

# Impact of Adjuvant Oral Care on Clinical Outcomes in Mechanically Ventilated ICU Patients: A Randomized Controlled Trial

Oral Care on  
Clinical  
Outcomes in  
Ventilated ICU  
Patients

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## ABSTRACT

**Objective:** This was a prospective study to determine the impact of structured adjuvant oral care on clinical outcomes, such as duration of mechanical ventilation, ICU length of stay and mortality among mechanically ventilated ICU patients.

**Study Design:** Randomized, controlled, trial study

**Place and Duration of Study:** This study was conducted at the Intensive Care Unit of a Tertiary Care Hospital from 30 July 2024 and 3 January 2025.

**Methods:** Mechanically ventilated patients (n = 100) were randomly put under intervention (n = 50) and control (n = 50) groups. The control group was provided with the standard care of the ICU in terms of oral care, whereas the intervention group went through the structured adjuvant oral care on top of the standard care. Clinical outcomes that were determined were the duration of mechanical ventilation, length of stay in ICU, and mortality. Independent sample t-tests and chi-square tests were used to analyze data with the statistical significance of  $p < 0.05$ .

**Results:** The intervention group showed better clinical outcomes when compared to the control group. The average ICU stay was also significantly lower in the intervention arm (12.28; 7.15 days) than the control arm (16.57; 8.75 days;  $p = 0.009$ ). On the same note, the average length of the mechanical ventilation duration was also significantly lower in the intervention group ( $11.19 \pm 6.97$  days) in comparison with the control group ( $15.46 \pm 8.67$  days;  $p = 0.008$ ). The intervention group also had a lower mortality rate (44% vs. 66%).

**Conclusion:** Organized oral care was linked with better clinical outcome among the patients who were put on mechanical ventilation in ICU. The intervention greatly decreased the mechanical ventilation duration and the length of stay in the ICU and was linked with a decreased mortality rate. The integration of systematic oral care procedures into the standard ICU nursing care could help to achieve better patient outcomes and less healthcare waste.

**Key Words:** Ventilator Associated Pneumonia, Intensive care unit, Adjuvant oral care, Chlorohexidine, Ventilator duration.

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## INTRODUCTION

Mechanical ventilation refers to a vital supportive treatment applied in an intensive care unit (ICU) to address critically-ill patients, with respiratory failure, and other life-threatening diagnoses<sup>1,2</sup>.

Regardless of its clinical advantages, there are numerous complications that are related to prolonged

mechanical ventilation and may adversely impact patient outcomes, such as infection, prolonged hospitalization, and even mortality<sup>3</sup>. These complications pose a significant burden on the healthcare systems and seriously raise treatment costs.

Oral hygiene is an important aspect of nursing care in the case of mechanically ventilated patients<sup>4</sup>. The mouth acts as a reservoir of pathogenic microorganisms that can colonize the respiratory tract especially in patients under intubation<sup>5</sup>. The existence of an endotracheal tube interferes with the micro-aspiration of oral secretions and the natural defense mechanisms, which leads to the fact that respiratory complications and prolonged ventilation using mechanical ventilation are under the threat of development<sup>6</sup>.

The focus on preventive nursing interventions to enhance the outcomes of the mechanically ventilated patients has become an object of growing interest in recent years<sup>7</sup>. They have proposed oral care interventions (brushing teeth, antiseptic mouth rinsing,

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oral moisturization, etc.) as the possible methods of the elimination of the bacterial colonization and enhancement of patient recovery<sup>8</sup>. Formulated oral hygiene guidelines can help improve respiratory, as well as help diminish the complications linked to prolonged ventilation<sup>9</sup>.

Although a number of studies have investigated the contribution of oral care to prevention of ventilator-associated pneumonia (VAP), not much literature has explored the overall clinical outcomes of these measures<sup>10,11</sup>. The length of time on mechanical ventilation, length of stay in ICU, and patient mortality are the key parameters of patient recovery and medical effectiveness<sup>12</sup>.

Thus, the objective of the given randomized controlled trial was to assess the effect of organized adjuvant oral care on clinical outcomes in mechanically ventilated ICU patients. The research question was particularly whether the use of a structured oral care protocol would be able to decrease the time on mechanical ventilation, decrease the length of stay on ICU and improve survival.

## METHODS

To assess the effectiveness of structured oral care on clinical outcome of mechanically ventilated patients in the ICU, a randomized controlled trial with a parallel group design was used to compare the effects of structured oral care on outcomes in this group. A total of 30 July 2024 to 3 January 2025 were the 6 months that data were gathered at the Services Hospital Lahore, Pakistan, after ethical consent was granted by the University of Health Sciences, Lahore. The smallest sample size was estimated 50 participants per group, with 80 percent power of study, 95 percent confidence interval, and 37.8 percent ventilator-associated pneumonia (VAP) incidence in the study group and 62.2 percent in the control group using the WHO Sample Size 2.0 formula with the standardized Z-values of 1.96 and 0.842. One-hundred participants were sampled with the help of non-probability consecutive, and randomly assigned to either intervention or control group with the help of computer-generated random numbers, which led to 50 patients in each group. The criteria used to select patients included being 18 years and above, invasive mechanically ventilated, and admitted to the ICU within the study period. Patients that were not at ICU at the time of pneumonia onset, were inherently unable to undergo oral care procedures and those who were anticipated to be on mechanical ventilation less than 24 hours were excluded. The intervention group members were provided with oral adjuvant care together with routine ICU care that included brushing of teeth with soft toothbrush that was moistened with chlorhexidine solution, application of 0.2% chlorhexidine oral rinse, cleaning of the oral cavity using wet swabs and oral moisturization, which

