42.0%
BREATHLESSNESS	8	16.0%	42	84.0%
COUGH	18	36.0%	32	64.0%
CHESTPAIN	48	96.0%	2	4.0%
WHEEZE	48	96.0%	2	4.0%
VOMITING	43	86.0%	7	14.0%
DIARRHEA	40	80.0%	10	20.0%

TABLE 3: Descriptive statistics Among death patients

Survival Status	N	Minimum	Maximum	Mean	Std. Deviation
Age	32	18.0	85.0	46.531	18.3180
ABG:pH	32	6.480	7.480	7.17297	.189842
pCO2	32	18.0	155.8	48.972	29.4891
pO2	32	24.0	112.0	73.919	22.5189
HCO3	32	10.3	21.5	16.316	2.7261
FiO2	32	.4	1.0	.631	.1281
Tidal Volume	32	300.0	500.0	401.250	54.2247
PaO2/FiO2	32	42.00	159.00	114.5794	32.92774
Hematocrit	32	24.9	53.4	37.275	6.9989
Pulse	32	50.0	130.0	101.844	14.9582
Systolic blood pressure	32	60.00	170.00	112.5000	28.05525
Diastolic Blood pressure	32	40.00	110.00	72.8125	16.70124
WBC	32	3200.0	30300.0	13793.750	7375.4579
Platelet	32	5000.0	384000.0	144625.000	128575.0064
Serum creatinine	32	.50	8.10	2.3891	1.82628
Serum Bilirubin	32	.20	4.20	1.3131	1.40010

TABLE 4: Descriptive statistics Among recovered patients

Survival Status	N	Minimum	Maximum	Mean	Std. Deviation
Age	18	20.0	65.0	40.889	12.9337
ABG:Ph	18	7.000	7.460	7.25944	.111380
pCO2	18	19.0	96.0	42.333	18.1659
pO2	18	53.0	120.0	85.756	15.5008
HCO3	18	18.2	26.2	22.194	2.4534
FiO2	18	.4	.8	.572	.0958
Tidal Volume	18	300.0	500.0	410.000	53.4680
PaO2/FiO2	18	92.50	194.00	155.2606	28.27596
Hematocrit	18	29.8	46.2	37.444	5.7318
Pulse	18	76.0	142.0	100.333	20.6512
Systolic blood pressure	18	80.00	200.00	110.2222	31.78523
Diastolic Blood pressure	18	50.00	100.00	71.1111	15.29663
WBC	18	3700.0	18400.0	13283.333	3887.7258
Platelet	18	25000.0	518000.0	155555.556	119655.9884
Serum creatinine	18	.20	3.60	1.3900	.92200
Serum Bilirubin	18	.16	3.90	.6439	.93567

TABLE 5: Ventilatory settings among ARDS patients

		Survival Status			
		DEATH		RECOVERED	
		N	%	N	%
MODE	P-CMV	1	3.1	1	5.6
	PRVC SIMV	28	87.5	16	88.9
	V-CMV	3	9.4	1	5.6
PEEP	5.0-7.0	8	25.0	17	94.4
	8.0-12.0	24	75.0	1	5.6

There is no significant difference in mode between dead and recovered(p=0.383)

There is significant difference in **PEEP** between dead and recovered (p<0.001)

TABLE 6: Use of inotropes and blood transfusion among ARDS patients

		Survival Status			
		DEATH		RECOVERED	
		N	%	N	%
Inotropes	NO	12	37.5	12	66.7
	YES	20	62.5	6	33.3
Transfusion	NO	20	62.5	14	77.8
	YES	12	37.5	4	22.2

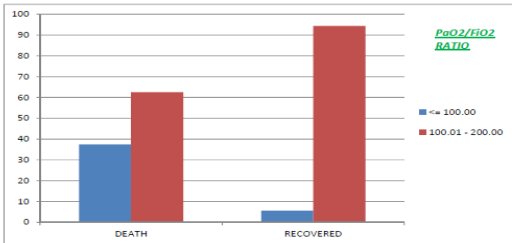There is significant difference in Inotropes between dead and recovered, p<0.05.

