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Undergraduate Nursing Students' Knowledge and Attitude: Care of Patients Of Mechanical Ventilators

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Abstract

Objective: To determine the knowledge and attitude of student nurses about mechanical ventilators (MV) and analyze the impact of a one-week educational program. **Methods:** Fifty student nurses were included in a one-week training program about MV's fundamental favorable knowledge and attitude in January 2021 at MG nursing Institute, Tamil Nadu, India. Student nurses in critical nursing courses were assessed before an education program. A pre-validated survey questionnaire comprised of knowledge and attitude items was adopted to collect data before and after the training program (post-course assessment). The program adopted a lesson plan and simulation procedures for learning, and it took seven days to complete. **Findings:** According to the study's findings, 35 (70%) participants (student nurses) were females, and 15 (30%) were males. The pre-test knowledge and attitude were inadequate 74% and 12.64 (25%), respectively. In the post-test, it increased to adequate with 44% and 64%. The mean knowledge score pre-test MV assessment was 8.58 (17%), and the post-test was 19.18 (38%). While their attitude on the pre-test was 12.64 (25%), their post-test score was 32.38 (64%). There was a statistically significant difference between pre and post MV knowledge and attitude among student nurses. **Novelty:** Students' mean post-knowledge and attitude scores were higher than the pre-test at p<0.05. The findings indicate that the computer-assisted teaching program with simulation was significantly effective in improving the knowledge and attitude of student nurses on the care of mechanical ventilator patients. The study recommended using simulation techniques in the care of mechanical ventilator patients to enhance the knowledge and attitude of nurses and nursing students.

1 Introduction

Air enters and exits the lungs during ventilation, allowing the alveolar-capillary membrane to exchange gases. A process known as mechanical ventilation (MV) was developed and refined in the second part of the 20th century. The mortality rate of Intensive Care Unit patients who are mechanically ventilated is greater[1]. The risk is most commonly associated with insertion and placement, injuries of the lungs, and MV-associated pneumonia[2]. Care for ventilated patients necessitates thorough familiarity with ventilator processes and techniques to avoid potential complications[3]. Management of MV-related adverse consequences needs unique skills. It is mandatory to acquire specific knowledge and analyzing skills[4]. Nurses must have specialized knowledge and skills associated with mechanical ventilator management and be trained when they are students as baseline learners[2] . A higher level of competence and confidence is needed for nursing students before collaborating with the healthcare team and becoming registered nurses[5]. Appropriate unique skills are mandatory to manage MV-related complications such as pneumonia and hemodynamic instability[6]. A study among senior residents emphasized evidence-based training to guide them to follow instructions correctly. Critical care student nurses as healthcare providers play a crucial role in adopting the efficient practices of working with MV[7]. It is expected that student nurses should understand the criteria, the modes of ventilation delivery, and the most common associated strategies of early diagnosis of identifying ventilator-associated complications before their clinical placements[8]. About 80% of patients in intensive care units require mechanical ventilation, and nursing students' attention to care for patients receiving mechanical ventilation has become increasingly important[9]. In the simulation lab, nursing students learn the fundamentals of intensive care job responsibilities, such as airway care, posture, dental care, and immaculate hand hygiene[10]. Despite the students having health assessment (HA) training in their first year of nursing education, a study suggests that only 11–29% of the skills are acquired from HA, and fewer competencies from HA are applicable in ICU when students transit to critical training course[11,12]. ICU patients require an advanced high skilled approach to care to rely on specific KA to observe individuals with MV. Adequate knowledge with a good attitude is essential to guide appropriate quality nursing care. The student nurse is usually the "first-line manager" challenged with the patient- and ventilator-related problems. As a result, it is essential that student nurses thoroughly understand the basics of ventilator support, including ventilator modes, settings, practices during and before endotracheal suctioning and alarms. It is also vital to be skilled in promptly identifying and managing the standards of quality care of patients with MV and ventilator-related problems to provide optimal patient-centered care and prevent complications[13].

ICU students' trainees' crucial tasks are critical to preventing risk factors related to mechanical ventilators (MV). Trainee nurses must retrain themselves on properly caring for patients with MV by becoming familiar with the symptoms and treatment options. This study was conducted to assess the effectiveness of a computer-assisted teaching program on the knowledge and attitude of students' nurses regarding the care of patients with mechanical ventilators in a selected college at Coimbatore. Research questions are

What are the baseline knowledge and attitude regarding nursing care of patients with MVs among nursing students?

Is there an effect of an education program regarding nursing care of patients with MVs among nursing students?

