

Outcome of Respiratory Failure Patients Managed In Medical Intensive Care Units (ICUs)

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Abstract

Background: To find out the outcome of patients managed with diagnosis of respiratory failure at Medical ICUs

Methods: In this cross sectional observational study all respiratory failure patients managed at Medical ICUs were included. Data regarding patient characteristics, cause and type of respiratory failure (type I or II), outcome (improved or expired) and duration of hospitalization was collected for each patient. Outcome was correlated with age, gender, hospital, cause and type of respiratory failure and duration of hospitalization employing Chi² or t test wherever appropriate. p- value <0.05 was considered significant.

Results: Two hundred and forty eight patients were included. 61.69% were male. Mean patient age was 48.58± 18.81 years. Type I respiratory failure was noted in 58.46% and type II respiratory failure in 41.53%. Chronic obstructive pulmonary disease, pneumonia and tuberculosis were commonest causes of respiratory failure. Mean duration of hospitalization was 4.69± 7.75 days. 57.25% patients expired and 42.74% recovered. Statistical association of outcome was only noted with difference to two hospitals.

Conclusion: Poor outcome is noted in majority respiratory failure patients . Chronic obstructive airway disease (COPD), pneumonia and pulmonary tuberculosis (TB) related lung damage are commonest etiologies of respiratory failure in these patients.

Key Words: Respiratory failure, Chronic Obstructive Pulmonary Disease, Pneumonia

Introduction

Respiratory failure is defined as impaired ability of the respiratory system to maintain adequate oxygen and carbon dioxide homeostasis.¹ Respiratory failure is classified as type I (hypoxemic) and type II

(hypercapnic) based on whether there is a high carbon dioxide level or not. Hypoxemic respiratory failure occurs due to decreased level of oxygen in the blood with normal carbon dioxide levels. Some major causes of type I respiratory failure are pulmonary edema, pneumonia, pulmonary embolism, acute respiratory distress syndrome (ARDS) and pulmonary hemorrhage. Hypercapnic respiratory failure occurs when there is decreased level of oxygen along with increased level of carbon dioxide in the blood. Chronic obstructive pulmonary disease (COPD), asthma, drug overdose, chest deformities and muscle disorders are major causes of type II respiratory failure.²

In Pakistan information about the characteristics and outcomes of patients with respiratory failure is limited. The mortality associated with respiratory failure varies according to the etiology, complications of the disease, additional illnesses, and expertise available at a particular health care facility. In United States respiratory failure related hospitalizations numbered 1,007,549 in 2001, and 1,917,910 in 2009.³ Mortality in these patients was 27.6% in 2001, and 20.6% in 2009.² Few of the COPD patients with acute exacerbation require mechanical ventilation. Mortality in these patients relates with type of precipitating illness and severity of COPD. Mortality in respiratory failure complicating COPD is lesser than mortality in patients with ARDS.⁴

Patients and Methods

This cross sectional observational study was conducted in Medical ICU settings of Allied Hospitals of Rawalpindi Medical University from March 2016 to March 2017 after approval from Institutional Research Forum. All patients managed at ICU with diagnosis of respiratory failure were included after informed consent of patient or surrogate. Each patient was managed for respiratory failure, its complications and additional illnesses wherever appropriate in standard way. Data regarding age, gender, occupation, address, name of hospital, duration of stay at ICU,

type of respiratory failure, cause and outcome of respiratory failure was noted on a specifically designed Performa. Frequency and percentage was calculated for categorical variables like gender, occupation, address, name of hospital, type of respiratory failure etc. Mean ± SD were calculated for continuous variables i.e., age and duration of stay. Outcome was compared with categorical variables using Chi square test. For continuous variables t test was used similarly. P value <0.05 was considered significant.

Results

Two hundred and forty eight patients were included in the study. 61.69% (n= 153) were male and 38.30% (n= 95) female. Mean patient age was 48.58± 18.81 years. 35.08% (n=87) patients were in the age group 31-50 years. Most of patients (46.77% n= 116) were from DHQ Teaching Hospital. 31.85% (n= 79) patients were from Holy Family Hospital (HFH), and 21.37% (n= 53) patients were from Benazir Bhutto Hospital (BBH). Type I respiratory failure was noted in 58.46% (n=145) patients and type II respiratory failure in 41.53% (n= 103) patients. Mean age of type I respiratory failure patient's was 45.06 ± 19.25 years and of type II respiratory failure was 53.55 ± 15.84 years (P value 0.0003). Commonest causes of respiratory failure included; chronic obstructive pulmonary disease (30.24%), pneumonia (25%) and tuberculosis (20.56%). Mean duration of hospitalization was 4.69± 7.75 days. 57.25% patients expired . 59.3% of type I and 54.36% type II respiratory failure patients expired (Table 1).

