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**ORIGINAL ARTICLE**

# Effectiveness of Prone Position among Patients with Acute Respiratory Disease (COVID-19)

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## ABSTRACT

**Objective:** Aim of current study is to determine the effectiveness of prone position in patients presented with severe coronavirus disease.

**Study Design:** Observational /Retrospective study

**Place and Duration:** King Salman Armed Forces Hospital Tabuk KSA. Feb 2021-Dec 2021

**Methods:** This research comprised a total of 85 patients with respiratory failure who were admitted to the ICU. Patients ranged in age from 20 to 75. After obtaining written permission from each patient, demographic information such as age, gender, and BMI was collected. A and B were the two groups of patients that were studied. Group A included 40 patients with COVID-19 who completed prone position testing, whereas group II included 45 patients as a comparison group. During the 15-day follow up period, patients in group A were remained in a prone posture whereas those in group B were subjected to invasive ventilation. Outcomes among both groups were compared in terms of mortality, hospital stay and reduction in intubation rate. Analyzation of data was completed by using SPSS 24.0 version.

**Results:** The majority of the patients were men, with 60 (70.6%) of the total, while the others were females, with 25 (29.4%). The mean age of the patients in the prone posture group was 48.12 years, with a mean BMI of 27.5 kg/m$^2$, whereas the mean age of the patients in the control group was 50.4 years, with a mean BMI of 27.9 kg/m$^2$. The average time spent in the prone position was 6.08 hours. When comparing the prone group to the controlled group, the mean PF ratio was higher in the former. The average length of stay in group A was 7.2 days, whereas the average length of stay in group B was 10.5 days. Group A had a death rate of 2 (5%), while group B had a mortality rate of 5 (11.1%).

**Conclusion:** As a result of this research, we came to the conclusion that the prone position was an effective and safe approach for reducing intubation, mortality, and hospital stay in patients of COVID-19. After this procedure, no side effects were observed.

**Keywords:** Respiratory Failure, Mortality, Prone Position, Covid-19,

## INTRODUCTION

There has been a rise in the number of cases of Coronavirus Disease 2019 (COVID-19) in numerous nations. In individuals with severe COVID-19, chronic hypoxemia is a prevalent symptom. Many COVID-19 patients had acute respiratory distress syndrome (ARDS), necessitating the use of invasive mechanical ventilation and a very high degree of patient care. Healthcare institutions throughout the globe are struggling to keep up with the rising demand for invasive mechanical ventilation.

The prone position has been used in previous studies to lessen the need for endotracheal intubation in conscious patients with acute respiratory failure [3-5].

COVID-19 patients often need mechanical ventilation, which necessitates the use of mechanical ventilation to improve oxygenation and reduce intubation rates. Non-invasive ventilation and high-flow nasal cannulas may benefit patients who are conscious and self-pronating while in the critical care unit (HFNC). COVID-19 has been shown to improve oxygenation and reduce respiratory effort in individuals with acute respiratory failure [6,7]. Improved ventilation/perfusion and recruitment of the dorsal lung segments may expand the collapsed dorsal alveoli, allowing for greater oxygenation and gas exchange [7,8]. Prone ventilation was associated with a decreased death rate in mechanically ventilated non-COVID-19 individuals with severe ARDS [9]. Prone posture in COVID-19 patients has yet to be studied in terms of its clinical effects (intubated and non-intubated). Because of this, additional study into the prone position's usefulness and safety for COVID-19 patients is required before any recommendations can be made.

The unavailability of CPAP and high-flow nasal cannulas necessitated early intubation of patients with severe hypoxic respiratory distress (HFNC). In order to prevent intubation, a variety of options were investigated. Due to the physiological and anatomical modifications associated with prone position, tidal volume is more equally distributed (PP). There is a better alveolar ventilation/perfusion connection due to pulmonary perfusion being directed preferentially to the larger dorsal lung regions and an improvement in dorsocaudal lung capacity due to less superimposed heart and belly pressure. [10] Patients with ARDS who are intubated and mechanically ventilated have received PP for decades. [11,12]

Patient self-inflicted lung injury (PSILI) may be exacerbated by the increased respiratory rate and inspiratory effort seen in patients with CARDS in addition to their acute hypoxemia [13]. It has been hypothesized that non-invasive respiratory assistance, particularly in the form of a helmet CPAP, might minimize the inspiratory effort and perhaps lessen the need for invasive mechanical ventilation.[14] It has been postulated that an awake prone posture and non-invasive respiratory assistance may

reduce inspiratory effort, dyspnea, and the need for intubation, by improving lung inflation and recruitment [15].