Is there an association between demographic variables and post-test KA scores regarding patients with MVs among nursing students?

2 Methodology

A quasi-experimental one-group pre-test post-test study design was adopted to perform this research. The study population was the B.Sc. nursing students in the fourth year of their education at NG Institute of Paramedical Sciences. Nursing students enrolled in the fourth-year education that proposed the final bachelor's degree was fifty students. Students registered in the fourth/last academic year aged 21 and older available at the time of data collection and willing to participate in the study, were included in this research. Students registered in the first, second, and third academic year who were unwilling to participate and were absent at the data collection were excluded from participating.

The tool comprised two parts; part one included demographical variables of participants such as; age, sex, religion, previous knowledge regarding care of the patient in mechanical ventilator, sources of information, and duration of critical care course posting in the acute care. The survey tool had three parts. The second part had knowledge items (thirty) of the multiple-choice questionnaire (score 1-30), and the third part had attitude items (score 1-40). The knowledge scores were adequate at 21-30, moderate at 11-20. And inadequate 1-10. Ten attitude items adopted a four-point Likert scale ranging from Strongly Agree (score 4) to disagree Strongly (score 1). The total scores of the attitude scale were 40. The interpretation was 0-13 as poor, 14-26 as moderate, and 27-40 as a good attitude. The content validity was performed by submitting the tool with the specialty guide, field experts of the medical-surgical department, and statisticians. According to suggestions and recommendations of the experts, the tool was moderated.

The structured questionnaire was administered to student nurses by testing their credibility. It was done by test and re-test method. The value was r= 0.88. The structured questionnaire was found to be reliable. The reliability of the observational checklist was done by adopting inter rated method, the value was found to be r=0.85, so the observational checklist was found to be reliable.

The pilot study was conducted at the NG Institute of Paramedical Sciences in Coimbatore, and students enrolled were about 10% of the calculated sample size. On the same day, a structured teaching program regarding the care of the patients on a mechanical ventilator was done. After seven days, post-test, kA was assessed using the same structured questionnaire and checklist on the patient's care on a mechanical ventilator. Based on the test results, some questions were modified, and the participants from whom the pilot was conducted were excluded from the study result.

The permission was obtained from the chairperson of the NG Institute of Paramedical Sciences, Coimbatore. Data was collected from the participants before and after the Computer-assisted teaching program. Students consented to be the study participants after getting their consent.

The data were analyzed by SPSS version 20, using descriptive and inferential statistics. Demographic characteristics of the study sample were analyzed and presented in table format as frequency and percentage. Knowledge and attitude levels were compared with participants' demographic data to determine the correlation using the Karl Pearson correlation and also presented in table format as frequency and percentage. Paired t-test was used to compare the knowledge and attitude of participants' mean of pre-test and post-test data. The correlation of knowledge and attitude regarding the care of the patients (MV) also were analyzed by Karl Pearson's correlation coefficient test to find the association between post scores of knowledge. P-value <0.05 was used to cut off the significance of the results.

3 Results and Discussion

Table 1 showed that the total number of participants was fifty, 35 (70%) were females, and 15(30%) were males. The majority of subjects, 46 (92%), were 21–22 years old, and 4 (8%) were over 22 years. About 30 (60%) were Hindu, 5 (10%) were Muslim, and 15 (30) were Christian. Regarding previous knowledge, the majority of them, 35 (70%), knew little details about the care of patients on mechanical ventilators, and 15 (30%) hadn't prior knowledge. Regarding the source of information, 20 (40%) have attended workshops and conferences, 5 (10%) students acquired an outline through colleagues, 10 (20%) had an opportunity to browse journals, and 15 (30%) happened to hear about it by mass media.

Table 2 depicts students' pre and post-scores on knowledge and attitude related to patients on mechanical ventilator care. In the pre-test, 74% were inadequate in knowledge, and 26% had a moderately adequate level of knowledge. None of them have scores above twenty-one out of thirty scores. In contrast, 22(44%) students were adequate knowledge in the post-test. This table also showed that students had a poor attitude regarding patients on mechanical ventilator care in the pre-test. At the same time, they demonstrated a 32 (64.0%) score of favorable in the post-test, followed by an 18 (36.0%) average score.

