# "A STUDY TO ASSESS THE IMPACT OF STRUCTURED EDUCATIONAL PROGRAMME ON COGNIZANCE REGARDING PREVENTION AND MANAGEMENT OF MECHANICAL VENTILATION RELATED COMPLICATIONS AMONG NURSING STUDENTS FROM SELECTED NURSING COLLEGES OF PUNE"

**Dr. Jaya Deshmukh[1] Dr. Shivcharan Singh Gandhar[2]**
**Mr. Vishvajeet Karde[3]Mr. Aniket Jogdande[4] Mr. Saurabh Kanojiya[5]**
Associate Professor, MAEER'S Vishwaraj Institute of Nursing , Pune
Principal, MAEER'S Vishwaraj Institute of Nursing , Pune
B.Sc Nursing Final year Students MAEER'S Vishwaraj Institute of Nursing , Pune

**ABSTRACT**

**Introduction**: According to WHO, 8.7% of patients Hospital acquired infection with mortality rate as high as 50%. In Europe, United states, and Asia Ventilator associated pneumonia rates range from 9- 40%, and as high as 78 %. Ventilator associated pneumonia is associated with a prolonged stay in ICU and is the leading cause of death from hospital acquired infection. Globally, complications related to mechanical ventilation continue to be a major challenge in critical care practice.

**Title of the Study**: A study to assess the impact of structured education programme on cognizance regarding prevention and management of mechanical ventilation related complications among nursing students from selected nursing colleges of Pune.

**Methodology**: The study adopted a pre-test post-test design to assess the effectiveness of a structured education programme on 60 nursing students' knowledge of mechanical ventilation–related complications, with data analyzed using descriptive and inferential statistics. A pilot study was conducted to test feasibility. Data were analysed using descriptive and inferential statistics.

**Results**: The study on 60 nursing students in Pune revealed that pre-test cognizance regarding the prevention and management of mechanical ventilation–related complications was mostly average (68%), with a mean score of $12.63 \pm 4.48$. Following the structured educational programme, post-test cognizance improved significantly, with 40% achieving good and 32% excellent levels, and an overall mean score of $20.08 \pm 5.67$ ($t=9.54$, $p=0.00001$). Post-test cognizance was not significantly associated with any demographic variables, indicating that the intervention effectively enhanced knowledge across all groups.

**Conclusion**: The study concluded that the Structured Education Programme effectively improved nursing students' knowledge regarding prevention and management of mechanical ventilation–related complications, with significant post-test improvement and no association with demographic variables.

**Keywords**: Assess, impact, structured education programme, cognizance, prevention, management, mechanical ventilation complications, nursing students, nursing colleges.

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## INTRODUCTION

When the respiratory system fails to function adequately, resulting in impaired gas exchange, the supportive device like mechanical ventilator is required. Mechanical ventilator is a positive pressure breathing device by which air and/or oxygen is forced into the lungs intermittently in a manner resembling normal breathing. Mechanical ventilation may be required for a variety of reasons, including the need to control the patient's respiration during surgery or during treatment of severe head injury, to oxygenate the blood when the patient's respiratory efforts are inadequate and to provide rest to the respiratory muscles.[1]

Mechanical ventilation is warranted for patients who have acute respiratory failure and are unable to maintain normal gas exchange. Respiratory failure occurs from impaired alveolar ventilation or

decreased pulmonary vascular perfusion. The outcome of respiratory failure is life-threatening hypoxemia. Respiratory failure may result from an acute process, such as airway obstruction or pulmonary embolus, or an exacerbation of a chronic pulmonary disease. An example of the latter is chronic obstructive pulmonary diseases in which superimposed pneumonia develops.[2]

Mechanical ventilation is indicated when a patient's spontaneous breathing is inadequate to maintain life. It may be indicated in anticipation of imminent respiratory failure, acute respiratory failure, acute hypoxemia, or prophylactically. Because mechanical ventilation serves only to provide assistance for breathing and does not cure a disease, the patient's underlying condition should be identified and treated in order to liberate them from the ventilator.[3]

Mechanical ventilation is often a life-saving intervention, but carries potential complications. A common complication of positive pressure ventilation stemming directly from the ventilator settings include volutrauma and barotrauma. Others include pneumothorax, subcutaneous emphysema, pneumomediastinum, and pneumoperitoneum.[4]Ventilator-associated complications commonly increase morbidity and mortality. They may also prolong the duration of mechanical ventilation and the length of stay in the hospital or the intensive care unit (ICU), with increased health care costs. Safe, effective therapeutic and preventative strategies often require multidisciplinary collaboration and are fundamental in mitigating poor outcomes from ventilator-associated events.[5]