Discussion

In present study patients with respiratory failure were mostly middle aged, had frequently type I respiratory failure, suffered most frequently from COPD, tuberculosis [TB], and pneumonia and more than 50% patients expired . Mean age of type II respiratory failure patients was comparatively more. COPD is a leading cause of death worldwide. Respiratory failure is leads to mortality in many of COPD patients. Natural course of COPD is characterized by progressive decline in lung function and recurrent exacerbation leading to respiratory failure types .¹¹ In our patients COPD was commonest cause of respiratory failure. As has been noted previously cardiogenic and non-cardiogenic pulmonary edema (ARDS), pneumonia, sepsis,

Table I. Patient characteristics and outcome based comparison

	Total	Expired	Recover ed	P value;
Frequency (n & %)				
	248	142/248=57.25%	106/248=42.74%	-
Mean age (years)				
	48.58±18.81	49.28±19.15	47.39±18.29	0.4340
Hospital				
DHQ	116/248=46.77%	54/116=46.55%	62/116=53.4%	0.0020
BBH	53/248=21.37%	28/53=52.83%	25/53=47.16%	0.5317
HFH	79/248=31.85%	60/79=75.9%	19/79=24.05%	0.0001
Type of respiratory failure				
Type I	145/248=58.46%	86/145=59.3%	59/145=40.6%	0.5150
Type II	103/248=41.53%	56/103=54.36%	47/103=45.6%	
Duration of hospitalization (days)				
	4.69±7.75	4.85±9.06%	4.52±5.66	0.9188
Causes of respiratory failure				
COPD	75/248=30.24%	44/75=58.66%	31/75=41.33%	0.7819
Pneumonia	62/248=25%	38/62=61.29%	24/62=38.7%	0.5535
Tuberculosis	51/248=20.56%	26/51=50.98%	25/51=49%	0.3425
Others	24/248=9.6%	16/24=66.67%	8/24=33.33%	0.3892
Asthma	17/248=6.85%	7/17=41.17%	10/17=58.82%	0.2061
Pulmonary embolism	11/248=4.43%	5/11=45.45%	6/11=54.54%	0.5364
ARDS	8/248=3.22%	6/8=75%	2/8=25%	0.4723

COPD- chronic obstructive pulmonary disease;ARDS- adult respiratory distress syndrome

trauma, neuromuscular disorders, obesity, and chest deformities caused respiratory failure in our patients.^{6,7}Except for TB our results are not much different. Interestingly tuberculosis alone causing respiratory failure is uncommon.⁸ Millitary TB,and TB related fibro-cavitation contribute to respiratory failure. It is to be noted that TB constituted 3rd commonest cause of respiratory failure in our patients. Review of these patient showed that they suffered from TB related lung damage i.e., bronchiectasis, fibrosis etc. ^{9,10}

Outcome of respiratory failure patients has been focus of various studies. According to Wallbridge et al, acute respiratory failure related mortality is 30.2%.⁷ In a US

study 33-37% mortality was noted in respiratory failure patients.²Scala R and Heunks L described up to 42% mortality in type I and 15% mortality in type II respiratory failure patients.⁶ According to an Indian study conducted by Khilnani GC, that focused 82 patients with acute respiratory failure secondary to COPD, 36.6% mortality was noted.³ According to a study conducted in Netherland, ICU mortality of patients requiring mechanical ventilation was 20.3%.¹² In a Pakistani study mortality in respiratory failure patients was 28%.¹³In another Pakistani study focusing type II respiratory failure, 23.5% mortality was noted.⁶ Mortality in our patients was comparatively high (57.25%). We also noted comparatively increased mortality in type I respiratory failure patients. Etiology, severity of illness, delayed presentation to hospital, delayed diagnosis, and resource constrained hospital set ups are possibly some of the factors contributing to higher mortality incircumstances like ours.^{14,15} These may have contributed to significantly association of outcome with two of the three hospital ICUs. Serious steps are required to improve the situation.

In a study of 1157 patients that compared outcome with pre-hospital frailty in respiratory failure, mean patient age was 67.1±16.4 years.¹⁶ Mean age of acute respiratory failure patients varied from 65.8 to 66.6 years during the year 2001 to 2009 in a US study.³ Our patients were comparatively younger. Relatively older age of our type II patients may have relation to common etiologies. According to Delerme S and Ray P, causes of acute respiratory failure in elderly people are difficult to diagnose that increase morbidity and mortality.¹⁷ Another study conducted in America focusing outcome of patients with acute neuromuscular respiratory failure showed that older age was associated with increased mortality during hospitalization.

In one study of acute respiratory failure patients, average hospital stay was 7.1 days.⁷In another study it varied from 7.1 to 7.8 days.³Morris PE et al focused on hospital length of stay in acute respiratory failure patients. In this study mean duration of hospitalization was 10 days.²⁰Iqbal N et al focused on length of hospital stay in hypercapnic patients with pneumonia. Longer duration of hospitalization was noted in these patients.²¹ Our patient's duration of hospitalization was 4.69±7.75 days. In our study no significant association between outcome and duration of hospitalization was noted.

Conclusion

1. Patients with respiratory failure managed at ICU of Allied Hospitals attached with Rawalpindi Medical University are predominantly middle aged male.
- 2.Type I respiratory failure patients are more in number compared to type II respiratory failure patient. COPD, TB, and pneumonia are commonest etiologies in these patients. Poor outcome is noted in majority of these patients.
3. Preventive steps and better patient management before admission in ICU may improve outcome together with review of ICU management practices and their improvement.

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