How to Cite:
Basit, A., Ali, S., Umer, M., Iqbal, Z., Zeb, S., Mehmood, . Z., & Ullah, A. (2023). The effectiveness of non-Invasive ventilation in Covid-19 patients. *International Journal of Health Sciences*, *6*(S7), 6775-6784. https://doi.org/10.53730/ijhs.v6nS7.13837

The effectiveness of non-Invasive ventilation in Covid-19 patients

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***Abstract*---**Background: Endotracheal intubation is avoided more often with noninvasive ventilation (NIV) in COVID-19 patients with hypoxemia. An endotracheal or tracheostomy tube is not required to use the NIV to deliver mechanical ventilation. When inflating the lungs for oxygenation, positive pressure is provided directly to the airway while negative pressure is applied externally to the abdomen and thorax to draw air into the lungs. Methods: The study was using a quasi-experimental (single-group pre- and post-test design) and sequential sampling approach. Patients hospitalised to the corona complex at LRH-MTI in Peshawar and who tested positive for COVID 19 PCR were selected for the study. Results: There were 34.8 percent of people in the study between the ages of 30 and 45, 38.5 percent between the ages of 46 and 60, and 26.2 percent between the ages of 61 and 75. Co-infections with a positive COVID-19 PCR were found in 47.8% (66) of patients. Overall, 53.6% of patients showed significant

Manuscript submitted: 18 Oct 2022, Manuscript revised: 9 Nov 2022, Accepted for publication: 18 Dec 2022

improvement after receiving NIV and were subsequently released. For 46.4% of these patients, the NIV did not work, leading to intubation or death. Co-existing diseases were present in the majority of individuals whose NIV attempts were unsuccessful. Patients presenting with COVID-19 co-morbidities did not benefit from the NIV. Conclusions: The Non-invasive ventilation (NIV) shows effectiveness in COVID-19 patients with hypoxemia.

***Keywords*---**COVID-19, NIV, Non-invasive ventilation, hypoxemia, respiratory failure, intubation, positive pressure.

Introduction

In December 2019, the Chinese CDC (Chinese Center for Disease Control and Prevention) discovered the COVID-19 pandemic in Wuhan City, Hubei Province, China[01]. The COVID-19 virus rapidly increased in both global prevalence and fatality after it was released. First proclaimed a PHEIC (public health emergency of international concern) on January 30, 2020, and then a Pandemic on March 11, 2020, by the World Health Organization [02]. Pakistan and other nations with inadequate health care infrastructure are particularly vulnerable to the continuing COVID-19 epidemic[03]. According to the WHO's Dashed Board, the overall number of confirmed cases was 251,788,329 as of November 13, 2021, and the total number of fatalities was 50,077,907[04]. Both preventative measures and therapeutic interventions are required. Evidence-based oxygen treatment for patients at home is the subject of this study, along with its epidemiological and clinical aspects. (1, 4) COVID-19 patients often experience high body temperature, difficulty breathing, a dry cough, chest pain, extreme exhaustion, and low oxygen levels[05]. Endothelial dysfunction plays a major role in the loss of hypoxic pulmonary vasoconstriction, which ultimately results in respiratory failure. COVID-19 may spread from person to person by a number of different vectors, including droplets, aerosols, faeces, and the oral mucosa [06]. Death results from progressive hypoxia-induced lung damage and multi-organ malfunction[07].Patients on ventilators with COVID-19 had the greatest death rate, up to 86%, therefore when respiratory failure was found, the notion of ARF acute respiratory failure treatment techniques was questioned[08]. In order to improve oxygen therapy, help the patient, lessen risk, and perhaps lower the death rate in COVID-19, several respiratory therapies were applied in these patients. Noninvasive ventilation (NIV) has been proven to lessen the likelihood of intubation in COVID-19 patients with acute hypoxemic respiratory failure[09]. The NIV is an alternative to traditional mechanical ventilation that does not need an endotracheal or tracheostomy tube[10]. Both the positive and negative pressures are delivered externally, with the former being focused on the belly and thorax to raise and improve lung oxygenation inflation, and the latter on the limbs to draw air into the lungs[10].Patients with moderate to severe ARF are being treated with NIV and CPAP during the current COVID-19 epidemic. Since there is a lack of information on the efficacy of NIV in patients with COVID-19 who are experiencing acute respiratory failure, it is important to determine whether or not NIV is beneficial for these individuals. The study's primary goal was to assess the efficacy of NIV in treating ARDS in COVID-19 patients[11].