We conducted this study to determine the effectiveness of prone position in patients presented with severe coronavirus disease.

## MATERIAL AND METHODS

This retrospective /observational study was conducted at King Salman Armed Forces Hospital Tabuk KSA and comprised of 85 patients with respiratory failure admitted to ICU. After obtaining written agreement, the demographics of the patients were recorded. This research was not open to patients who got PP through invasive mechanical ventilation and those who did not provide written agreement for participation.

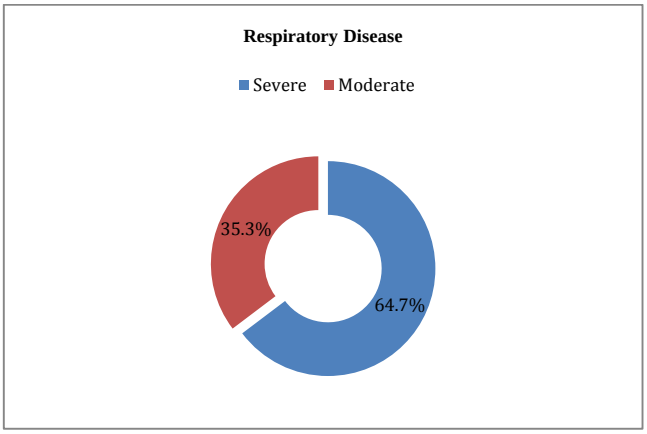
The age of the patients varied from 20 to 75 years. A and B are the names given to the two sets of patients. 40 COVID-19 patients were put in the prone position whereas 45 patients were employed as a control in group A. Both groups had chest X-rays taken. A 15-day follow-up was undertaken for patients in group A, whereas patients in group B received invasive ventilation. Between the two groups, there was a significant reduction in the rate of intubation as well as mortality, hospital stay, and complications. The SPSS 24.0 version was used to examine the entire set of data. Descriptive variables were computed using standard deviation, whereas categorical variables were examined using frequency and percentage counts, respectively.

## RESULTS

The majority of the patients were men, with 60 (70.6%) of the total, while the others were females, with 25 (29.4%). In the prone posture group mean age was 48.12 years, a mean body mass index of 27.5 kg/m$^2$, While in the control group, the mean age of the patients was 50.4 years and had mean BMI of 27.9 kg/m$^2$. (table 1)

Table1: The demographics of enrolled cases

| Variables | Group A | Group B |
|---|---|---|
| Mean age (years) | 48.12±7.44 | 50.4±9.48 |
| Mean BMI | 27.5 ±4.45 | 27.9 ±5.55 |
| Sex | | |
| Male | 30 (35.3%) | 30 (35.3%) |
| Female | 10 (11.8%) | 15 (17.6%) |




We found that 55 (64.7%) patients had moderate disease while 30 (35.3%) had severity of disease among all cases.(Fig 1)

Symptoms such as fever, cough, and dyspnea were the most often reported in both groups. The majority of patients showed bilateral lung involvement with interstitial infiltrates, followed by consolidation and unilateral infiltrates, according to the findings. (table 2)

Table 2: Symptoms and results of X-rays

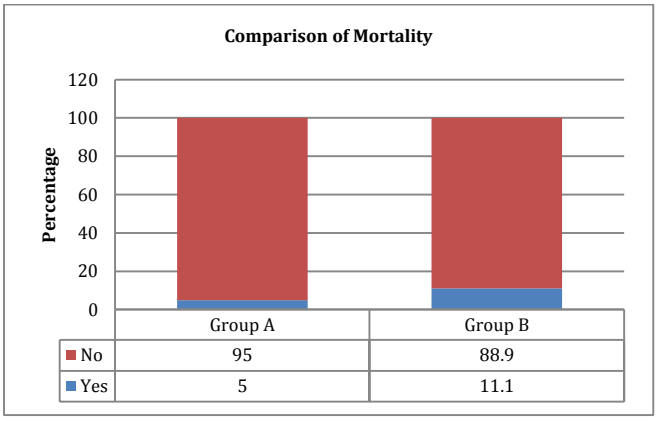
| Variables | Group A | Group B |
|---|---|---|
| Symptoms | | |
| Fever | 15 | 17 |
| Cough | 14 | 16 |
| Dyspnea | 6 | 5 |
| Myalgia | 2 | 4 |
| Vomiting | 2 | 1 |
| Headache | 1 | 2 |
| X-ray Results | | |
| BI (bilateral infiltrates) | 18 | 19 |
| II (interstitial infiltrates) | 15 | 16 |
| CL (consolidation) | 4 | 5 |
| UI (unilateral infiltrates) | 3 | 5 |