There is no significant Pfference in Transfusion between dead and recovered, p=0.266.

TABLE 7: Statistics among ARDS patients

	Survival Status	Mean	Std. Deviation	P value	95 Confidence Interval of the Difference	
ABG:pH	DEATH	7.17297	.189842	.084	-.185015	.012063
	RECOVERED	7.25944	.111380			
pCO2	DEATH	48.972	29.4891	.391	-8.7920	22.0691
	RECOVERED	42.333	18.1659			
pO2	DEATH	73.919	22.5189	.034*	-22.7139	-.9597
	RECOVERED	85.756	15.5008			
HCO3	DEATH	16.316	2.7261	<0.001*	-7.4384	-4.3192
	RECOVERED	22.194	2.4534			
Fio2	DEATH	.631	.1281	.095	-.0107	.1287
	RECOVERED	.572	.0958			
Tidal Volume	DEATH	401.250	54.2247	.585	-40.7141	23.2141
	RECOVERED	410.000	53.4680			
Pao2/Fio2	DEATH	114.5794	32.92774	<0.001*	59.25805	-22.10431
	RECOVERED	155.2606	28.27596			

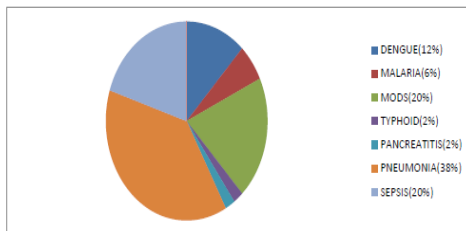-----* significant

There is significant difference in pO2 (p= .034), HCO3 (p= <0.001), Fio2 (p= .095) and Pao2/Fio2 (p <0.001*) between dead and recovered

There is significant difference in PaO2/FiO2 between dead and recovered (p<0.001.)

Fig 1: Showing PaO2/FiO2 ratio between death and recovered patients

The above pie chart depicts the etiology of ARDS. Pneumonia being the more common cause of ARDS followed by Sepsis with MODS.

Fig 2: Etiology of ARDS patients

DISCUSSION

A total of fifty patients satisfying AECC criteria for ARDS are included in our study.

Males comprised slightly more about 58% and remaining are females (p=0.738) in our study. The mean age of patients enrolled in our study is 43.7years, which is similar to study done by John. A. Millberg et al.[1] Most of the patients belonged to age group of 30 and less. There was no significant increase in mortality with increasing age in our study. However a study done by Agarwal et al[2] in North India, it was observed that when patient aged more than 50 years were compared to younger patients, the outcome was not significantly different. Between patients with ARDS due to direct causes and indirect causes, there was no significant difference in mortality(p= 0.279) in our study. 36% were due to direct causes and 64% are due to indirect causes of lung injury.Patients with ARDS due to sepsis and febrile illness with MODS had higher mortality in our study which is similar to other studies done by Agarwal et al[2] and other studies.

Pulmonary infection (38%) is the most common cause for ARDS in our study followed by Sepsis(20%) and febrile illness with MODS (20%). A study conducted in Hyderabad by Vigg et al[3] has showed similar observations as our study. Other causes of ARDS in our study are dengue (12%), malaria (6%), typhoid (2%) and acute pancreatitis (2%) which is similar to study done by Bhadade RR et al.[4]

Diabetes, Hypertension, Smoking and alcohol are the co-morbidities and risk factors assessed in ARDS patients in our study, but there is no statistically significant difference in outcome of ARDS patients with risk factors and co-morbidities when compared to patients without any risk factors or co-morbid conditions in our study.

There was no statistically significant difference in incidence of ARDS between diabetics and non-diabetics in our study compared to study done by Moss M et al[5] which found that diabetic patients have decreased incidence of ARDS.