Material & Methdology: This quasi-experimental study was conducted at LRH-COVID in Peshawar, KP, Pakistan. We sampled 138 using G power tool 3.179 and a 95% confidence interval. Single-group research used serial sampling and pre- and post-tests. 138 patients from LRH-MTI Peshawar's corona complex who tested positive for COVID 19 PCR were chosen. After a 6-hour session, SpO2, PaO2/FIO2, and ABG are measured. If a patient's condition deteriorated and SpO2 could not be maintained, they were intubated and transported to the ICU. As soon as patients' SpO2 and PaO2/FiO2 ratios stabilised with stable condition and no difficulties, they were discharged or moved to the Post COVID-19 ward.Both sexes with a positive COVID 19 PCR and hypoxemic respiratory failure were included. NIV patients required normal cognitive abilities, clean bronchial secretions, hemodynamic stability, and cooperation.

Patients with the following conditions couldn't participate: Type II respiratory failure (pH less than 7.25), high oxygen needs (more than 10 l/min to maintain 88% O2 saturation), poor awareness, disorientation, agitation, profuse secretions, difficulty to protect airway, and patient intolerance or refusal.

Result: Data were analysed using SPSS 23 and the Shapiro-Wilk test was used to ensure normal distribution.

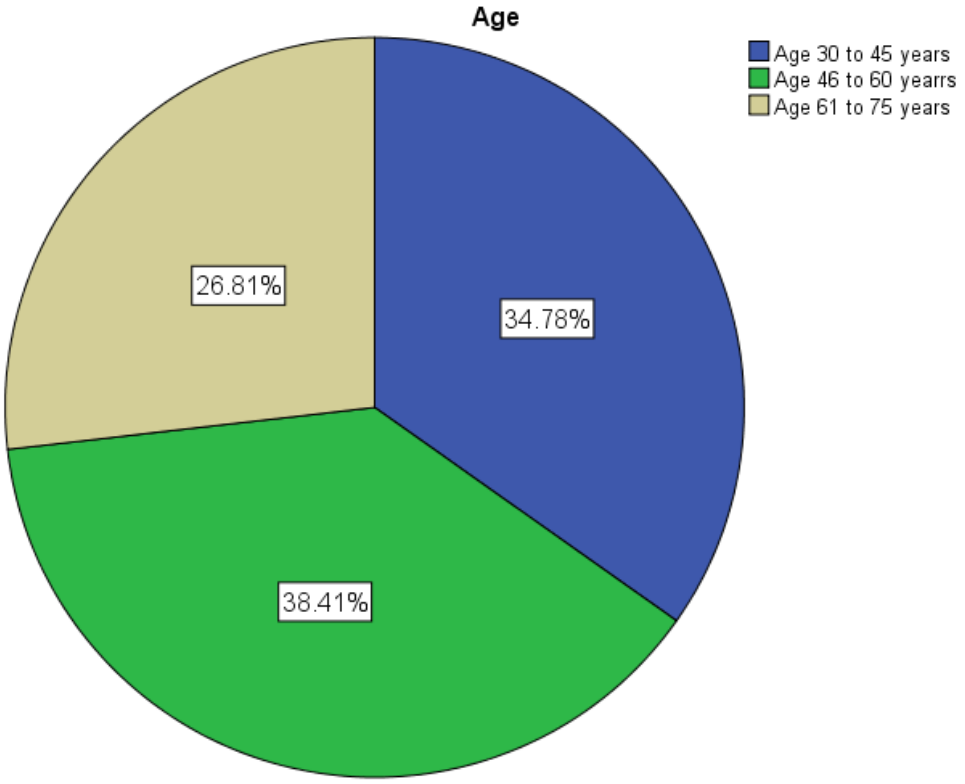

Figure 1: Statistics Showing the Distribution of Participants' Ages

Participants' ages were divided into three groups: those between 30 and 45 years old, 46 and 60 years old, and 61 and 75 years old. In terms of age distribution, the percentages were as follows: 34.8, 38.5, and 26.