was administered twice daily during a period of about five days. The control group was provided with regular oral attention according to the normal ICU practice including suctioning of the oral secretions, regular mouth cleaning, and antiseptic mouth rinsing as needed. The major outcomes measured were the length of mechanical ventilation, length of ICU stay and ICU mortality. Age, gender, smoking history and comorbid conditions were gathered as baseline demographic and clinical outcomes were monitored during the ICU stay. Analysis of data was done using Statistical Package of Social Sciences (SPSS) whereby the continuous variables were measured in terms of mean and standard deviation and the categorical variables measured in terms of frequencies and percentages. The comparisons of continuous variables between groups were done with the help of independent sample t-tests, whereas the comparisons of categorical variables were carried out and chi-square tests were utilized with a statistical significance level of  $p < 0.05$ .

## RESULTS

One hundred patients were involved in the study, half of them were in the intervention group and the other half in the control group. The average age of the people who participated in the intervention population was  $48.71 \pm 10.54$ , and the average age of the population who participated in the control group was  $48.83 \pm 11.60$ . Base line demographic characteristics were not significantly different between the groups, which means that the randomization was successful (Table 1).

**Table No. 1: Baseline Characteristics of Study Participants**

Variable	Intervention Group (n=50)	Control Group (n=50)
Age (years) Mean $\pm$ SD	$48.71 \pm 10.54$	$48.83 \pm 11.60$
Male n (%)	30 (60%)	32 (64%)
Female n (%)	20 (40%)	18 (36%)
Smoking History n (%)	16 (32%)	18 (36%)
Comorbidities n (%)	21 (42%)	23 (46%)

The average ICU length of stay was much low in the intervention group than in the control group. Mean ICU stay among patients who were given structured oral care was  $12.28 \pm 7.15$  days compared with the patients in the control group who faced an average stay of  $16.57 \pm 8.75$  days ( $p = 0.009$ ). Equally, the intervention group had a considerable shortening of the mechanical ventilation time. The mean hospitalization of the patients under the oral care intervention of  $11.19 \pm 6.97$  days versus  $15.46 \pm 8.67$  days in the control group ( $p = 0.008$ ). (Table 2)

**Table No. 2: Comparison of Clinical Outcomes Between Groups**

Outcome	Intervention Group Mean±SD	Control Group Mean ± SD	t-value	p-value
ICU Length of Stay (days)	12.28 ± 7.15	16.57 ± 8.75	2.682	0.009
Mechanical Ventilation Duration (days)	11.19 ± 6.97	15.46 ± 8.67	2.710	0.008

The intervention group also was better in terms of mortality outcomes. The death rate among the interventional group was 44/66 respectively. Such results imply that systematic oral care can help to achieve better outcomes among mechanically ventilated ICU patients. (Table 3)

**Table No. 3: Patient Outcomes During ICU Stay**

Outcome	Intervention Group (n=50)	Control Group (n=50)	p-value
Discharged	28 (56%)	17 (34%)	0.028
Expired	22 (44%)	33 (66%)	

## DISCUSSION

Results of the present randomized controlled study indicate that among mechanically ventilated patients in an ICU, structured oral care is linked to better clinical outcomes. The patients who were subjected to the oral care intervention had much shorter mechanical ventilation and ICU stay periods than those who were provided with regular care.

The decrease in the mechanical ventilation time that has been observed in this paper could be explained by an increase in oral hygiene and a decrease in bacterial colonization of the oral mouth. Oral cleanliness of intubated patients can contribute to the prevention of the buildup of pathogenic microorganisms that can potentially disrupt the respiratory system and slow down the recovery rate<sup>13</sup>.

Equally, the intervention group had the shorter length of stay at ICU, which implies positive clinical outcomes and reduced complications in the treatment process. The improvement of ICU stay is especially crucial, since the long-term ICU admission can be linked with high cost of healthcare delivery and predisposition to hospital-acquired infection<sup>14</sup>.

The intervention group also performed better as far as mortality results are concerned. Even though baseline mortality of critically ill ICU patients is high, the reduced mortality rate of the intervention group indicates that structured oral care could be a part of the overall improved patient outcomes<sup>15</sup>.

The results agree with the earlier studies that show the significance of oral hygiene interventions in acutely ill patients<sup>16</sup>. Some studies have also stated that oral care protocols conducted in a structured manner may minimize respiratory complications and enhance recovery in the patients who are under mechanical ventilation<sup>7,17</sup>.

Clinically, these findings demonstrate the significance of integrating the structured oral care protocols in the routine ICU nursing practice<sup>18</sup>. Oral hygiene interventions are quite easy, inexpensive and can be undertaken by the nursing staff without the need to have complicated equipment and a lot of resources<sup>9</sup>.

But this work also has a number of drawbacks. The research was also based in one health facility and this might affect the external validity of the research results to other clinical environments. Moreover, the sample size was also rather small, and multi-centre trials can be needed to verify the findings.

## CONCLUSION

This study proves that structured oral care is linked to better clinical outcomes in the cases of mechanically ventilated ICU patients. Intervention markedly decreased length of mechanical ventilation and length of stay in the ICU and had a lower mortality than usual care. The findings are relevant to the suggestion that structured oral hygiene regimes should be integrated into the routine ICU nursing practice to enhance patient recovery and reduce complications related to mechanical ventilation.

### Author’s Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Akash Samuel, Saira Khalid
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Agreement to accountable for all aspects of work:	All the above authors

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