## NEED OF THE STUDY

Ventilator associated pneumonia is associated with a prolonged stay in ICU and is the leading cause of death from hospital acquired infection. 40% of ventilator associated pneumonia is poly microbial. The European cooperative group on nosocomial pneumonia found aerobic gram-ve rods to be causative in 53%, staphylococcus species in 26% and anaerobes in patients is upto 75% of ventilated patients. The mortality is 24-71%.[6]

Globally, complications related to mechanical ventilation continue to be a major challenge in critical care practice. Ventilator-associated pneumonia (VAP) remains the most frequent complication, with an estimated prevalence of 1–5 cases per 1,000 ventilator-days in developed countries and 10–20 per 1,000 ventilator-days in developing nations.[7]

In India, the prevalence of complications associated with mechanical ventilation remains higher compared to global averages due to limited resources, overcrowded ICUs, and variable adherence to infection control guidelines. Studies have shown that the incidence of VAP ranges from 10–25 per 1,000 ventilator-days, while barotrauma and oxygen toxicity occur in about 8–10% of patients receiving prolonged mechanical ventilation.[8]

At the state level, Maharashtra shows similar trends in ventilator-associated complications. Hospital-based surveillance reports indicate that the prevalence of VAP varies between 12–22 per 1,000 ventilator-days, especially in tertiary hospitals in urban regions such as Pune and Mumbai.[9]

A hospital-based study in a Pune tertiary care hospital found that 28.3% of mechanically ventilated patients developed VAP, with high mortality and prolonged ICU stay. Another Pune study noted VAP incidence of 22.4 per 1,000 ventilator-days, highlighting poor adherence to ventilator bundles.[10]

Nursing students, being the future frontline caregivers in critical care settings, need to be adequately prepared with knowledge and skills to prevent and manage such complications. A structured educational programme serves as an effective strategy to enhance their cognizance, improve adherence to preventive measures, and ensure patient safety. Therefore, the researchers have chosen this study to assess the impact of structured educational intervention among third-year nursing students, with the ultimate goal of reducing the burden of mechanical ventilation–related complications in clinical practice.

## MATERIALS AND METHODS

The present study adopted a quantitative research approach to assess the impact of a structured education programme on cognizance regarding the prevention and management of mechanical ventilation-related complications among nursing students. A pre-experimental one-group pre-test post-test research design was employed. The target population comprised all Second Year (3rd Semester) B.Sc. Nursing students studying in selected nursing colleges of Pune, while the accessible population included students who were present during the study period and fulfilled the inclusion criteria. A total of 60 nursing students were selected using a non-probability purposive sampling technique. The inclusion criteria included students currently enrolled in the Second Year (3rd Semester) B.Sc. Nursing programme, those willing to participate in the study, and those able to

understand and communicate in English. Students who had previously attended any structured educational programme related to mechanical ventilation-related complications were excluded from the study.

Data were collected using a structured cognizance questionnaire developed after an extensive review of literature, standard nursing textbooks, and evidence-based guidelines. The research tool consisted of two sections: Section I included socio-demographic variables, while Section II comprised a structured questionnaire containing 30 multiple-choice questions to assess cognizance regarding the prevention and management of mechanical ventilation-related complications. Following the pre-test, a structured education programme was administered using lectures, audiovisual aids, case-based discussions, and interactive teaching methods. A post-test was conducted after seven days using the same questionnaire to evaluate the effectiveness of the intervention. Content validity of the tool was established through expert review from various nursing specialties, and reliability was assessed using the test-retest method with Karl Pearson's correlation coefficient, yielding an r-value of 0.9627. A pilot study was conducted on six nursing students to assess the feasibility of the study and to finalize the research methodology and statistical analysis. The collected data were analysed using descriptive and inferential statistics, including frequency, percentage and graphical presentation through tables and charts to interpret the findings and determine the effectiveness of the structured education programme.

