Original Research

A study to develop nursing care protocol regardingthe care of child on mechanical ventilator and assess its effectiveness in terms ofknowledge and practice among the staff nurses working in the intensive care unit in selected hospital of New Delhi

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ABSTRACT:
Aim: A study to develop nursing care protocol regarding the care of child on mechanical ventilator and assess its effectiveness in terms of knowledge and practice among the staff nurses working in the intensive care unit in selected hospital of New Delhi. **Material and methods:** The purpose of the study was explained, and the subjects were assured about the confidentiality of their responses and informed consent was taken. A structured knowledge questionnaire was administered to assess the knowledge of participants regarding care of child on Mechanical ventilator. Average time taken for completing the questionnaire varied from 25-30 minutes. An Observation checklist (Hand hygiene, IV Injection, Suctioning) was used to assess thepractice of staff nurses regarding care of child on Mechanical ventilator. Time taken for single observation, Hand washing was 1min, IV Injection 4-5 min and suctioning 7-8 min respectively. Nursing care protocol regarding care of child on Mechanical ventilator was administered forthe study subjects. Post-test and practice were observed after 7th day of administration of nursing care protocol. **Results:** The mean post- test knowledge score (27.5)was higher than the mean pre-test knowledge score (18.6) with a mean difference of 8.9. The calculated't' value of 8.217 is higher the't' table value 2.054 at $p < 0.05$ level of significance. The mean post- test practice score (11.87)was higher than the mean pre -test practice score (8.57) with a mean difference of 3.3.The calculated't' value of 11.60 is higher the 't' table value 2.045 at $p < 0.05$ level of significance. **Conclusion:** The finding of the study proved that Nursing care protocol was effective in improving the knowledge and practices of nurses regarding care of child on Mechanical ventilator.
Keywords: Mechanical ventilator, Hand hygiene, IV Injection, Suctioning

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INTRODUCTION

Children are the backbone of a nation and development of any nation depends on the health and well-being of its child population. An important index used to estimate Nation's health is the health status of children in that country. India has the second largest child population in the World. Numbering over 1.98 billion worldwide and 373 million in India (Census, 2017). So optimum development of children attains special significance in the context of National development.[1] The miracle of life begins at conception and continuous throughout the life span. The manifestation of miracle was encountered during newborn period, infancy and childhood. According to WHO (2019), 140 million children are born in every year of which 2.5 million children dies in the first month of life in the developing countries and 5.2million children died under age 5. The care of children has in recent decades changed dramaticallyfor nurses due to the advances in medical knowledge.[2,3]
Mechanical ventilation is a process by which gases are moved into and out of the lungs by means of a ventilator, a machine that delivers a controlled flow of gas to a patient's airway. Ventilatory support is an essential and a common form of therapy in Neonatal and Pediatric Critical Care Units. In recent years, this

modality has evolved into a highly specialized discipline. The term mechanical ventilation refers to various artificial means used to support ventilation and oxygenation.[4] Natural spontaneous ventilation occurs when the respiratory muscles (diaphragm, intercostal muscles) create negative intrathoracic pressure, in part by expanding the rib cage, leading to lung expansion, which pulls air into the alveoli and allows gas exchange to occur. In contrast, ventilation is achieved in intubated patients by delivering compressed gas to the lungs by positive pressure ventilation.[5]

When children are sick and hospitalized, they are treated by using various types of equipment's including Mechanical ventilators especially when they are admitted in the Intensive care unit. The mechanical ventilator plays a vital role to save the life of the children. When children are initially placed on Mechanical ventilator, they must be closely observed so that the effectiveness of the therapy can be evaluated, and complications can be prevented from occurring. Serious complications that may arise during initial mechanical ventilation include rapid electrolyte changes, severe alkalosis and hypotension due to decrease in cardiac output.[6]

The physician decides when to begin weaning a child from mechanical ventilator. The decision is often based on assessments made by nurses and respiratory therapists. The length of time required for successful weaning generally relates to the underlying disease process and to the child's state of health before a ventilator is used. Careful assessment of ventilator status before and during weaning is necessary, including spontaneous tidal volume; vital capacity; maximal voluntary ventilation; inspiratory effort; breath sounds; cardiovascular and cerebral status; and arterial blood gas.[7] The nurse is the singular person in the Neonatal Intensive Care unit who creates an environment in which critically, unstable, highly vulnerable neonates and children benefit from attentive care. The Neonatal Intensive Care unit nurse co-ordinates the actions of a highly skilled team of patient focused health care professionals.[8]

