

Effectiveness of Nursing Intervention on Knowledge Regarding Care of Patients on Mechanical Ventilator Among Health Care Workers At Selected Hospitals of Jaipur

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ABSTRACT

Mechanical ventilation is an important life-support intervention used for critically ill patients with respiratory failure or compromised airway function. Safe care of patients on mechanical ventilator requires adequate knowledge regarding airway management, ventilator settings, suctioning, infection prevention, monitoring, prevention of ventilator-associated complications and timely response to clinical changes. Health care workers play a key role in providing continuous care to mechanically ventilated patients; therefore, structured nursing intervention may improve their knowledge and promote quality patient care.

Objectives: The study aimed to assess the pre-test and post-test knowledge of health care workers regarding care of patients on mechanical ventilator, determine the effectiveness of nursing intervention in terms of gain in knowledge, and find the association between pre-test knowledge score and selected demographic variables.

Methods: A quantitative research approach with quasi-experimental design was adopted for the study. The study was conducted among 60 health care workers working at Liberty Hospital, Jaipur. Participants were selected by simple random sampling technique. A structured knowledge questionnaire was used to assess knowledge regarding care of patients on mechanical ventilator. The reliability of the knowledge questionnaire was found to be 0.82. Data were collected from 04/10/2025 to 30/10/2025 after obtaining formal administrative permission and informed consent from participants.

Results: In the pre-test, 8 (13.33%) health care workers had poor knowledge, 29 (48.33%) had average knowledge and 23 (38.33%) had good knowledge. In the post-test, 1 (1.67%) had poor knowledge, 9 (15%) had average knowledge and 50 (83.33%) had good knowledge. The mean pre-test knowledge score was 30.11 out of 39, which increased to 35.81 out of 39 in the post-test. The mean difference was 5.7. The calculated paired t value was 8.87 at 59 degrees of freedom, which was statistically highly significant at $p < 0.001$.

Conclusion: The study concluded that nursing intervention was effective in improving knowledge of health care workers regarding care of patients on mechanical ventilator. Regular in-service education and training programmes are recommended to improve safe ventilator care practices.

Keywords: Mechanical ventilator; nursing intervention; health care workers; knowledge; ventilator care.

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INTRODUCTION

Mechanical ventilation is a major life-saving intervention used for critically ill patients who are unable to maintain adequate airway protection, ventilation or oxygenation independently. It is commonly indicated in conditions such as airway compromise, hypoventilation, hypoxemic respiratory failure, severe sepsis, shock, acute respiratory distress syndrome, pneumonia, trauma and neurological impairment [1,2]. Although mechanical ventilation supports gas exchange and reduces the work of breathing, its safe use requires sound clinical knowledge regarding ventilator modes, tidal volume, respiratory rate, positive end-expiratory pressure, fraction of inspired oxygen, humidification, airway suctioning, alarm response, sedation monitoring, weaning readiness and prevention of complications [1].

Patients receiving invasive mechanical ventilation are highly vulnerable to complications such as ventilator-associated pneumonia, ventilator-

associated events, airway trauma, secretion retention, atelectasis, barotrauma and ventilator-induced lung injury. Ventilator-associated pneumonia is among the most frequent intensive care unit-acquired infections, with reported incidence varying from 5% to 40% depending on setting and diagnostic criteria, and with an estimated attributable mortality of about 10% [3]. The Centers for Disease Control and Prevention classifies ventilator-associated events into ventilator-associated condition, infection-related ventilator-associated complication and possible ventilator-associated pneumonia, reflecting the need for systematic surveillance and prevention [4,5].

Health care workers, especially nurses and bedside critical care personnel, have continuous contact with mechanically ventilated patients and are central to safe ventilator care. Evidence-based practices such as hand hygiene, head-end elevation, oral care, suctioning precautions, prevention of

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unnecessary intubation and reintubation, minimization of sedation and early mobilization are recommended to reduce preventable complications [6]. However, studies have shown variable knowledge and practice among critical care nurses. An Indian study reported that 75.93% of ICU nurses had average knowledge and 94.44% had average practice regarding VAP prevention [7]. Therefore, structured nursing intervention may improve knowledge and promote safer care of mechanically ventilated patients.