Table 1. Description of study sample according to their demographic information

Demographic Variables		Frequency (n)	Percentage (%)
	Male	15	30
Gender	Female	35	70
	Total	50	100
	21 - 22 years	46	92
Age in Years	Above 22 years	4	8
	Total	50	100
	Hindu	30	60
Religion	Muslim	5	10
	Christian	15	30
	Total	50	100
Previous knowledge regarding care of patients in mechanical ventilator	Yes	35	70
	No	15	30
	Total	50	100
	Workshop and Conferences	20	40
Sources of information	Colleagues	5	10
	Journals	10	20
	Mass Media	15	30
	Total	50	100
Duration of clinical posting in the critical care unit	Less than three months	10	20
	More than three months	40	80
	Total	50	100

Table 2. Distribution of pre and post-test scores on knowledge and attitude of participants (n=50)

Level of Knowledge and attitude		PRE-TEST	POST-TEST
	Inadequate knowledge	37(74%)	4(8.0)
Knowledge	Moderately adequate knowledge	13(26%)	24(48.0%)
	Adequate knowledge	0 (0.0%)	22(44.0%)
	Poor	44(88. %)	0(0.0%)
Attitude	Average	6(12.0%)	18(36.0%)
	Good	0(0.0%)	32(64.0%)

Table 3. Paired "t" test value of student pre and post-test scores Knowledge and Attitude (n=50)

Levels	Pre-test Mean± SD	Post-test Mean± SD	Paired 't' 'test value	Table value	Level of significance
Knowledge	8.58 ±3	19.18±5	13	2.001	P<0.005 significant
Attitude	12.64 ±5.99	32.38±3.7	19	2.001	P<0.005 significant

Legend p<0.005 Highly significant

Based on the Paired t-test, the Table 3 showed the effectiveness of a computer-assisted teaching program in increasing the knowledge and attitude of student nurses toward providing care for mechanically ventilated patients.

Table 4. Association between the post-test scores of knowledge among student nurses with their demographic variables (n=50)

Demographic information	Knowledge Score			Significant
	Adequate	Moderate adequate	Inadequate	
Age in years				c^2=1.8119 df=4 P>0.05 NS
21 - 22 years	33	10	3	
Above 22 years	2	2	0	
Gender				c^2=2.0941 df=2 P>0.05 NS
Male	10	3	2	
Female	25	9	1	
Religion				c^2=1.185 df=4 P>0.05 NS
Hindu	19	9	2	
Muslim	3	2	0	
Christian	11	3	1	
Previous knowledge regarding care of patients in mechanical ventilator				c^2=2.06 df=2 P>0.05 NS
Yes	20	12	3	
No	11	2	2	
Sources of information				c^2=3.00 df=6 P>0.05 NS
Workshop and Conferences	17	3	0	
Colleagues	4	0	1	
Journals	9	1	0	
Mass Media	13	2	0	
Duration of clinical posting in the critical care unit				c^2=1.96 df=2 P>0.05 NS
Less than three months	6	2	2	
More than three months	30	5	5	

The Table 4 reflected the association between post-test knowledge scores of student nurses with their demographic variables such as age, gender, religion, place of residence, education, sources of information, and ward. According to the Chi-square values, there was no significant association between post-test knowledge scores towards mechanical ventilators and demographic variables.

The Table 5 reflected the association between post-test attitude scores of student nurses with their demographic variables such as age, gender, religion, residence, education, sources of information, and ward. It revealed no significant association between post-test scores and demographic variables as reflected by the Chi-square values.

The Table 6 reflected the mean and mean percentage of knowledge questions and attitude scale. The pre-test score was 8.58 (17%) +3SD at a mean rate of 17, and the post-test score was 19.18 (38%+5SD at a mean rate of 38.

The research was conducted to explore student nurses' knowledge and attitude (KA) of caring for patients with mechanical ventilators among student nurses studying in a nursing college in Tamil Nadu. The KA education program regarding the patient's mechanical ventilator care was delivered after assessing participants' baseline KA. A post-test supported the researchers in identifying the significant difference in KA scores between pre and post-test to authenticate the effectiveness of an education program. Student nurses are developing the required KA while undergoing critical nursing courses and theoretical lectures; however, there would be the possibility of failures in recognizing the clinical deterioration of patients connected with ventilators when they are placed for hospital training[14]. Above fifty percent of health care providers lack knowledge, especially about weaning criteria[15] and low skills in the physical assessment of a patient with ventilators[16]. Our results concerning student knowledge and attitudes discovered that more than seventy percent of students exhibited inadequate mechanical ventilator patient care knowledge in the pre-test. Literature suggests that knowledge deficiency is one of the core factors for delivering low-quality care for severely ill patients in the ICU[17]. A study highlighted the lack of KA among nurses towards the professional care practices of critical patients. It is a massive challenge for healthcare providers to render efficient services without reliable measurement with meager studies in Intensive care units[14].