The average time spent in the prone position was 6.08 hours. Mean hospitalization in group A was 7.2 days, lower than that of group B 10.5 days. (table 3)

Table 3: Comparison of mortality and hospitalization among both groups

| Variables | Group A | Group B |
|---|---|---|
| Mean time of Prone Position (hours) | 6.08±1.44 | - |
| Hospitalization (days) | 7.2±2.55 | 10.5±13.2 |

Group A had a death rate of 2 (5%), while group B had a mortality rate of 5 (11.1%). (fig 2)




When comparing the prone group to the controlled group, the mean PF ratio was higher in the group A. (table 4)

Table 4: Severity of disease and comparison of PaO2/FiO2 (PF) among groups

| Variables | Group A | Group B |
|---|---|---|
| Disease Severity | | |
| Moderate | 315.03±3.44 | 301.04±7.78 |
| Severe | 319.04±9.19 | 306.06±7.66 |

## DISCUSSION

Compared to the control group, patients with COVID-19 in the prone position had higher PaO2/FiO2 ratios and SpO2 levels than those in the study group, according to our meta-analysis of randomised controlled studies. Although the PaCO2 level decreased, there were no statistically significant changes in intubation rates or the number of patients who were discharged alive over the study period. While in the prone position, the collapsed dorsal lung region may expand, improving the ventilation/perfusion ratio and allowing lung ventilation to be distributed more evenly throughout the patient's body, this is not always the case. [16,17]

In our study majority of the patients were men, with 60 (70.6%) of the total, while the others were females, with 25 (29.4%). In the prone posture group mean age was 48.12 years, a mean body mass index of 27.5 kg/$m^2$, While in the control group, the mean age of the patients was 50.4 years and had mean BMI of 27.9 kg/$m^2$. Our results were comparable to the previous researches.[18,19] We found that 55 (64.7%) patients had moderate disease while 30 (35.3%) had severity of disease among all cases.[18] Symptoms such as fever, cough, and dyspnea were the most often reported in both groups. The majority of patients showed bilateral lung involvement with interstitial infiltrates, followed by consolidation and unilateral infiltrates, according to the findings.[20] The average time spent in the prone position was 6.08 hours. Our findings were significantly skewed since the length of time patients spent in the prone position was left up to the treating physicians in each study. COVID-19 patients who spent more time in the prone position were less likely to require intubation, according to Pavlov and colleagues [21]. The lack of uniform intubation criteria limits.[22]

Mean hospitalization in group A was 7.2 days, lower than that of group B 10.5 days.[23] Group A had a death rate of 2 (5%), while group B had a mortality rate of 5 (11.1%). In those who underwent prone ventilation, our meta-analysis found a decreased death rate. However, a research by Mathews and colleagues indicated that prone ventilation reduced mortality rates in mechanically ventilated COVID-19 patients with ARDS [24]. The bulk of treatment for patients with intubated classical ARDS is provided in the prone position. In COVID-19 patients who are intubated or not, the influence of prone posture on mortality rates remains unclear since standard ARDS and COVID-induced ARDS have unique pathophysiologies. Pregnant postures are regarded to be safer since the patient administers their own treatment.[25] Hyman et al. found a higher survival rate in patients with a COVID-19 who were mechanically ventilated early in the course of their hospitalization. To avoid future lung damage, it is important to consider early, aggressive, invasive ventilation in selected awake and prone position patients, especially if the patient's respiratory drive is strong.[26]

COVID-19-related acute respiratory failure (16 March 2021) treatment found that the awake self-prone posture may promote oxygenation and should be used when more oxygenation is needed to maintain SpO2 > 90% [27]. The use of an awake prone position may be used to delay the progression of respiratory decline in selected patients who currently need oxygen support. Mechanical ventilation will be less often used in intensive care units across the world, especially in resource-constrained countries, as a consequence. In the meanwhile, ongoing, high-quality clinical research will resolve any concerns about this technique.

## CONCLUSION

As a result of this research, we came to the conclusion that the prone position was an effective and safe approach for reducing intubation, mortality, and hospital stay in patients of COVID-19. After this procedure, no side effects were observed.

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