Effectiveness of Structured Teaching Programme on Knowledge Regarding Mechanical Ventilator Among B.Sc. Nursing 3rd Year Students Studying in SGRR College of Nursing, Patel Nagar, Dehradun

Nita Shrestha[1], Sita Chaudhary[2], Gayanand Mandal[3]

[1]Nursing Officer, Department of Medical Surgical Nursing, BPKIHS, Dharan, -18, Sunsari, Nepal.
[2]Nursing Officer, Department of Medical Surgical Nursing, BPKIHS, Dharan, -18, Sunsari, Nepal.
[3]Professor, Department of Medical Surgical Nursing, BPKIHS, Dharan, -18, Sunsari, Nepal.

Corresponding Author: Nita Shrestha

ABSTRACT

Mechanical ventilation refers to the use of life-support technology to perform the work of breathing for patients who are unable to do so with their own. The study aimed to assess the effectiveness of structured teaching programme on knowledge regarding Mechanical Ventilator among B.SC.(N) 3rd year students studying in SGRR College of Nursing, Patel Nagar, Dehradun

Methods: The research design selected for this study was pre- experimental one group pre-test post- test design; 50 students of B.SC. (N) 3rd year of SGRR College of Nursing at Patel Nagar, Dehradun, were enrolled in the study by using a non-probability convenient sampling technique. The data were analyzed and interpreted by using descriptive and inferential statistics.

Results: The study depicts that the findings related to pre-test level of knowledge of 84% of students have inadequate knowledge, after structured teaching programme , 70% students have moderate knowledge in their posttest about Mechanical ventilator. The mean pre – test knowledge score was 11.48 with standard deviation 4.001, after structured teaching mean post –test knowledge score increased to 21.16 and with standard deviation 2.713, It was significantly higher than mean pre – test level of knowledge score at 0.05 level of significantly.

Conclusion: Finding of the study shows that the difference between pre- test and post – test score was statistically significant. Hence it can be concluded that there was an increase in the level of knowledge after structured teaching programme regarding Mechanical ventilator.

Keywords: Effectiveness, Structured teaching programme, Knowledge, Students, Mechanical ventilator.

INTRODUCTION

A mechanical ventilator is positive or negative pressure breathing device that can maintain ventilation and oxygen delivery for a prolonged period. Caring for a patient on mechanical ventilator has become an integral part of nursing care in critical care or general medical surgical units, extended care facilities and Main objectives of the study to assess the level of knowledge of the B.SC. (N) 3rd year students regarding Mechanical ventilator before educational intervention, To assess the level of knowledge of the B.SC. (N) 3rd year students regarding Mechanical ventilator after educational intervention and to evaluate the effectiveness of structured teaching programme regarding Mechanical ventilator among the B.SC. (N) 3rd year students .[1]

Mechanical ventilation has been used for decades to support the respiratory function of patients with various degrees of

respiratory failure. Patients who have weak or absent spontaneous respirations usually require mechanical support to assist in ventilation and oxygenation. Because the ventilator is integral life support equipment in the critical care, it is important for the practitioner to know the basic concepts and applications of mechanical ventilation .[2]

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.[3]

The rationale for endotracheal intubation and mechanical ventilation should be to optimize conditions for clinical recovery and not for the restoration of "normal" physiological values, which would probably be deleterious to patients? The paradigm of lung-protective mechanical ventilation has traditionally advocated for the least injurious ventilator settings and adjunctive strategies, but increasing attention has also been placed on the potentially harmful effects of mechanical ventilation on the heart and the diaphragm. The recognition of these mechanisms of injury to alternative organs prompted the development of heart-protective (e.g., right ventricle) and muscle-protective (e.g., diaphragm) mechanical ventilation strategies.[4]

A multi-center, cross-sectional, self-administered survey was conducted on nurse managers of adult intensive care units (ICUs) in Denmark, Germany, Greece, Italy, Norway, Switzerland, Netherlands, and United Kingdom (UK), regarding decisional responsibility for mechanical ventilation and weaning. Findings indicate, according to nurse managers, that inter-professional collaboration was the predominant model for decisions about mechanical ventilation and weaning. The nurses generally had reasonable influence on decisions made. Inter-professional collaboration varied according to the type of decision with physicians more likely to select initial ventilator settings and nurses more involved in the ongoing titration of ventilation and determination of extubation readiness. ICU nurses maintain a near continuous presence at the bedside and therefore may be in a best position to titrate ventilator settings in response to changes in physiologic parameters.[5]