MATERIAL AND METHODS
The present study was conducted in Guru Teg Bahadur Hospital (GTB), New Delhi. This Hospital has 1700 beds capacity run under Govt. of NCT of Delhi after taking the permission from the ethical committee. 30 Staff nurses working in Intensive care units (NICU/PICU) of selected Hospital, New Delhi were included in this study. A structured knowledge questionnaire was prepared to assess the knowledge of staff nurses working in Intensive care units (NICU/PICU) of a selected Hospital, New Delhi. It was based on literature extracted from books, journals, research reports, personal experience, peer group and expert opinion. An observational checklist

was prepared on selected procedures to assess the practice of staff nurses regarding the care of child on Mechanical ventilator.

Demographic variables consists of 6 items related to sample characteristics such as: Age, Marital status, Religion, Educational qualification, Years of working experience in NICU/PICU, Attended any workshop or skill training on care of child on Mechanical ventilator. Assessment of knowledge regarding care of child on Mechanical ventilator consists of 35 multiple choice questions to assess the knowledge of nurses on care of child on mechanical ventilator. There are 4 options in each item with one correct response. Each correct response given with score '1' and incorrect response with score '0'. The maximum possible score is 35. Structured observational check list for selected procedures regarding care of child on Mechanical ventilator was made on selected procedures (Hand hygiene 14 items, I.V injection 21 items, E.T suctioning 20 items to assess the practice of staff nurses regarding the care of child on mechanical ventilator. It consists of total 55 items with dichotomous options. A score of 1 was given for every step correctly performed and 0 was given for incorrect or missed step. Total score of checklists is 55.

INCLUSION CRITERIA
- Staff nurses who are willing to participate.
- Staff nurses working in Intensive Care Unit (NICU/ PICU).

EXCLUSION CRITERIA
- Staff nurses who are not available at the time of data collection.

METHODOLOGY
Data collection is gathering of information to address a research problem. The purpose of the study was explained, and the subjects were assured about the confidentiality of their responses and informed consent was taken. A structured knowledge questionnaire was administered to assess the knowledge of participants regarding care of child on Mechanical ventilator. Average time taken for completing the questionnaire varied from 25-30 minutes. An Observation checklist (Hand hygiene, IV Injection, Suctioning) was used to assess the practice of staff nurses regarding care of child on Mechanical ventilator. Time taken for single observation, Hand washing was 1min, IV Injection 4-5 min and suctioning 7-8 min respectively. Nursing care protocol regarding care of child on Mechanical ventilator was administered for the study subjects. Post-test and practice were observed after 7th day of administration of nursing care protocol.

RESULTS

Table 1: Frequency and percentage distribution of demographic variablesof nurses

Socio-Demographic Variables	Frequency (f)	Percentage (%)
1.Age in years		
• 20-25	5	16.7
• 26-30	9	30.0
• 31-35	6	20.0
• > 35	10	33.3
2.Marital Status		
• Married	23	76.7
• Un-Married	7	23.3
3.Religion		
• Hindu	11	36.7
• Muslim	6	20.0
• Christian	9	30.0
• Sikh	4	13.3
4.Educational Qualification		
• GNM	13	43.3
• B.Sc. / Post B.Sc. Nursing	10	33.3
• M.Sc. Nursing	7	23.3
5.Years of Experiencein PICU/ NICU		
• <1year	4	13.3
• 1 - 2 Years	6	20.0
• 2 - 3 Years	8	26.7
• More than 3 years	12	40.0
6. Attended any workshop or skill training related to care of child on ventilator		
• Yes	13	43.3
• No	17	56.7

The data in table 1 describes the demographic characteristics of the samples. There were 10 (33.3%) subjects in the age group of >35 years, 9 (30%) belong to 26- 30 years, 6 (20%) belong to 31-35 years, and only 05 (16.7%) were belong to 20-25 years. Majority of the subjects 23(76.7%) were married, and 07 (23.3%) were un-married. There were 11 (36.7%) subjects belongs to Hindu religion, 9 (30%) belongs to Christian, 06 (20%) belongs to Muslim, and only 4 (13.3%) belongs to Sikh religion. There were 13 (43.3%) subjects whose educational qualification were GNM, 10 (33.3%) qualification were B.Sc. nursing, and 7 (23.4%) education qualification were M.Sc. nursing.