Table: 1 Frequencies and Percentages by Age wise

Age categories	Frequency	Percentage
30 to 45 years	**48**	**34.8 %**
46 to 60 years	**53**	**38.4 %**
61 to 75 years	**37**	**26.8 %**
Total	**138**	**100 %**

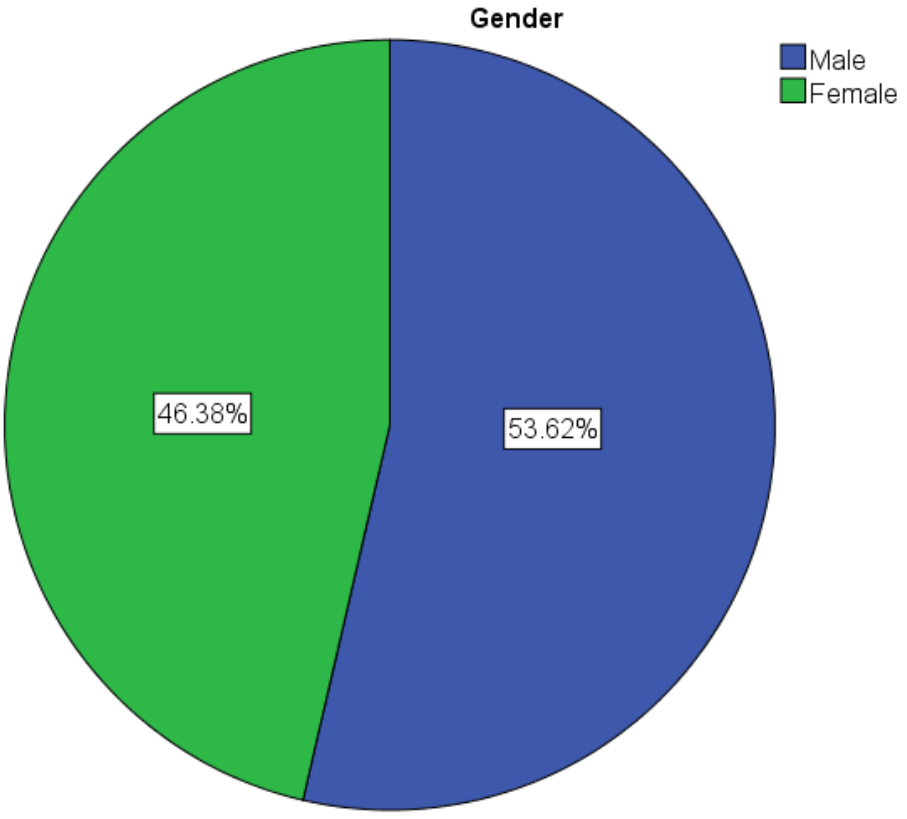

Figure 2: Participant gender distribution shown as a pie chart

In this study, both men and women participated. The study included 74 men and 64 females (with a gender split of 53.6% to 46.4%).