According to WHO, 8.7% of patients Hospital acquired infection with mortality rate as high as 50%. Ventilator associated pneumonia is the most common Hospital acquired infection among mechanically ventilated patients worldwide, is a major clinical concern, associated with high incidence rates, mortality and costs. In Europe, United states, and Asia Ventilator associated pneumonia rates range from 9-40%, and as high as 78 %.[6]

A recent study in Ontario, suggesting that, there is an increasing number of patients receiving mechanical ventilation. The projected number of ventilated patients in 2026 will be 34,478 representing 80% increase compared to year 2000. The cured incidence increased 31%, from 222 to 291 per 1, 00,000 adults the annual increase in rate is 2.3% which is similar to growth rate present in 1990. The projected incidence is more terrifying it may range from 31,473 to 36,313 ventilated adults till 2026 globally.[7]

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 <25%. Pseudomonas and acinetobacter occur later and tend to be associated with a worse outcome. The incidence in adult ICU

patients is upto 75% of ventilated patients. The mortality is 24-71%.[8]

The patient can be prone to various complications while on a mechanical ventilator. Studies have shown that ventilator associated pneumonia is one of the most common infectious complications among patients admitted in intensive care units (ICU) and accounts for up to 47% of all infections among ICU patients. It prolongs ICU length of stay and increase the risk of death in critically ill patients. The data summary for1992 to 2004 from the National Nosocomial Infections Surveillance System report reveals a median ventilator associated pneumonia rate of 2.2 to 14.7 cases per 1000 patient days of mechanical ventilation in adult ICUs.[9]

The Central for Disease Control (CDC), National nosocomial infection surveillance system (NNIS) in 2002 reported: Patients receiving continuous mechanical ventilation are at 6-21 times risk of developing health care associated pneumonia in comparison to the patients who are not receiving.[10]

Ventilator-associated pneumonia (VAP) is a type of nosocomial pneumonia that occurs in patients who receive mechanical ventilation. VAP is usually acquired in the hospital setting approximately 48–72 hours after mechanical ventilation. The main aim of mechanical ventilation is to aid in gas exchange without causing trauma to the lungs. Unfortunately, MV can harm the lungs by the stress and strain developed in the lung. High pressure and volume can cause barotrauma and volutrauma to the lungs, which is followed by biotrauma and atelectrauma. According to the International Nosocomial Infection Control Consortium (INICC), the overall rate of VAP is 13.6 per 1,000 ventilator days. The incidence varies according to the patient group and hospital setting. The incidence of VAP ranges from 13–51 per 1,000 ventilation days. The mean duration of occurrence of VAP is around 5–7 days. The mortality associated with VAP ranges from 24–76 per cent, and is even higher among critically ill patients.[11]

Most of the nurses had adequate knowledge on the items like, definition of mechanical ventilation (100%), care of tracheotomy (88.6%), risk of 100% oxygen (85.7%), management of acidosis (91.4%), weaning (82.9%), whereas the limited nurses had knowledge on indication of CPR (25.7%), indication of laryngeal mask air-way (LMA) (5.7%), and indication of continuous positive air-way pressure (CPAP) (5.7%). The association calculated with items of knowledge score and other variables, it was found significant association between indication of non-invasive mechanical ventilation (MV) and training institute ($p=0.034$), LMA and ICU experiences ($p=0.047$), synchronized intermediate mandatory ventilation (SIMV) use and ICU experiences ($p=0.042$) and goal of tracheostomy care and ICU experiences ($p=0.046$).[12]

The student nurses must know about taking care of critically ill patient when they are posted in intensive care unit as they are facing difficulties & not having adequate knowledge in care patient supported in ventilator. Therefore, in the light of the above facts & the experiences I felt that if we strengthen the knowledge base of student nurses regarding care of a patient on Mechanical ventilator, by reinforced teaching & testing during student life, we can create more efficient nurses for the society. This will improve the quality of nursing care provider by the student.

METHODS

Pre-experimental one group pre-test post-test design was used for the study. Study was carried out among B. SC. Nursing 3rd year student of SGRR college of Nursing Patel Nagar, Dehradun. Altogether 50 students were selected by using non probability convenience sampling technique, and a quantitative research approach was used to assess the knowledge regarding Mechanical ventilator. The main goal is to assess the effectiveness of structured teaching program. After ethical approval from the study was conducted after

the approval of the dissertation committee of SGRR college of Nursing at Patel Nagar, Dehradun. Prior permission has been obtained from the concerned authorities, the Principal of SGRR College of Nursing, Patel Nagar, Dehradun who were willing to participate and were present at the time of study were included in the study. Informed written consent was obtained from each participant.