## RESULTS

## SECTION I

## DESCRIPTION OF SAMPLE ACCORDING TO DEMOGRAPHIC

**Table no.1: Description of sample according to demographic data**

**N = 60**

| Demographic Variables | F | % |
|---|---|---|
| **1. Age (years)** | | |
| a. 18-19 years | 28 | 47 |
| b. 20-21 years | 29 | 48 |
| c. 21-22 years | 3 | 5 |
| d. Above 22 years | 0 | 0 |
| **2. Gender** | | |
| a. Male | 9 | 15 |
| b. Female | 51 | 85 |
| c. Other | 0 | 0 |
| **3. Type of College** | | |
| a. Government | 0 | 0 |
| b. Private | 56 | 93 |
| c. Deemed/Autonomous | 4 | 7 |
| **4. Clinical exposure to ventilated patients** | | |
| a. Yes | 38 | 63 |
| b. No | 22 | 37 |
| **5. Previous theory classes about mechanical ventilation?** | | |
| a. Yes | 41 | 68 |
| b. No | 19 | 32 |

The table no.1 shows that the demographic profile of the 60 nursing students showed that the majority of participants were aged 20–21 years (48%), followed closely by those aged 18–19 years (47%), while only 5% were aged 21–22 years, and none were above 22 years of age. Most participants were female (85%), whereas males constituted 15% of the sample. Regarding the type of college, the majority of students (93%) belonged to private nursing colleges, while 7% were from deemed/autonomous colleges, and none were from government colleges. Nearly two-thirds of the participants (63%) had prior clinical exposure to mechanically ventilated patients, whereas 37% had no such exposure. Additionally, 68% of the students had previously attended theory classes on mechanical ventilation, while 32% had not. Overall, the findings indicate that the study participants were predominantly female students from private nursing colleges, with most having prior theoretical knowledge and clinical exposure related to mechanical ventilation

## .SECTION II

**Data related to assess the on cognizance regarding prevention and management of mechanical ventilation related complications among nursing students from selected nursing colleges of Pune.**

**Table No. 2 Data of Pre-test Cognizance regarding prevention and management of mechanical ventilation related complications among nursing students**

| Level of Pre-test Cognizance | F | % | Mean | SD |
|---|---|---|---|---|
| Poor (0-7) | 3 | 5 | 12.63 | 4.48 |
| Average (8-15) | 41 | 68 | | |
| Good (16-23) | 15 | 25 | | |
| Excellent (24-30) | 1 | 2 | | |

The pre-test findings showed that most nursing students (68%) had an average level of cognizance regarding the prevention and management of mechanical ventilation-related complications. About one-fourth (25%) had good cognizance, while only 2% demonstrated excellent cognizance and 5% had poor cognizance. The mean pre-test score was 12.63 ± 4.48, indicating a moderate baseline level of cognizance. These findings suggest that although most students had basic knowledge, there was a need for a structured educational programme to improve their understanding of mechanical ventilation-related complications.

**Data related to assess the cognizance regarding prevention and management of mechanical ventilation related complications among nursing students after the intervention.**

**Table No.3 – Related to Post test cognizance regarding prevention and management of mechanical ventilation related complications among nursing students.**

| Level of post test Cognizance | F | % | Mean | SD |
|---|---|---|---|---|
| Poor (0-7) | 0 | 0 | 20.08 | 5.67 |
| Average (8-15) | 16 | 27 | | |
| Good (16-23) | 24 | 40 | | |
| Excellent (24-30) | 19 | 32 | | |

The post-test findings revealed a considerable improvement in nursing students' cognizance regarding the prevention and management of mechanical ventilation-related complications following the structured educational programme. None of the students had poor cognizance, while 27% demonstrated average, 40% good, and 32% excellent cognizance. The mean post-test score increased to 20.08 ± 5.67, indicating that the structured educational programme was effective in significantly enhancing the students' knowledge and understanding of mechanical ventilation-related complications.

**SECTION III**

**Data related to compare the pre-test and post-test mean cognizance scores of nursing students regarding prevention and management of mechanical ventilation related complications.**