NEED OF THE STUDY

The need for this study arises from the increasing use of mechanical ventilators in critical care areas and the high level of technical knowledge required for safe patient management. Mechanical ventilation is not merely an equipment-based therapy; it is a complex clinical intervention requiring continuous assessment, early identification of complications, infection prevention, maintenance of airway patency, monitoring of oxygenation and coordination with the multidisciplinary team [1,6]. Inadequate knowledge among health care workers may contribute to delayed response to ventilator alarms, improper suctioning, poor oral hygiene, ineffective positioning, inadequate infection-control practices and reduced adherence to ventilator care bundles.

The clinical burden of ventilator-related complications further strengthens the need for educational interventions. VAP is associated with prolonged ventilation, increased ICU stay, higher cost of care and increased mortality [3]. In an Indian intensive care setting, 122 out of 500 ICU admissions received mechanical ventilation for more than six hours, demonstrating the routine requirement of ventilatory support in critical care practice [8]. International and Indian studies have also reported that knowledge and practice gaps persist among nurses caring for ventilated patients. Kalyan et al. found that most ICU nurses had only average knowledge and average practice regarding VAP prevention, and knowledge was not significantly associated with practice, indicating the need for focused training and reinforcement [7]. Similarly, Getahun et al. reported that 51.96% of ICU nurses had poor knowledge regarding VAP prevention, and ICU training was significantly associated with better knowledge [9].

Educational interventions have shown positive results in improving ventilator-related competencies. A Quasi-experimental study in Bangladesh reported significant improvement in nurses' knowledge, skills, practice, motivation and work engagement after evidence-based training and mentoring ($p < 0.001$) [10]. Another quasi-experimental study from Lahore demonstrated significant improvement in nurses' knowledge and practice after educational guidelines on VAP prevention ($p < 0.001$) [11]. Hence, the present study

was undertaken to assess the effectiveness of nursing intervention on knowledge regarding care of patients on mechanical ventilator among health care workers at selected hospitals of Jaipur and to identify associations between pre-test knowledge and selected demographic variables.

OBJECTIVES

1. To assess knowledge of health care workers regarding care of patients on mechanical ventilator by pre test and post test.
2. To determine the effectiveness of nursing intervention interns of gain in knowledge of the health care workers.
3. To find out the association between pre test knowledge score of the health care workers with their selected demographic variables.

HYPOTHESIS

- ❖ **H₁:** There will be a significant difference between pre and post-test knowledge mean scores of health care workers regarding care of a patient on mechanical ventilator.
- ❖ **H₂:** There will be a significant association of knowledge scores of health care workers with their selected demographic variables.

RESEARCH METHODOLOGY

The research approach adopted for this study was quantitative approach. This approach is considered by the investigator as the most suitable one for this study. The quasi experimental research design was considered as the appropriate design for this study. The purpose of quasi experimental research design is to describe the variables and examine relationships among these variables. In this study independent variable "refers to nursing intervention on care of patients on mechanical ventilator." In this study knowledge of health care workers regarding care of patients on mechanical ventilator was the dependent variable. The demographic variables include age, gender, educational qualification, year of experience in nursing, current work area and previous knowledge about mechanical ventilator. This study was undertaken in selected hospital of Jaipur namely Liberty hospital Jaipur. The 60 health care workers working in Liberty hospital Jaipur were selected through simple random sampling technique. The reliability of the tool found knowledge questionnaire 0.82 and after calculated given for statistical analysis.

The health care workers from Liberty hospital Jaipur were selected for the study by using the simple random sampling technique. Formal administrative permission was obtained from the concerned authorities of the hospitals. Data was collected from 04/ 10/2025 to 30/10/2025 at

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Liberty hospital Jaipur. The purpose of study was explained to the health care workers and an informed consent was taken before starting the study. There was no attrition of subjects.