A semi-structured self-developed questionnaire was used to assess the knowledge and practice of the participants which was divided into 2 parts: Section A, consist of 6 questions related to demographic variables and Section B consists of 30 score related questions to assess knowledge and effectiveness of structured teaching regarding Mechanical ventilator. Each correct response was given 1 score and incorrect response was given.

This study will be conducted to obtain information for improving the main project or for assessing its feasibility and to test the reliability of the tools. In order to find out feasibility and practicability, 10% student has taken for a pilot study is done in 6 GNM 3rd year students of SGRR College of Nursing at Patel Nagar, Dehradun. After doing of pilot study, the investigator had selected 50 samples by using non probability convenience sampling technique. Investigator visited 10 respondents in each group, introduced herself to the samples and explained the purpose of the study and ascertained the willingness of the participants, the respondents were assured anonymity and confidentiality of the information provided by them. A comfortable place was selected and the participants were made comfortable. A semi-structured self-developed questionnaire was used to assess the knowledge and practice of the participants which was divided into 2 parts: Section A,

consist of 6 questions related to demographic variables and Section B consist of 30 score related questions to assess knowledge and effectiveness of structured teaching related to Mechanical ventilator. Each correct response was given 1 score and incorrect response was given 0. Data collection done over the period of 4 weeks.

Pre- test was done on first day to assess the level of knowledge through structured knowledge questionnaire and structured teaching programme for 1 hr. on the same day. Then the post- test knowledge was assessed after 6 days. Content validity of the tool was established by 5 experts comprising of 4 nursing experts from the department of Medical surgical nursing and 1 is Medical Doctor (Asst. Medical Superintendent). Score 76% - 100% was considered adequate knowledge, 51 % - 75% was moderate knowledge and 1% - 50% was inadequate knowledge.

The collected data was checked on the same day for completeness to find out errors and missing of information. Data obtained were coded and entered in Microsoft excel using MS-Excel Program, version 10 for statistical analysis. Descriptive statistics was used to analysis frequency, percentage, mean and standard deviation, which were used to assess the demographic variables and effectiveness of structured teaching program. Pearson's Chi – square analysis was used to find the association between the pre – test and post- test knowledge of the subject with their selected demographic variables. Inferential statistics was used by using "t" test for comparison of pre- test and post- test .and association of pretest and posttest knowledge with demographic variables (age, sex, religion, educational board , type of family, previous knowledge). Statistically significant at $p < 0.05$ level.

RESULTS

Table 1: Demographic Profile of Respondents n=50

Demographic Variables	Frequency(f)	Percentage (%)
Age		
17-20 yrs.	22	44%
21-24 yrs.	27	54%
25-28 yrs.	1	2%
Sex		
Male	1	2%
Female	49	98%
Religion		
Hindu	33	66%
Muslim	8	16%
Sikh	3	6%
Christian	6	12%
Educational Board		
State Board	10	20%
Indian Certificate of Secondary Education (ICSE)	7	14%
Central Board of Secondary School(CBSE)	27	54%
Others	6	12%
Type of Family		
Joint Family	12	24%
Nuclear family	36	72%
Extended family	2	4%
Previous knowledge		
Yes	39	78%
No	11	22%

Table1 depicts that majority of respondents (54%) were from age group 21- 24 years, highest percentage (98%) were female , 66% were Hindu by religion, in relation to their educational board shows that highest percentage (54%) were from Central Board of Secondary School(CBSE),), highest percentage (72%) were from nuclear family, (24%) and 78% were having previous knowledge regarding mechanical ventilator.

Table 2: Pretest posttest knowledge score of respondents

Level of Knowledge	Pre test		Post Test	
	No of Sample (f)	Percentage (%)	No of Sample (f)	Percentage (%)
Adequate (≥76%-100%)	0	0%	14	28%
Moderate (51%-75%)	8	16%	35	70%
Inadequate (≤50%)	42	84%	1	2%

Table 2 presents that the findings related to pre-test & post- test level of knowledge o, 84% of students had inadequate knowledge in the pretest and after structured teaching programme, 70% students had moderate knowledge in their posttest about Mechanical ventilator.

