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The Efficacy of an Educational Intervention On Staff Nurses' Knowledge and Practices for The Prevention of Ventilator-Associated Pneumonia in Neonates in The Intensive Care Unit

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Abstract

Background:
Ventilator-associated pneumonia is a serious consequence for newborns on mechanical ventilation and makes up 6.8–32.2% of all healthcare-associated infections (HAIs) in neonates. VAP rates have significantly decreased as a result of educational initiatives for nurses.

Aim:
The study's objective was to evaluate the impact of an educational intervention on staff nurses' knowledge and practices on the prevention of ventilator-associated pneumonia (VAP) in neonates in the Neonatal Intensive Care Unit (NICU).

Methodology:
Fifty staff nurses from the NICU of a tertiary care hospital were chosen using a non-probability purposive sampling technique for this quasi-experimental one group pre-test post-test investigation. A demographic proforma, a structured knowledge questionnaire, and an observational checklist on VAP prevention were used to gather data prior to and ten days following the educational intervention's implementation. The Institutional Ethical Committee (IEC) gave its approval to the study protocol. Using descriptive and inferential statistics (percentage, mean, parametric and nonparametric tests of significance), the data was analyzed using SPSS 16.0.

Results:
The mean knowledge score of the participants had increased from 21.44±3.06 (pre-test) to 30.26±2.46 (post-test) and the median score for practice prior to the intervention was 21 (interquartile range, Q1=20, Q3=22.5) and after the intervention it was 24 (interquartile range, Q1=23, Q3=25). The educational intervention
was found to be effective in terms of improvement in the knowledge ($t= -17.238$, $p<0.001$) and practice ($z= - 6.180$, $p<0.001$) of the staff nurses as evidenced by statistically significant differences in the pre-test and posttest

knowledge and practice scores of the staff nurses.

Conclusion:
In order to manage a newborn in the Neonatal Intensive Care Unit (NICU) and avoid ventilator-related issues, staff nurses must get education.

Keywords: Knowledge, practice, educational intervention, nurses, Neonatal Intensive Care Unit, Ventilator Associated Pneumonia (VAP).

1. Introduction:

Between 6.8 and 32.2% of health-care associated infections (HAIs) in neonates are caused by ventilator-associated pneumonia (VAP), a dangerous complication in newborns on mechanical ventilation. Neonatal morbidity, survival, hospital expenses, and length of stay in the neonatal intensive care unit (NICU) are all significantly impacted. Between 16.1 and 89 incidents of VAP per 1,000 ventilator days were recorded in poor nations (Afjeh, S.A., Sabzehei, M.K., Karimi, A., Shiva, F., Shamshiri, A.R., 2012).

Ventilator-associated pneumonia (VAP) is defined by the Centers for Disease Control and Prevention (CDC) as an episode of pneumonia in a patient who needs a tracheostomy or endotracheal tube to help or regulate breathing within 48 hours prior to the onset of the infection (Centers for Disease Control and Prevention, 2017). Fever, leucocytosis, purulent tracheobronchial secretions, and a recent or developing pulmonary infiltrate are its hallmarks (Munro et al., 2006). Sadly, not much research has been done on newborns, especially those with low or extremely low birth weights.

Because it is challenging to distinguish between new or progressive radiographic infiltrates caused by neonatal pneumonia, exacerbation of bronchopulmonary dysplasia, and frequent episodes of atelectasis, it is challenging to accurately determine the incidence of neonatal VAP (Al-Alaiyan & Binmanee, 2017). One of the biggest clinical challenges is preventing ventilator-associated pneumonia (VAP) in patients receiving critical care. According to empirical observation, nurses' ignorance may make it difficult for them to follow evidence-based recommendations for reducing VAP, and it is still difficult to translate evidence-based results into consistently provided care at the bedside. Nonetheless, numerous studies have demonstrated that staff development initiatives, educational interventions, and multi-educational intervention programs significantly decreased ventilator-associated pneumonia (Ali, 2013).