There were 12 (43.3%) subjects having > 3 years' experience in NICU/PICU, 8 (26.7%) were having 2-3 years in NICU/PICU, 6 (20%) were having 1-2 years' experience 'in NICU/PICU and only 4(13.3%) were having <1-year experience. Majority of subjects 17 (57.7%) were not attended workshop and skill training related to care of child on Mechanical Ventilator and 13 (43.3%) were attended workshop and skill training regarding care of child on Mechanical Ventilator.

Table 2: Frequency and percentage distribution of level of knowledge of nurses regarding care of child on Mechanical Ventilator before and after administration ofnursing care protocol

Score	Level of Knowledge	Pre-Test Score		Post-Test Score	
		F	%	F	%
<50%	Below AverageKnowledge	14	46.7%	0	0
50-75%	Average Knowledge	10	33.3%	9	30
>75%	Good Knowledge	6	20%	21	70

The table 2 shows that there were 14 (46.7%) subjects had below average knowledge, 10 (33.3 %) subjects had average knowledge and 6 (20%) subjects had good knowledge. After administration of nursing care protocol 21 (70%) of subjects had good knowledge, 9 (30%) of subjects had average knowledge, and none of them had below average knowledge regarding care of child on Mechanical Ventilator.

Table 3 A: Frequency and percentage distribution of level of practice (Hand Hygiene) of nurses regarding care of child on Mechanical Ventilator before and after administration of nursing care protocol

Score	Level ofPractice	Pre-Test Score		Post-Test Score	
		F	%	F	%
<50%	Below Averagepractice	7	23.3	0	0
50-75%	Average practice	17	56.7	6	20
>75%	Good practice	6	20	24	80

The table 3 A represent that there were 17 (56.7%) subjects had average practice, 7 (23.3%) had poor practice and 6 (20%) had good practice regarding care of child on Mechanical ventilator before administration of nursing care protocol. After administration of nursing care protocol 24 (80%) subjects had good practice,6 (20%) had average practice, and none of them had poor practice regarding care of child on Mechanical ventilator after administration of nursing care protocol.

Table 3 B: Frequency and percentage distribution of level of practice (I.V Injection) of nurses regarding care of child on Mechanical Ventilator before andafter administration of nursing care protocol

Score	Level ofPractice	Pre-Test Score		Post-Test Score	
		F	%	F	%
<50%	Below Averagepractice	5	16.7	0	0
50-75%	Average practice	16	53.3	5	16.7
>75%	Good practice	9	30	25	83.3

The table 3 B represent that there were 16 (53.3%) subjects had average practice, 5 (16.7%) had poor practice and 9 (30%) had good practice regarding care of child on Mechanical ventilator before administration of nursing care protocol. After administration of nursing care protocol 25 (83.3%) subjects had good practice,5 (16.7%) had average practice, and none of them had poor practice regarding care of childon Mechanical ventilator after administration of nursing care protocol.

Table 3 C: Frequency and percentage distribution of level of practice (Suctioning) of nurses regarding care of child on Mechanical Ventilator before and after administration of nursing care protocol

Score	Level of Practice	Pre-Test Score		Post-Test Score	
		F	%	F	%
<50%	Below Averagepractice	12	40	0	0
50-75%	Average practice	14	46.7	12	40
>75%	Good practice	4	13.3	18	60

The table 3 C represent that there were 14 (46.7%) subjects had average practice, 12 (40%)had poor practice and 4 (13.3%) had good practice regarding care of child on Mechanicalventilator before administration of nursing care protocol. After administration of nursing care protocol 18 (60%) subjects had good practice,12 (40%) had average practice, and none of them had poor practice regarding care of child on Mechanical ventilator after administration of nursing care protocol.

Table 4: Sum Total (Hand hygiene, I.V Injection, Suctioning) Frequency and percentage distribution of level of practice of nurses regarding care of child on Mechanical Ventilator before and after administration of nursing care protocol

Score	Level ofPractice	Pre-Test Score		Post-Test Score	
		F	%	F	%
<50%	Below Average Practice	9	30	0	0
50-75%	Average practice	13	43.3	11	36.7
>75%	Good practice	8	26.7	19	63.3

The table 4 represent that there were 13 (43.3%) subjects had average practice, 9 (30%)had poor practice and 8 (26.7%) had good practice regarding care of child on Mechanicalventilator before administration of nursing care protocol. After administration of nursing care protocol 19 (63.3%) subjects had good practice,11 (36.7%) had average practice, and none of them had poor practice regarding care of child on Mechanical ventilator after administration of nursing care protocol.

