



## A RETROSPECTIVE ANALYSIS OF PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE EXACERBATION IN INTENSIVE CARE UNIT

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### ABSTRACT

Choosing best treatment for patients with chronic obstructive pulmonary disease (COPD) because of compli Subject: Table 1. The comparison of mortality rates and the survival rates Survival Mortality P value Men/Women 31/65 17/36 0, 9 Age 6

#### Key words:

chronic obstructive pulmonary disease, non invasive mechanic ventilation, invasive mechanic ventilation

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## INTRODUCTION

Intensive care units, equipped with high-tech devices, are used to provide rapid intervention, and close observation of patients vital functions. A great variety of critically ill patients in intensive care units are closely monitored, one of which is a group of patients with Chronic Obstructive Pulmonary Disease (COPD). Almost one-fourth of the COPD patients are assumed to die within a year after first admission (1). Also, the patients with acute exacerbation of COPD are assumed to die in two years (2).

That increased respiratory acidosis, mental status changes, hypoxia, respiratory acidosis due to the patient's exercise capacity, and deterioration of the situation in patients with chronic obstructive lung disease are the indications of mechanical ventilation, despite medical and oxygen therapy (3-7). Although Endotracheal intubation (ET) - Invasive mechanical ventilation (IMV) is the most common procedure to be used, noninvasive mechanical ventilation (NIMV) has gained importance in recent years because of the complications of ET (8-11). Also, some studies have shown that NIMV treatment reduces length of hospital stay and the need for mechanical ventilation (12-18). In addition to this, NIMV may reduce the complications due to ET. So, it is very important how best to treat patients with COPD exacerbation. An initial

pH upon presentation is very important for the outcome from NIVM treatment (19, 20). Therefore, the patient with severe acidosis should be considered for ET treatment. Some authors accepted pH threshold as 7,25 and below for ET treatment (21-24). Another studies also accepted pH threshold as 7,20 (25). According to Baldwin and Allen, NIMV should be given to all patients with COPD-pH <7,35 (26). NIMV may be applied by using nasal or facial mask. Today, NIMV is considered to be an initial treatment for patients with acute exacerbations of COPD (27-30). In this study, we aimed to show which treatment is effective for patients with COPD.

## MATERIAL-METHODS

The case records of 149 patients with Acute Respiratory failure due to acute exacerbations of COPD in ICU between October 2010-February 2012 were retrospectively reviewed. Age, gender, hospital stays, type of treatment, mortality values were obtained from the records. Diagnosis was confirmed by using Thoracic Society's diagnosis and treatment criteria (30). IMV and NIMV treatments were applied to the patients.

*NIMV treatment was applied according to the following criteria (31, 32):*

*The signs of respiratory support needs*

*The presence of acute respiratory failure*

- a. Progressive dyspnea
- b. Respiratory frequency > 24/minute
- c. PaCO<sub>2</sub> > 45 mmHg, pH < 7,35 or
- d. PaO<sub>2</sub>/FiO<sub>2</sub> < 200.

#### Contraindications for NIMV

- ❖ Respiratory arrest
- ❖ Cardiovascular instability (hypotension, arrhythmias, myocardial infarction)
- ❖ Impaired mental status, somnolence, and inability to cooperate
- ❖ Copious and/or viscous secretions with high aspiration risk
- ❖ Recent facial or gastroesophageal surgery
- ❖ Craniofacial trauma and/or fixed naso-pharyngeal abnormality, burns
- ❖ Extreme obesity
- ❖ In the first four hours of noninvasive ventilation treatment, the patients with no improvement in both arterial blood gases and in clinical conditions were treated with IMV.

#### Statistics

In this study, statistical analysis using SPSS 16.0 for Windows (SPSS Inc, Chicago, IL, USA) software package was used. Descriptive statistics for continuous variables, mean and standard deviation values were used. Nonparametric Mann-Whitney U test was used for comparison of valuation. Categorical variables were analyzed using Chi-square test. Effective factors on mortality nonparametric Spearman correlation test was used.  $p < 0,05$  was considered statistically significant.

#### RESULTS

The mean age of 149 patients was 71 years (range, 46 - 96 years). All of % 70 was geriatric patients (> 65 years). 101 patients (67,8%) were male and 48 (32,2%) were female. The mean ICU stay was 25 days. Fifty-seven (38,2%) were intubated, 92 patients (61,8%) were treated with NIMV (non-invasive mechanical ventilation) 33 of 92 patients' treatment was changed to IMV. 21 of Intubated patients percutaneous tracheostomy was performed. Overall mortality rate was 36,2%. 92 patients were followed up with NIPPV. An average duration of NIVM was 7,4±8 days, and an average duration of intubation was 27,7±39 days. Initial blood gas values on admission, the average pH values were 7,14±0,8, while those of patients treated with NIMV were 7,21±0,4. At discharge from ICU, Ph values of both intubated and treated with NIVM patients were 7,34±0,7 and 7,39±0,7, respectively ( $p = 0,0001$ ). Initial pCO<sub>2</sub> values of intubated patients were 97±33, while those of patients treated with NIMV were 81±14 ( $p = 0,0001$ ). In admission, PO<sub>2</sub>/FiO<sub>2</sub> values were calculated. Both intubated and NIVM patients, the median PO<sub>2</sub>/FiO<sub>2</sub> values were 106±35 and 159±34, and before discharged from ICU, the median PO<sub>2</sub>/FiO<sub>2</sub> values were calculated as 156±55 and 236±43, respectively. 112 patients were smokers. Average duration of smoking was found to be 39±8 years. 53 patients died during the admission (% 35) of 36 patients were male. Only 3 of 59 patients treated with only NIMV died at the admission, while 30 of 44 patients treated with only mechanic ventilation died. Also, 20 of 44 patients treated with both NIVM and IMV died. Mortalty rate in patients treated with IVM, was found to be signifiicalty higher ( $p = 0,0001$ ).