According to Korhan, Hakverdioglu, Parlar, and Uzelli (2014), a cross-sectional study carried out in Turkey to determine nurses' knowledge of evidence-based VAP prevention guidelines revealed that nurses had inadequate knowledge of these guidelines. As a result, educational programs were advised to improve staff nurses' understanding of these guidelines. A study conducted in Thailand revealed a significant decrease in the crude mortality rate (12.3% vs. 8.7%; $p<0.001$) and VAP rates (40.5% vs. 24%; $p<0.001$) following the implementation of the educational program (Danchaivijitr, Assanasen, Apisarnthanarak, Judaeng, & Pumsuwan, 2005).

In their review of the literature on the efficacy of educational programs in preventing ventilator-associated pneumonia (VAP), Jansson, Kaariainen, and Kyngas (2014) came to the conclusion that critical care staff education is crucial for patient safety and high-quality care.

In their study to evaluate the impact of a self-instructional module on staff nurses' knowledge of

nosocomial infection prevention in the Neonatal Intensive Care Unit (NICU), Jacob, D'Souza, and John (2014) found that staff nurses' prior knowledge was inadequate (mean knowledge score percentage = 54.33%). Nonetheless, a rise in the post-test knowledge scores was observed following the delivery of the self-instructional module (mean knowledge score percentage=98.66%). There was a 44.33% gain in knowledge.

In the chosen NICU of the tertiary care facility, neonatal VAP surveillance is not a standard procedure. But each month, the NICU saw about 20–30 intubated patients on mechanical ventilators. In order to improve the quality of care for ventilated newborns and prevent VAP, a hospital-acquired infection, it was therefore possible to measure the registered nurses' knowledge and practice in this area. Adequate knowledge and application of VAP preventive methods would assist reduce the VAP burden in the neonatal intensive care unit (NICU), as nurses are involved in the 24-hour care of ventilated neonates. Neonates are extremely delicate to handle since they are not tiny adults. As a result, the nurses working in the NICU should be well-versed in and proficient in preventing VAP. In light of this perspective, the study was carried out to determine whether the NICU staff nurses' knowledge and practices regarding the prevention of ventilator-associated pneumonia (VAP) in neonates would differ significantly following the implementation of the educational intervention. This would help to raise the registered nurses' awareness of the need to routinely assess intubated neonates on mechanical ventilators for VAP findings.

Testing of Hypothesis

Two hypotheses were intended to be tested at the 0.05 level of significance.
H1: Staff nurses' pre-test and post-test knowledge scores about preventing VAP in newborns in a particular NICU of a tertiary care hospital will differ significantly.
H2: The staff nurses' pre-test and post-test practice ratings in the chosen NICU of a tertiary care hospital will differ significantly.

Methodology

One group pre-test post-test pre-experimental design was used in this investigation. A Level IIIA Neonatal Intensive Care Unit (NICU) in a tertiary care hospital in Karnataka that has been accredited by the National Neonatal Forum of India was selected as the study's setting. A non-probability purposive sampling technique was used to choose fifty staff nurses. Staff nurses who were present during data collection, willing to take part in the study, registered as Diploma, B.Sc., or M.Sc. in Nursing, and involved in the care of ventilated newborns (direct patient care allocation) met the inclusion criteria.

Data Collection Tools:

Data was gathered using an observational checklist on VAP prevention, a structured knowledge questionnaire, and a demographic proforma created by the researcher.
The demographic proforma included questions about age (in years), professional education, religion, work experience as a critical care nurse, attendance at prior VAP training, the source and timing of such training, the average number of neonates assigned to care per shift, awareness of the existence of regular

in-service education on VAP and its prevention (frequency of in-service education), and awareness of the availability of an organizational policy on VAP.

There was only one right response for each of the 34 multiple-choice questions on the structured knowledge test. One point is awarded for each right response, and 0 points are awarded for incorrect responses. With scores ranging from 27–34, 20–26, and less than 20, the knowledge score was arbitrarily categorized as "Good," "Average," and "Poor." Each of the 33 items on the observational checklist had a score of 1 for "Yes" and 0 for "No." The checklist received a total score of 33. The practice scores were arbitrarily categorized as "Unsatisfactory (<70%)" and "Satisfactory (≥70%)." Six experts were given the instruments to ensure their veracity.