Table 5: Mean, mean difference standard deviation and 't' value of pre-test and post-test knowledge score of nurses

Knowledge score	Mean	Mean Difference	Standard Deviation	't' test	'p' value
Pretest	18.6	8.9	5.52		
Posttest	27.5		4.63	8.217	0.000

*Significant at 0.05 level of significance, Df (29), Critical 't' value=2.045 at 0.05 level of significance
The data presented in table 5 depicts that the mean post- test knowledge score (27.5) was higher than the mean pre-test knowledge score (18.6) with a mean difference of 8.9. The calculated 't' value of 8.217 is higher the 't' table value 2.054 at $p < 0.05$ level of significance.

Table 6 A: Mean, mean difference standard deviation and 't' value of HandHygiene pre-test and post-test practice score of nurses

Practice score	Mean	Mean Difference	Standard Deviation	't' test	'p' value
Pretest	8.57	3.3	2.54	11.60	0.000
Posttest	11.87		1.57		

The data presented in Table 6 A depicts that the mean post- test practice score (11.87) was higher than the mean pre -test practice score (8.57) with a mean difference of 3.3. The calculated 't' value of 11.60 is higher the 't' table value 2.045 at $p < 0.05$ level of significance.

Table 6 B: Mean, mean difference standard deviation and 't' value of IV Injection pre-test and post-test practice score of nurses

Practice Score	Mean	Mean Difference	Standard Deviation	't' test	'p' value
Pretest	13.83		3.45	8.29	0.000
Posttest	17.17	3.33	1.80		

The data presented in Table 6 B depicts that the mean post- test practice score (17.17) was higher than the mean pre -test practice score (13.83) with a mean difference of 3.33. The calculated 't' value of 8.29 is higher the 't' table value 2.045 at $p < 0.05$ level of significance.

Table 6 C: Mean, mean difference standard deviation and 't' value of Suctioningpre-test and post-test practice score of nurses

Practice Score	Mean	Mean Difference	Standard Deviation	't' test	'p' value
Pretest	11.33		3.47	13.50	0.000
Posttest	15.47	4.13	2.58		

The data presented in Table 6 C depicts that the mean post- test practice score (15.47) was higher than the mean pre -test practice score (11.33) with a mean difference of 4.13. The calculated 't' value of 13.50 is higher the 't' table value 2.045 at $p < 0.05$ level of significance.

Table 7: Sum Total (Hand hygiene, IV Injection, Suctioning) Mean, mean difference standard deviation and 't' value of pre-test and post-test practice scoreof nurses

Practice Score	Mean	Mean Difference	Standard Deviation	't' test	'p' value
Pretest	33.83		8.39	7.041	0.000
Posttest	44.5	10.7	5.07		

The data presented in Table 10 depicts that the mean post- test practice score (44.5) was higher than the mean pre -test practice score (33.83) with a mean difference of 10.7. The calculated 't' value of 7.041 is higher the 't' table value 2.045 at $p < 0.05$ level of significance.

Table 8: Chi -square value showing association between pre-test knowledge level of nurses regarding care of child on mechanical ventilator with selecteddemographicvariables.

Socio demographic variables	Knowledge score(Pre-test			Chi- square value	Tablevalue	p' value
	Below Average knowledge	Average knowledge	Good knowledge			
1.Age in years						
• 20-25	3	1	1	3.908	12.59**	0.68
• 26-30	6	2	1			
• 31-35	2	3	1			
• > 35	3	4	3			
2. Marital Status						
• Married	9	9	5	2.343	5.99**	0.31
• Un-Married	5	1	1			
3.Religion						
• Hindu	7	3	1	7.216	12.59**	0.30
• Muslim	4	1	1			
• Christian	1	5	3			
• Sikh	2	1	1			

4. EducationalQualification						
• GNM	11	2	0			
B.Sc. / Post B.Sc. Nursing	3	5	2	17.582	9.49*	0.00
• M.Sc. Nursing	0	3	4			
5. Years of Experience in PICU/ NICU						
• <1year	3	1	0			
• 1 - 2 Years	4	2	0			
• 2 - 3 Years	4	2	2	6.095	12.59**	0.41
• More than 3years	3	5	4			
6.Attended any workshop or skilltraining related tocare of child on ventilator						
• Yes	1	7	5			
• No	13	3	1	14.273	5.99*	0.00

Data represent in table 8 depicts that there was a significant association between pre- test knowledge score of nurses with selected demographic variables such as educational Qualification and attended any workshop or skill training related to careof child on ventilator at p< 0.05 level of significance.

There was no significant association found between pre-test knowledge score of nurses with selected demographic variables such as age, marital status, religion and years of working experience in NICU/PICU.