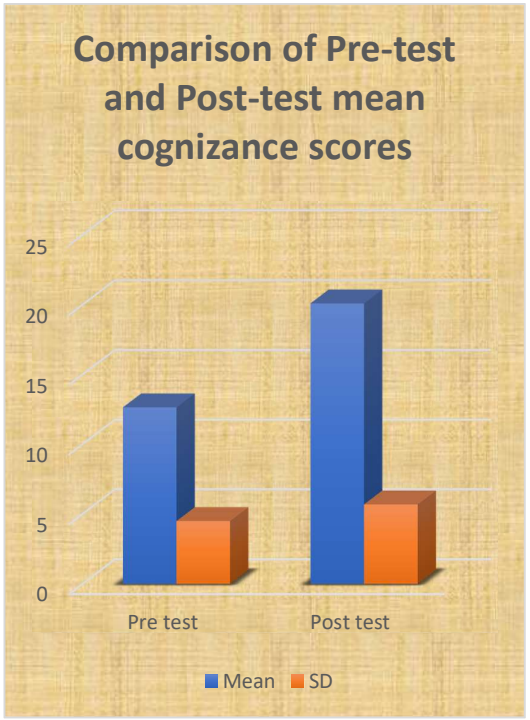


**Fig. No. 1 Comparison of the pre-test and post-test mean cognizance scores of nursing students**

The comparison of pre-test and post-test cognizance scores showed a significant improvement following the structured educational programme. The mean score increased from 12.63 ± 4.48 in the pre-test to 20.08 ± 5.67 in the post-test. The calculated t-value (9.54) with a highly significant p-value (0.00001) confirmed that the improvement was statistically significant and not due to chance. Therefore, the structured educational programme was effective in enhancing nursing students' cognizance regarding the prevention and management of mechanical ventilation-related complications. Hence, the research hypotheses ($H_1$ and $H_2$) were accepted, and the null hypothesis ($H_0$) was rejected.

**SECTION- IV**

**Finding related to an association between cognizance with selected demographic variables.**

The analysis showed no statistically significant association between post-test cognizance regarding prevention and management of mechanical ventilation–related complications and any of the selected demographic variables, including age,

gender, type of college, clinical exposure to ventilated patients, and previous theory classes. All calculated chi-square values were lower than the respective table values, with p values greater than 0.05, indicating non-significance. This suggests that the improvement in cognizance was independent of demographic characteristics, confirming that the structured educational programme was equally effective across all groups of nursing students.

## DISCUSSION

The findings of the present study are consistent with the results reported by Karthi (2025), who evaluated the effectiveness of a structured educational programme on knowledge regarding care of patients on mechanical ventilators among B.Sc. Nursing III-year students in Villupuram. In the present study, nursing students demonstrated a moderate level of cognizance in the pre-test (Mean = 12.63 ± 4.48), which significantly improved in the post-test (Mean = 20.08 ± 5.67) following the structured education programme. Similarly, Karthi (2025) reported a notable improvement in knowledge scores, with the pre-test mean of 14 ± 3.316 increasing to a post-test mean of 19.5 ± 2.915, and a statistically significant t value of 12.78 ($p < 0.05$).

Both studies employed a pre-experimental one-group pre-test post-test design and used structured questionnaires to assess knowledge or cognizance related to mechanical ventilation. Furthermore, the findings of both studies revealed no statistically significant association between post-test knowledge/cognizance levels and selected demographic variables, indicating that the effectiveness of the structured educational programme was independent of demographic characteristics.

The present study demonstrated a significant improvement in nursing students' cognizance regarding the prevention and management of mechanical ventilation–related complications after the structured education programme. The increase in post-test scores indicates that planned teaching effectively enhanced students' understanding of mechanical ventilation care.

These findings are consistent with the study conducted by Chauhan and Patel among final-year B.Sc. nursing students in Gujarat, which reported poor baseline knowledge in the pretest and a significant improvement in post-test knowledge following a structured teaching programme ($p < 0.05$). Both studies used a pre-experimental one-group pre-test post-test design and structured questionnaires to assess knowledge outcomes.

Overall, the similarity in findings supports the conclusion that structured teaching programmes are effective in improving nursing students' knowledge and cognizance related to mechanical ventilator care, thereby strengthening their preparedness for clinical practice.

## CONCLUSION:

The present study concluded that nursing students had average to inadequate cognizance regarding the prevention and management of mechanical ventilation–related complications before the intervention. In the pre-test, the majority of students had average cognizance (68%) and poor cognizance (5%), with a mean score of 12.63 ± 4.48. After the administration of the structured education programme, a significant improvement in cognizance was observed, with most students attaining good (40%) and excellent (32%) levels of cognizance and an increased mean score of 20.08 ± 5.67. The difference between pre-test and post-test cognizance scores was statistically significant ($t = 9.54$, $df = 59$, $p = 0.00001$), confirming the effectiveness of the structured education programme. No statistically significant association was found between post-test cognizance and selected demographic variables, indicating that the intervention was effective across all groups of nursing students.

## DECLARATION BY AUTHORS:

**Ethical Approval:** The study was approved by the institutional ethics committee of MAEER'S Vishwaraj Institute of Nursing, Pune. The study participants were briefed about the purpose and nature of the study and written informed consent was obtained before data collection.

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**Conflict of Interest:** The authors declare no conflict of interest.

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