Table 2: Statistically Distribution by Gender

Gender	Frequency	Percentage
Male	74	53.6 %
Female	64	46.4 %
Total	138	100 %

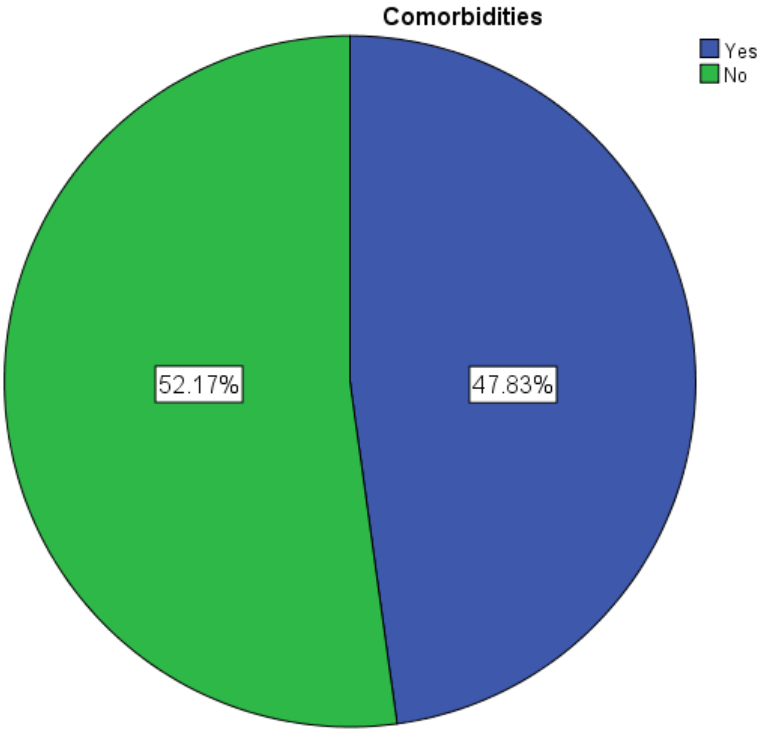

Figure 3: Participant Comorbidities in a Pie Chart

Out of 138 patients, 66 also had co-existing conditions such as COPD, asthma, DM, chronic lung illnesses, and even neurological disorders including stroke. Age was a major factor in the development of the comorbidities. A total of 52.2% of the 72 people evaluated had no comorbidities, whereas 47.8% showed up with one or more disorders that tested positive for COVID-19 by PCR.

Table: 3 Comparative Prevalence and Percentages of Comorbidities

Comorbidities	Frequency	Percentage
Yes Comorbidities Present	66	47.8 %
No Comorbidities present	72	52.2 %
Total	138	100 %