Table 3: Effectiveness of Structured teaching programme regarding Mechanical ventilator among B.Sc. (N) 3rd Year Students n=50

Overall level of Knowledge	Mean	SD	't' value
Pre test	11.48	4.001	17.393
Post test	21.16	2.713	

P< 0.05

Table 3 shows that knowledge score in post – test after administering Structured teaching programme is (Mean= 21.16, SD= 2.713) is increased in comparison to the pre – test knowledge score (Mean = 11.48, SD = 4.001). This change is statistically significant at $p < 0.05$ level.

Table 4: Association between pretest knowledge score regarding Mechanical ventilator with their selected demographic variable. n=50

Characteristics	Demographic variable	Adequate (≥76%-100%)		Moderate (51%-75%)		Inadequate (≤50%)		Chi square P value	Level of significance
		f	%	f	%	F	%		
Age groups in Years	17-20	0	0%	3	6%	19	38%	0.068#	NS
	21-24	0	0%	4	8%	23	46%		
	25-28	0	0%	1	2%	0	0%		
	29-32	0	0%	0	0%	0	0%		
Sex	Male	0	0%	0	0%	1	2%	1.0 F.E. #	NS
	Female	0	0%	8	16%	41	82%		
Religion	Hindu	0	0%	6	12%	27	54%	0.510#	NS
	Muslim	0	0%	0	0%	8	16%		
	Sikh	0	0%	1	2%	2	4%		
	Christian	0	0%	1	2%	5	10%		
Educational Board	State Board	0	0%	0	0%	10	20%	0.036 *	Sig
	ICSE	0	0%	0	0%	7	14%		
	CBSE	0	0%	5	10%	22	44%		
	Others	0	0%	3	6%	3	6%		
Type of Family	Joint	0	0%	2	4%	10	20%	0.004*	Sig
	Nuclear	0	0%	4	8%	32	64%		
	Extended	0	0%	2	4%	0	0%		
	Broken	0	0%	0	0%	0	0%		
Previous knowledge	Yes	0	0%	3	6%	36	72%	0.009 F.E.	Sig.
	No	0	0%	5	10%	6	12%		

Key=
*Significant at p<0.05 level, # non – significant at p <0.05 level, FE=Fisher's exact test

Table 4 shows that there was no association between pre – test level of knowledge with demographic variables that are age, sex and religion and there is association between pre – test level of knowledge with demographic variables that are educational board, type of family and previous knowledge

DISCUSSION

This study was pre- experimental one group pre-test post- test design, and carried out among B.SC. Nursing 3rd year 50 student of SGRR college of Nursing Patel Nagar, Dehradun to assess the knowledge regarding Mechanical ventilator and to evaluate the effectiveness of structured teaching programme regarding Mechanical ventilator among the B.SC. (N) 3rd year students . Structured Teaching Programme was assessed by paired "t" test. Pearson's Chi – square analysis was used to find association between the pre- test and post- test of the respondents with selected demographic variables such as age, sex, religion, educational board, type of family and previous knowledge.

In this study majority of majority of respondents (54%) were from age group 21- 24 years, highest percentage (98%) were female , 66% were Hindu by religion

72% were from nuclear family, (24%) and 78% were having previous knowledge regarding mechanical ventilator. Pre – test level of knowledge shows that only 16% students had moderate knowledge and after structured teaching programme, 70% students had a moderate knowledge in their posttest about Mechanical ventilator. So the research hypotheses (H1) is accepted because there was a significant difference between pre- test knowledge score and post – test knowledge score.

Findings reveal that post- test mean level of knowledge score is significantly higher than pre–test mean level of knowledge score after administering Structured teaching programme is (Mean= 21.16, SD= 2.713) in comparison to the pre – test level of knowledge (Mean = 11.48 , SD = 4.001) .The statistical paired "t" test for overall level of knowledge score is found to be 17.393 that is greater than table value (2.00) which implies that the difference in pre – test and post – test level is found statistically significant at $p < 0.05$ level.

In the present study, the mean post – test level of knowledge score of B.SC. (N) 3rd year students after Structured teaching programme was significantly higher than mean pre – test level of knowledge score at

0.05 level of significantly, which is similar to the finding of research conducted in Mata Sahib Kaur College of Nursing, Balongi (Mohali).