In a review published on ARDS cases, mortality was found to vary between 30% to 70% which is comparable to mortality in our study (74%).[6] A study done by Jerng JS[7] et al at a tertiary center showed that mortality of patients with ALI/ARDS was higher and is found to be similar to our study.

The parameters showing statistical significance with mortality in our study are pO2(p=.034), HCO3(p=<0.001),FiO2(p=.095), PaO2/FiO2(p=<0.001), Serum creatinine(p=.035), Serum Bilirubin(p=.049), PEEP(p<0.001). The mean value of HCO3 in the recovered group (22.194mmol/l) and death group(16.316mmol/l) is suggestive that acidosis was significant cause of mortality and statistically significant and is comparable to study done by Bhadade RR et al[4] which also showed that acidosis is a significant predictor of outcome of ARDS.

PaO2/FiO2 (p value: <0.001) ratio was found to be statistically significant between the death and the survived group and ratio was lower in the death group(114.5794) than the survived group(155.2606) in our study, similar to study done by Bhadade et al.[4] Study done by Bhadade RR et al[4] found that anemia, thrombocytopenia, renal failure, hepatic failure, and X-ray picture were not predictors of the outcome of ARDS patients but in our study mean values of Serum creatinine(p value:0.035) and Serum bilirubin(p value: 0.049) among the death group was higher than the recovered group and found to be statistically significant and suggests that renal failure and hepatic failure are cause for increase in mortality in our study and are significant predictors of outcome.

Acute pancreatitis is one of the cause of ARDS and mortality in our study which suggests that acute

pancreatitis has increased mortality due to pulmonary congestion and ARDS similar to studies done by Benjamin Interiano et al and Renner IG et al.[8] Use of inotropes and transfusion of blood and blood products was higher in the death patients compared to recovered patients in our study and use of inotropes(p=<0.05) showed statistical significance between deaths and recovered and is similar to study done by Michelle Ng Gong et al.[9] But use of blood transfusion and its products is not statistically significant between the deaths and recovered in our study. However study done by Michelle Ng Gong et al,[9] showed that use of blood and blood transfusion products was significantly high in death patients.

Culture sensitivity of sputum/tracheal aspirate or blood showed positive growth in 15(30%) patients and most common organism was acinetobacter species and found to be resistant to many of the antibiotics, but there is no significant difference in Culture Sensitivity between dead and recovered (P=0.522) in our study.

CONCLUSION
- A total of fifty patients satisfying AECC criteria for ARDS are included in our study.
- Males are 58% and females 42%
- Affects all ages between 18-85years (mean: 44.5 years), Common age group affected is 30 and less.
- Causes of ARDS are Pneumonia (38.0%), Sepsis (20.0%), acute febrile illness with MODS (20.0%), Dengue (12.0%), Malaria (6.0%), Pancreatitis (2.0%) and Typhoid (2.0%).
- Symptoms: Fever and Breathlessness were the commonest presenting features. Cough, chest pain, myalgia, wheeze, vomiting are the other presenting symptoms.
- Risk factors and co-morbidities in our patients of ARDS are Diabetes, Hypertension, Smoking and alcohol, but there is no statistically significant difference on outcome.
- Outcome: Mortality in our study is 64%,36% recovered.
- Factors showing strong correlation with mortality on outcome of the patient are PEEP, pO2, Acidosis, Pao2/Fio2, renal failure, liver failure and duration of stay.
- Most patients in the recovered group, required a lower level of PEEP. Use of inotropes and transfusion of blood and blood products was higher in the death patients compared to recovered patients. Use of inotropes had strong correlation with outcome of the patient.79
- Culture Sensitivity of bodily fluids (sputum/ blood/ tracheal aspirate) showed positive growth in 15 patients(30%). organisms grown are Acinetobacter, Enterococcus species, E.coli, Klebsiella pneumoniae, Staphylococcus- coagulase negative species, Streptococci but there is no significant difference in Culture Sensitivity between dead and recovered patients.

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