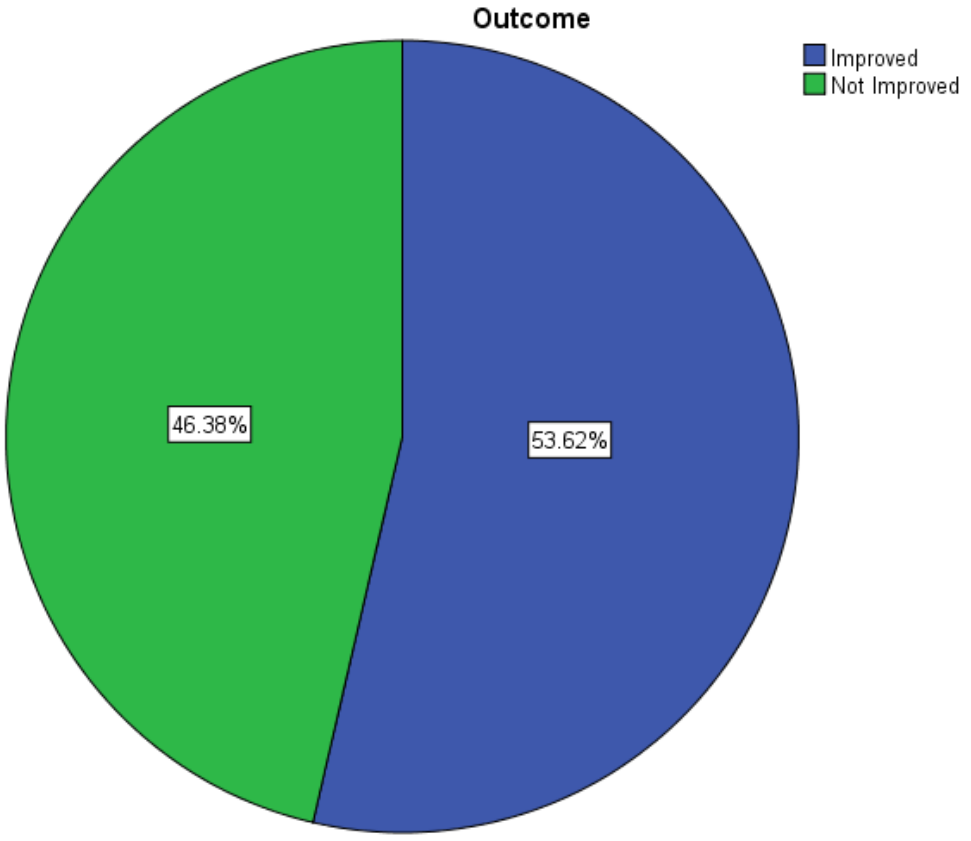

Figure 4: Pie Chart for outcome of the Participants

NIV was successful in reducing symptoms and preventing relapses for 53.6% of patients (74 individuals). Patients who had shown signs of improvement were released, and those who had not were sent to a post-COVID-19 unit. Only 46.4% of patients had success with the NIV. Those who did not recover or who were unable to maintain their SpO2 had their airways intubated and were sent to the intensive care unit (ICU) promptly; some of these patients did not survive. Table 4 displays the results' frequency distributions.

Table: 4 Frequencies and Percentage Table for Outcome

Outcome	**Frequency**	**Percentage**
Improved	74	53.6 %
Not Improved	64	46.4 %
Total	138	100 %

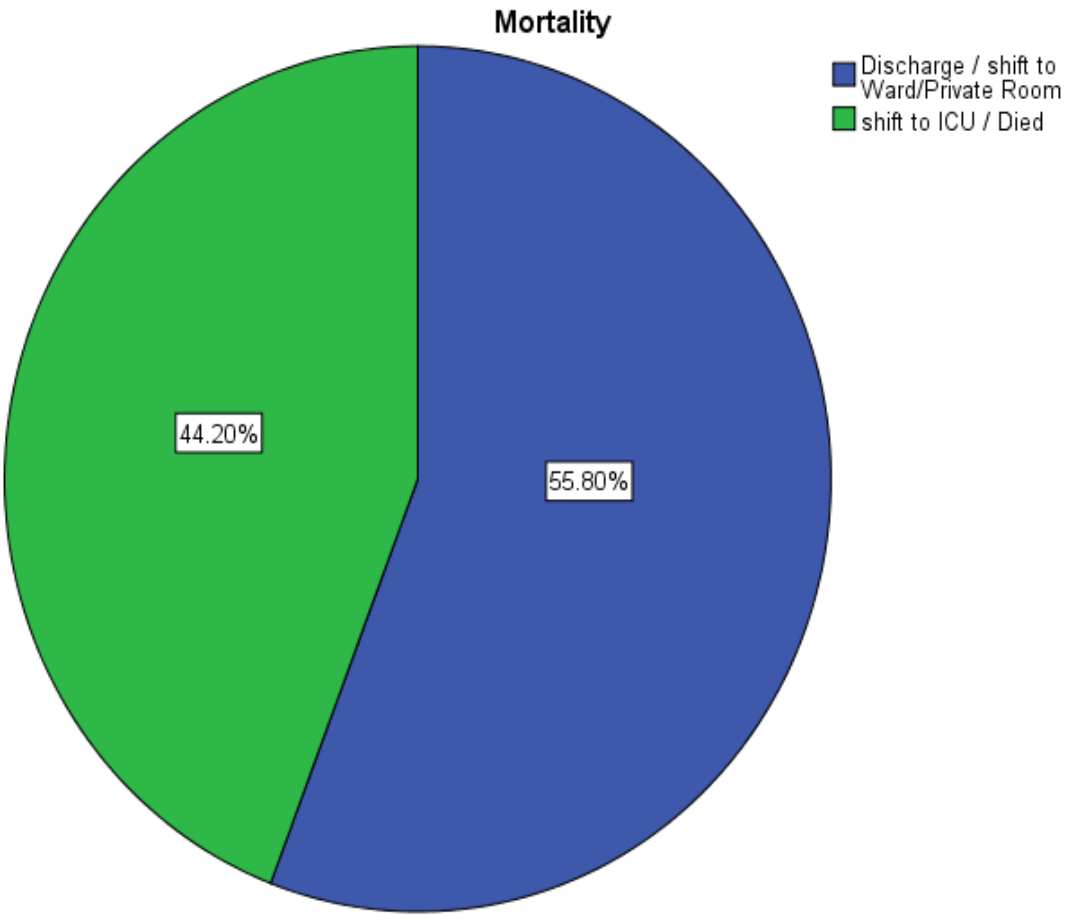

Figure 5: Pie Chart for Mortality of the participants

Table: 5 Frequency & Percentage Table for Mortality

Mortality	Frequency	Percentage
Discharge/shift to Post COVID-19 ward/Private Room	77	55.8 %
Shift to ICU/Died	61	44.2 %
Total	138	100 %