The difference between mean pre test and post test knowledge score of experimental group was statically significant at p < o.o5. It was found that there was no association between pre test level of knowledge on care of patient on mechanical ventilation among B. Sc. nursing students with socio-demographic variables. So, it was concluded that planned teaching programme was highly effective in enhancing knowledge of B. Sc. nursing students regarding care of patient on mechanical ventilation. [13]

Similar study was done in KIMS hospital carried out in 50 nurses. Quantitative research approach and a pre-experimental one group pretest post-test research design were used to accomplish the stated objectives. The data were collected by using a self administered structured knowledge questionnaire. Inferential and descriptive statistical analysis was performed by using SPSS-IBM 20. Results were calculated by using p value < 0.05. The results revealed that, in pretest 80% of the nurses had inadequate knowledge where as in posttest 82% of the nurses had gained moderately adequate knowledge and the improvement was statistically significant at P <0.05.[14]

CONCLUSION
The study findings revealed that post- test mean knowledge score (Mean= 21.16, SD= 2.713) is significantly higher than pre–test mean knowledge score (Mean = 11.48, SD = 4.001) after administering Structured teaching programme This study shows that there is no association between pre – test level of knowledge with demographic variables that are age, sex and religion and there is association between pre – test level of knowledge with demographic variables that are educational board, type of family and previous knowledge . Hence it can be concluded that educational intervention was effective in bringing changes in knowledge regarding mechanical ventilator.

REFERENCES
1. Polanski, Arlane L. (1993)Lulckman's Core Principles and Practice of Medical & Surgical Nursing, 4th Ed. Saunders company, Philadelphia, pp 533.
2. Carol Taylor Fundamentals of Nursing the art and science of nursing care (1st edition). New Delhi: Lippincott Williams and wilkins, 2008,PP: 1633-1639.
3. Brunner and Suddarth's Text book of Medical Surgical Nursing (11th –edition). New york: Lippincott, 2008, PP: 743-759.
4. Pettenuzzo T, Fan E. 2016 Year in Review: Mechanical Ventilation. Respiratory Care. 2017;62(5):Doi: 10.4187/respcare.05545 629-635.
5. Rose L, Blackwood B, Egerod I, Haugdahl H, Hofhuis J, Isfort M et al. Decisional responsibility for mechanical ventilation and weaning: an international survey. Critical Care. 2011;15(6):R295.
6. Garner J, Jarvis W, Emori T, Horan T, Hughes J. CDC definitions for nosocomial infections, 1988. American Journal of Infection Control. 1988;16(3):128-140.
7. Needham D, Bronskill S, Calinawan J, Sibbald W, Pronovost P, Laupacis A. Projected incidence of mechanical ventilation in Ontario to 2026: Preparing for the aging baby boomers. Critical Care Medicine. 2005;33(3):574-579.
8. Hanaoka N, Araki M, Problem of infection in ICU;2010;59,[46-55]. Available from www.pubmed.com
9. Cason Tyner T, Saunders S, Broome L. Nurses' Implementation of Guidelines for Ventilator-Associated Pneumonia From the Centers for Disease Control and Prevention. American Journal of Critical Care. 2007;16(1):Doi: 10.4037/ajcc2007.16.1.28 28-37.
10. From the Centers for Disease Control and Prevention. Transmission of nosocomial Legionnaires disease. JAMA: The Journal

of the American Medical Association. 1997;277(24):1927-1928.

11. Charles M. Ventilator-associated pneumonia. Australasian medical journal. 2014Doi: 10.4066/amj.2014.2105 334-344.

12. Louise Rose, S B Lawrence. Decisions made by critical care nurses during mechanical ventilation and weaning in an Australian intensive care unit. Critical Care Management 2006 Feb [cited 2012Aug 28]: 445,446. Available from: URL:http://www.aacn.org/WD/CETests/Media/A071605.pdf .

13. Ghuman P, Saggi M, Choudhary R. Effectiveness of Planned Teaching Programme on Knowledge Regarding Care of Patient on Mechanical Ventilation among B. Sc. Nursing Students. International Journal of Nursing Education. 2015; 7(4). Doi: 10.5958/0974-9357.2015.00210.x153.

14. G, A K U. Effectiveness of Teaching Program on Knowledge of Clinical Nurses Regarding Risk of Unplanned Extubation of Patients with Mechanical Ventilation at a Selected Hospital, Bangalore. International Journal of Science and Healthcare Research. 2021;6(3):Doi: 10.52403/ijshr.20210773 452-459

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