RESULTS

Section I: Description Of Demographic Characteristics Of The Health Care Workers.

Table no. 1: Frequency and percentage distribution of health care workers

S. No.	Variables	Frequency	Percentage
1.	Age		
	20 – 25 years	17	28.33%
	26 – 30 years	25	41.67%
	31 – 35 years	11	18.33%
	36 years and Above	7	11.67%
2.	Gender		
	Male	33	55%
	Female	27	45%
	Other	00	00%
3.	Educational qualification		
	Diploma in Nursing	23	38.33%
	B.Sc. Nursing	19	31.67%
	Post graduate degree	13	21.67%
	Other	5	8.33%
4.	Years of experience in Nursing		
	Less than 1 years	21	35%
	1 – 3 years	20	33.33%
	4 – 6 years	15	25%
	More than 6 years	4	6.67%
5.	Current work area		
	ICU	12	20%
	Emergency Department	17	28.33%
	General Ward	16	26.67%
	Other (Specify).....	15	25%
6.	Previous knowledge about mechanical ventilator		
	Yes	29	48.33%
	No	31	51.67%

The table no. 1 represent that Majority 25 (41.67%) samples were from the 26 – 30 years of age. most of 33 (55%) samples were male, most of 23 (38.33%) samples were have completed diploma in nursing, most of 21 (35%) samples were have less than 1 year of experience, most of 17 (28.33%) samples were work in emergency department and most of 31 (51.67%) samples have not any previous knowledge about mechanical ventilator.

Table No. 2: Level of knowledge of health care workers regarding care of patients on mechanical ventilator by pre test and post test

S. N o.	Aspe ct	Pre Test		Post Test	
		Frequ ency	Perce ntage	Frequ ency	Perce ntage
1.	Poor <50 %	08	13.33%	01	1.67%
2.	Average 51 – 75%	29	48.33%	09	15%
3.	Good > 75%	23	38.33%	50	83.33%

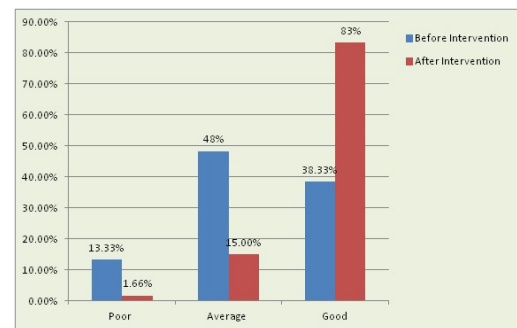


Fig. No. 1: Column diagram showing the level of knowledge of health care workers by pre test and post test

The above table no. 2 and figure no. 1 showed the level of knowledge regarding care of patients on mechanical ventilator. With regard to knowledge scores, 08 (13.33%) health care workers had poor knowledge, 29 (48.33%) health care workers had average knowledge and 23 (38.33%) health care workers had good knowledge regarding care of patients on mechanical ventilator in pre test whereas 01 (1.67%) health care workers had poor knowledge, 09 (15%) health care workers had average knowledge and 50 (83.33%) health care workers had good knowledge regarding care of patients on mechanical ventilator in post test.

Table – 3: Mean, median and SD of pre test and post test

S. No .	Aspect Of Knowled ge	Max . Scor e	Mea n	Media n	Standa rd Deviati on
1.	Pre test	39	30.11	30	± 2.70
2.	Post test	39	35.81	36	± 3.66

The above table no. 3 shows the summary of statistical outcomes of pre test and post test

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knowledge scores of health care workers regarding care of patients on mechanical ventilator. The nursing intervention used to collect the data. The pre test mean is 30.11 while post test mean is 35.81, the pre test median is 30 whereas the post test median is 36 and standard deviation for pre test is ± 2.70 and ± 3.66 for post test.