Discussion: Lady Reading Hospital-MTI assisted in the management of the infection during COVID-19. We established our LRH-pulmonology department and COVID-19 Complex on March 23, 2020, where hundreds of patients get BIPAP, CPAP, and mechanical ventilation. Our hospital devised a triage-based escalation of care strategy due to the enormous number of patients and limited resources in this epidemic. Patients were moved from the ER to three different areas: one with just oxygen, one with NIV and CPAP, and one with mechanical ventilation[12].

NIV was used to treat patients with progressive respiratory failure and a respiratory rate more than 25 breaths per minute. Patients on the first level of the COVID-19 Complex with PaO2/FiO2 ratios of 200 to 300 mmHg were given oxygen Due to a lack of knowledge, we were unable to treat early respiratory failure with NIV during the first pandemic. In COVID-19 pneumonia patients with hypoxic respiratory failure, NIV decreased intubation. The majority of NIV patients did not need intubation, and those who did had a high likelihood of ICU death. Patients with HTN, DM, and OAD renal failure did not respond to NIV[13]. Maurizio Bertaina and colleagues performed a cohort study in 2021, recruiting 2798 participants between January 26 and April 18, 2020. Patients from 1933 were chosen for their oxygen, data, and vigour. 1437 patients were given a nasal cannula or oxygen, 390 were given NIV, and 106 were given invasive ventilation. Despite low in-hospital survival, more than half of NIV patients avoided intubation[14]. Our study is supported by these results. In March 2021, Francesco Menzella et al. investigated NIV in COVID-19-related ARDS patients. Patients with COVID-19-related ARDS required NIV. NIV was given to 79 patients hospitalised with COVID-19, 21 required endotracheal intubation, and 20 died. Patients who did not complete NIV had the same mortality risk as those who did. Following NIV, 43% of intubated ICU patients died. At baseline, the mean pO2/FiO2 was 120.1 (SD = 41.6), 155.6 (SD = 78.6) after 72 hours, and 191.0 (SD = 86.8) after 7 days. NIV was observed to minimise intubation in COVID-19 ARDS patients in this study. NIV helped more than half of our patients, yet 46.6% were intubated and several died. 46.4% of patients had COPD, asthma, hypertension, diabetes, or obesity. In 53.6% of COVID-19 patients, NIV reduced intubation[15].A 2020 retrospective analysis compared 30-day mortality in COVID-19 patients with respiratory failure who were intubated prior to NIV against NIV alone. Before, after, and in conjunction with the NIV. NIV aided the survival of all 222 COVID-19 patients. (14) The mortality rate was 77.5% (72-83%). Intubation initially had a mortality rate of 82% (73-89%; 75/91), intubation after NIV had a death rate of 84% (70-92%; 37/44) and NIV-only had a death rate of 69% (59-78%; 60/87). The mortality rate for both intubated-first and intubated-after NIV was the same. Intubated patients died at a higher rate than NIV patients. (14) This retrospective investigation confirms our findings that early NIV is superior to mechanical ventilation in patients with COVID-19 pneumonia and does not cause problems, intubation, or an increase in mortality[16].

Conclusion: Non-invasive ventilation (NIV) has clinically shown to reduce the need for mechanical ventilator support and intubation in patients with COVID-19 hypoxemic respiratory failure.

Conflict of Interest: The authors declare that there is no conflict of interest in the publishing of this work.

Author Contributions : Dr. Zial Ullah supervises and reviewed the manuscript, while Dr. Zafar Iqbal conceived of the study and supervised its execution; Drs. Anila Basit and Abid Ullah collected data, wrote up the study, and conducted the statistical analysis; Drs. Sher Ali and Umar contributed to the data and edited the paper; and Dr. Zial Ullah supervised and reviewed the manuscript.

Ethical Approval: This study was approved by the Institutional Review Board of Lady Reading Hospital – Medical Teaching Institution, Peshawar.

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