Table 9: Chi -square value showing association between pre-test practice level of nurses regarding care of child on Mechanical Ventilator with selected demographic variables.

Socio demographicvariables	Practice score (Pre-test)			Chi-square value	Tablevalue	p' value
	Poor Practice	Average Practice	Good Practice			
1.Age in years						
• 20-25	4	1	0			
• 26-30	4	3	2	11.853	12.59**	0.06
• 31-35	1	3	2			
• > 35	0	6	4			
2.Marital status						
• Married	4	12	7			
• Un-Married	5	1	1	7.526	5.99*	0.02
3.Religion						
• Hindu	4	4	3			
• Muslim	3	2	1	6.265	12.59**	0.39
• Christian	0	6	3			
• Sikh	2	1	1			
4.Educational qualification						
• GNM	6	5	2			
• B.Sc. / Post B.Sc.Nursing	2	5	3	3.565	9.49**	0.46
• M.Sc. Nursing	1	3	3			
5.Years of Experience inPICU/NICU						
• <1year	3	1	0			
• 1 - 2 Years	4	2	0	16.997	12.59*	0.02
• 2 - 3 Years	2	4	2			
• More than 3 years	0	6	6			
6. Attended any workshop or skill training related to care ofchild on ventilator?						

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• Yes	0	7	6			
• No	8	6	3	8.698	5.99*	0.01

Data represent in Table 12 depicts that there was a significant association between pre- test practice score of nurses with selected demographic variables such as marital status, years of working experience in NICU/PICU and attended any workshop or skill training related to care of child on ventilator at p< 0.05 level of significance. There was no significant association found between pre-test practice score of nurses with selected demographic variables such as age, religion and educational qualification.

DISCUSSION

The present study revealed that out of 30 samples 6 (20%) of sample had good knowledge, 10 (33.3 %) of sample had average knowledge and 14 (46.7%) of sample had below average knowledge. These findings were supported by the study conducted by Mateena Maqbool. (2019)[9] which revealed that 24(48%) had poor knowledge, 22 (44%) had average knowledge, and only 4(8%) had good knowledge.

The present study revealed that 13 (43.3%) sample had average practice, 9 (30%) had poor practice and 8 (26.7%) had good practice of care of child on Mechanical ventilator. This study agrees with Said, (2012) who found that out of 30 nurses 10 (33%) had good practice skills, 20 (66.7%) had poor practice skills. Also, Habashneh, Sakhaa. (2018)[10] also reported that, nurse's performance in endotracheal suction was poor in caring ventilated clients.

The present study revealed that mean post- test knowledge score (27.5) was higher than the mean pre-test knowledge score (18.6) with a mean difference of 8.9. The calculated 't' value of 8.217 is higher the 't' table value 2.054 at p< 0.05 level of significance. The present study revealed that mean post- test practice score (44.5) was higher than the mean pre -test knowledge score (33.83) with a mean difference of 10.7. The calculated 't' value of 7.01 is higher the 't' table value 2.045 at p< 0.05 level of significance. These findings were supported by the study conducted by Usha Singh. (2011)[11]. The mean pre-test knowledge score was 12.32 and the mean post-test knowledge score was 24.25 with mean difference of 11.93, also the calculated 't' value (23) was greater than the tabulated 't' value (1.68) at 0.05 level significance. The mean pre-test practice score was 23.22 and mean post-test practice score was 35.35 with mean difference of 12.1. and the calculated 't' (36.26) was greater than tabulated 't' (1.68) at 0.05 level of significance.

The present revealed that there was a significant association between pre-test knowledge score of nurses with selected demographic variables such as educational qualification and attended any workshop or skill training related to care of child on ventilator at 0.05 level of significance. These findings were supported by the study conducted by Mohamed et al (2020)[12] who assessed the knowledge of staff nurse's

on mechanical ventilation and found that there was significant association between knowledge scores of staff nurses in relation to their demographic variables. The present revealed that there was a significant association between pre-test practice score of nurses with selected demographic variables such as marital status, years of working experience in NICU/PICU and attended any workshop or skill training related to care of child on ventilator at 0.05 level of significance. These findings were supported by the study conducted by Adib et al (2013)[13] found that, there was association between practice and years of working experience (p-value 0.00), ICU training (p- value 0.00) and level of education (p-value 0.01).

CONCLUSION

The finding of the study proved that Nursing care protocol was effective in improving the knowledge and practices of nurses regarding care of child on Mechanical ventilator.

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