Table 4: Mean, median, SD and t value of knowledge level

S. No.	Knowledge	Mean	Median	SD	Mean difference	Df	t value	p value
1.	Pre Test	30.11	30	2.70	5.7	59	8.87	0.001
2.	Post test	35.81	36	3.66				

The above table no. 4 revealed that the pre test mean score of health care workers is 30.11 while 35.81 for post test with 5.7 mean difference. The median is 30 for the pre test and 36 is for post test. The SD is 2.70 for pre test and 3.66 for post test. The t value is 8.87 at 0.001 p value. This value is obtained by paired t test. The calculated value of t (8.87) is more than the tabulated value (1.96) at 0.05 level of significance.

Here the calculated value i.e. 8.87 is more than the tabulated value i.e. 1.96; so we can say that the nursing intervention regarding care of patients on mechanical ventilator is effective for health care workers. In other words we can say that nursing intervention is beneficial for health care workers to improve the level of knowledge regarding care of patients on mechanical ventilator. The hypothesis H_1 is accepted.

DISCUSSION

The present study assessed the effectiveness of nursing intervention on knowledge regarding care of patients on mechanical ventilator among 60 health care workers at selected hospitals of Jaipur. The demographic findings showed that the majority of participants were in the age group of 26–30 years (41.67%), followed by 20–25 years (28.33%). More than half were males (55%), and most had Diploma in Nursing (38.33%) or B.Sc. Nursing qualification (31.67%). In relation to clinical experience, 35% had less than one year of experience and 33.33% had 1–3 years of experience, indicating that a large proportion of participants were early-career health care workers. This highlights the importance of structured in-service education for safe ventilator care.

The pre-test findings revealed that 13.33% of health care workers had poor knowledge, 48.33%

had average knowledge and 38.33% had good knowledge. After nursing intervention, knowledge improved markedly, as 83.33% achieved good knowledge, while only 1.67% remained in the poor category. The mean knowledge score increased from 30.11 in the pre-test to 35.81 in the post-test, with a mean difference of 5.7. The paired t-test value was 8.87 at 59 degrees of freedom, showing a statistically highly significant improvement at $p < 0.001$. Thus, the findings clearly indicate that nursing intervention was effective in improving knowledge regarding care of patients on mechanical ventilator.

The findings are consistent with Kalyan et al. [7], who reported that most ICU nurses had only average knowledge and practice regarding prevention of ventilator-associated pneumonia, suggesting the need for regular educational reinforcement. Similarly, Getahun et al. [9] found that only 48.04% of ICU nurses had good knowledge regarding VAP prevention and concluded that ICU training and higher academic qualification were significantly associated with better knowledge. The present study also supports Akhter et al. [10], who found significant improvement in nurses' knowledge, skills, practice and motivation after an evidence-based education and mentoring programme. Alvina et al. [11] also reported significant improvement in nurses' knowledge and practice after educational guidelines on VAP prevention. Therefore, the present study confirms that planned nursing intervention is an effective strategy for improving ventilator-care knowledge among health care workers.

CONCLUSION

The present study concluded that nursing intervention was effective in improving the knowledge of health care workers regarding care of patients on mechanical ventilator. The study was conducted among 60 health care workers at selected hospitals of Jaipur using a quasi-experimental research design. The demographic findings showed that most participants were young, had diploma or B.Sc. nursing qualification, and had comparatively less clinical experience, indicating the need for continuous professional education in critical care settings.

The pre-test findings showed that nearly half of the health care workers had average knowledge regarding mechanical ventilator care. After the nursing intervention, a substantial improvement was observed, with the majority of participants achieving good knowledge in the post-test. The mean knowledge score increased from 30.11 out of 39 in the pre-test to 35.81 out of 39 in the post-test, with a mean difference of 5.7. The paired t value of 8.87 at 59 degrees of freedom was statistically highly significant at $p < 0.001$.

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Thus, the study findings proved that the planned nursing intervention significantly improved knowledge among health care workers. Regular training programmes, skill updates and evidence-based teaching sessions should be organized for health care workers to promote safe ventilator care, prevent ventilator-associated complications and improve the quality of patient.

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