Table 5. Association between the post-test scores of attitudes among student nurses with their demographic variables (n=50)

Demographic information	Attitude Score		Significant
	Good	Average	
Age in years			
21 - 22 years	35	11	c^2=0.2071 df=2 P>0.05 NS
Above 22 years	3	1	
Gender			
Male	10	5	c^2=1.1514 df=1 P>0.05 NS
Female	28	7	
Religion			
Hindu	24	6	c^2=0.862 df=2 P>0.05 NS
Muslim	4	1	
Christian	13	2	
Previous knowledge regarding care of patients in mechanical ventilator			
Yes	32	3	c^2=1.6266 df=2 P>0.05 NS
No	6	12	
Sources of information			
Workshop and Conferences	18	2	
Colleagues	8	2	c^2=4.361 df=3 P>0.05 NS
Journals	9	1	
Mass Media	14	1	
Duration of clinical posting in the critical care unit			
Less than three months	8	2	c^2=1.6337 df=2 P>0.05 NS
More than three months	30	10	

Table 6. Mean, and mean percentage of pre and post-test scores of knowledge and attitude among participants. (n=50)

Knowledge and Attitude	Max marks	Pre-test			Post-test		
		Mean	SD	Mean %	Mean	SD	Mean %
Knowledge	50	8.58	3	17	19.18	5	38
Attitude	40	12.64	5.99	25	32.38	3.7	64

Of the participants in our study, 35 (70%) were female, and 15 (30%) were male. The majority of subjects were aged between 21 and 22. Forty percent of the participants acquired details about caring for patients with ventilators from workshops and conferences. A recent study during covid-19 insisted that sophisticated training is mandatory to care for patients with mechanical ventilators to enhance productive patient outcomes [18] . A pre-test survey on KA identified that most of the student nurses had inadequate knowledge with unfavorable attitudes. Three-fourths of fifty student nurses did not have the appropriate knowledge to deliver acute nursing care. The knowledge mean score was 8.58± 3 in the pre-test. Surprisingly, the literature review provided subtle data among student nurses working in ICU with mechanical ventilators.

Regarding the dependent variable of knowledge about ventilators, as being females (71.4%), nurses' knowledge towards care of patients increased by one-third percentage compared with males. Hence it can be assumed that male students have more barriers to rendering the necessary care than females. Despite being trained in theory as part of their curriculum, preclinical critical care training with simulation is essential to all student nurses [19] . Another study revealed that ICU is a field that requires expertise in several attributes to prevent patients from potential health risks. Hence prevention is the vital strategy that an education protocol can provide to deliver comprehensive care to patients with MV [20] .

Our study showed a statistical difference exists between pre and post-test scores of knowledge and attitude (p<0.05). Hence, the gap between theory and practice may be due to the inability to adhere to the new guidelines and hospital instructions [21] . Perhaps students need an adaptation period to learn the current changes that the hospital has amended [22] . Student nurses who implement evidence-based practice make decisions wisely, and provide higher quality care, less hospital stay, less cost, and improved care [20] . Our study showed a significant impact of education on MV to enhance their favorable attitude and knowledge. The critical care unit is the core and pivotal hospital healthcare setting team. Due to the acute conditions of MV

patients hospitalized in ICUs, nurses must have profound scientific knowledge and enhanced experience. Besides, high-quality professional care, a high understanding of technical devices, more clinical competencies, and broader abilities in team decision-making is expected to develop critically ill patients' outcomes.

As a patient with MV-supported is more likely to get complications, student nurses who have clinical placement in the ICU must keep abreast of evidence-based and institution protocol-based knowledge to enhance their clinical competencies in daily practice. The findings of this study will help healthcare institutions to adopt simulation procedures to bridge the gap between theoretical knowledge and clinical practice. Further research is needed to explore additional educational programs related to MV and KA. Providing training on hospital guidelines, handling of instruments and gadgets to manage hospital-acquired infections can also be mandatory.

Even though the study has shown the impact of education programs, the limitation was that the study had a small sample size which does not meet the standards in generalizing the finding. The second limitation was that the intervention program was given within a short training session.

4 Conclusion

Nursing administrators could play an essential role in clinical setting management and also in improving nursing students' professional knowledge, attitude, and skills to prevent complications of mechanically ventilated patients. We advocated for strengthening the understanding and practice of nursing students working in the intensive care unit through courses, training, workshop, and curricula.

The use of a questionnaire for self-assessment of knowledge rather than a direct evaluation of competency in mechanical ventilation is a drawback of the present study. In the future, an alternate sampling technique can be utilized with diverse characteristics to explore innovations in the findings.

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