In our study, the mortality rate increased with age, which was found to be significant ( $p = 0,001$ ). There was no significant difference between hospital stay and mortality ( $p = 0,9$ ). But there was a significant correlation between mortality rate and increased NIMV or IMV duration ( $p = 0,0001$ ). There was no significant difference between smokers and non-smokers in term of mortality rate ( $p = 0,2$ ). But mortality rate in patients smoking for a long time was found to be significant ( $p = 0,0001$ ). A decreased pO<sub>2</sub>/FiO<sub>2</sub> in initial samples was connected with increased mortality rate, which was found to be statistically significant ( $p = 0,0001$ ). Similarly, the same result for decreased pH levels and decreased pCO<sub>2</sub> in first blood samples was found to be significant ( $p = 0,0001$ ). There was no significant difference between survival and gender ( $p = 0,9$ ).

#### DISCUSSION

Noninvasive ventilation in patients with COPD increases the amount of oxygen in the circulation and reducing the need for intubation, decreases both the length of stay and the mortality rate (33). NIMV success rate has been reported 60-70% in patients with COPD (34). According to Esteban and his colleagues, MV ratio was found 33%, the average duration of IMV was determined to be 5,9±7,2 days (35). In our study, IMV ratio was found 38,2%, and MV duration was found to be higher (27,7±39 days). Mortality rate was found 24-41 % according to Goldhill and friends who conducted on 24 ICU in the UK (36). In another study, the ICU mortality rate was reported as 43% (37). In our study, 36,2% of the total mortality has been observed. Several authors have reported that PaCO<sub>2</sub> levels decrease significantly compared with baseline levels in first hour after the onset of NIMV treatment and decreased PaCO<sub>2</sub> levels may have been a decisive factor in prognosis (12, 38, 39, 40). In an another study, decreased PaCO<sub>2</sub> values have been found in first three hours after the onset of NIMV (41). In our study, there was a statistically significant correlation between PaCO<sub>2</sub> and mortality rate ( $p = 0,9$ ).

Initial low pH is known to be indicator of NIV failure (19,21) In our study, we found that there was a correlation between decreased pH-increased pCO<sub>2</sub> and mortality rate, which was found to be statistically significant ( $p = 0,0001$ ). A previous study stated there is a negative correlation between initial pH and FiO<sub>2</sub> values (42) In our study, decreased pO<sub>2</sub>/FiO<sub>2</sub> in first blood samples was related with increased mortality rate, which was found to be statistically significant ( $p = 0,0001$ ). There was no significant difference between smokers and non-smokers in terms of mortality rates ( $p = 0,2$ ). But mortality rates in patients with long-term smoking was found to be very significantly increased ( $p = 0,0001$ ). There was no significant difference between hospital stay and mortality ( $p = 0,9$ ). But there was a significant correlation between mortality rate and increased NIMV or IMV duration ( $p = 0,0001$ ). Several studies have shown that NIV treatment reduces length of hospital stay and the need for mechanical ventilation via endotracheal intubation (IMV-ETI) (12-18). In our study, Noninvasive ventilation time was 7,4 ± 8 days, while entubation time was 27,7 ± 39 days. Plant and colleagues did a prospective multicentre randomised controlled study comparing NIV with standart therapy in patients with moderate acidosis. 236 patients recruited and they stated that the early use of NIV for mildly and moderately acidotic patients with COPD. Sets the reduction in the need for invasive mechanical ventilation and a reduction in hospital mortality (43). In another study Tao wang and friends determined the effects of NIV on clinical outcomes when used

for the treatment of acute respiratory failure in immunocompromised patients. They retrieved 3359 records from the electronic database searches. They found a significantly lower mortality in hospital stay in NIV compared to IMV group. NIV was associated with a significant lower mortality rates, especially in less severe patients. For more severe patients NIV didn't show clear advantages over IMV (44). In a study performed by Carlucci and friends, the incidence of use and effectiveness of NIV among 42 intensive care units showed NIV represented the first attempted ventilatory technique in 16% of acute respiratory failure patients. 35% of patients admitted without ETI. Similar to our study, ETI improvement of the clinical toleration of NIV in the future seems necessary (45).

## CONCLUSION

As a result, we may mention that nasal NIMV treatment is tolerable, safe, a way to reduce costs, decreased morbidity in patients with acute exacerbations of COPD.

We think that NIMV can be the initial treatment for patients having the acceptance criteria for NIMV.

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