The demographic proforma, structured knowledge questionnaire, and observational checklist all have Scale Content Validity Indexes (SCVIs) of 1, 0.98, and 0.99, respectively. Five babies in the NICU were pre-tested on the instruments, typically once every shift. Every class lasted at least an hour. The post-test was administered ten days after the educational intervention was administered to all participants, i.e., from staff nurses on January 20, and it was deemed suitable for use. The split half method and inter-rater reliability testing revealed that the tools' reliability was 0.76 for the knowledge questionnaire and 1 for the observational checklist, respectively.

Educational intervention: The main goal of the educational intervention was to give the participants sufficient knowledge about ventilator-associated pneumonia (VAP) and how to prevent it, as well as the ability to put that knowledge into practice to prevent VAP in the NICU. In order to accomplish the main goal, the educational sessions addressed topics like the epidemiology of ventilator-associated pneumonia (VAP) in neonates, the definition and meaning of VAP, risk factors for VAP development, pathogenesis of VAP, a brief explanation of mechanical ventilation in neonates, and VAP preventive strategies based on Centers for Disease Control and Prevention (CDC) guidelines, including early detection of VAP signs and symptoms.

Ethical Consideration

The study was carried out from December 29, 2017, to February 20, 2018, after permission was received from the Institutional Ethics Committee (IEC no.753/2017) and registered under the Clinical Trial Registry of India (CTRI) (Reg.no CTRI/2017/12/010875). Before any data was collected, each participant was given an explanation of the participant information sheet and asked for their informed consent.

Data Collection procedure:

From December 29, 2017, to January 10, 2018, the pre-test data was collected by giving the staff nurses a knowledge questionnaire and a demographic proforma, as well as by observing how each staff member handled the ventilated newborn. Throughout the participant's duty hours, one-on-one observations of the practices were made. Every participant was seen just once. The educational sessions were held after all fifty participants had completed the pre-test data collection. The lessons took place in the NICU classroom from January 10 to January 18, 2018. Using the same knowledge quiz and observational checklist, the lessons were held whenever it was most convenient for the participants without sacrificing care from February 20, 2018.

Statistical analysis:

SPSS version 16.0 was used to analyze the data. The frequency and percentage of knowledge and practice scores from the pre-test and post-test were computed. The Wilcoxon sign rank test and paired t-test were used to determine how effective the educational intervention was. The Pearson Chi-Square test (χ 2) and, when necessary, Fisher's exact test were used to calculate the relationships between the variables. Statistical significance was defined as a p value of less than 0.05 (95% confidence interval).

Results

The following primary headings can be used to explain the study's findings: An explanation of the sample's attributes According to the information gathered from the demographic proforma, 88% of the participants (44 out of 50) were between the ages of 23 and 34 (23 and 46 were the minimum and maximum ages, respectively), 28 (56%) had a nursing diploma, 20 (40%) had a B.Sc. in nursing, and 2 (4%) had an M.Sc. in nursing. Eighty-four percent of the participants had worked as critical care nurses for one to ten years. 47 (94%) were given three newborns to care for each shift, whereas only 3 (6%) had previously received training on VAP prevention at CNE classes that were held six months prior.
10% (5) of the participants reported that there is regular in-service training on VAP prevention; 3 (6%) out of 5 participants stated that it used to be held once every six months; 2 (4%) said it used to be held once a year; 22 (44%) were unaware that there was no organizational policy on VAP and its prevention in the NICU; 16 (32%) were aware that there was no policy on VAP and its prevention in the NICU; and 12 (24%) were unsure if there was an organizational policy. (Table 1).

Table 1: Frequency and Percentage Distribution of sample characteristics. N=50

Participant characteristics	*Frequency*	*Percentage(%)*
Age(years)		
23-33	44	88
34-47	6	12
Professional Education		
Diploma in Nursing	28	56
B.Sc. Nursing	20	40
M.Sc. Nursing	2	4
Religion		
Christian	17	34
Hindu	33	66
Muslim	0	0
Others	0	0
Work Experience		
<1 year	4	8
1-10 years	42	84
11-26 years	4	8
Previous Training on VAP		
Yes	3	6
No	47	94
Where was previous training on VAP done?		
CNE Class	3	6
Not attended	47	94
When was previous training done?		
6 months back	3	6
Not attended	47	94
Babies allotted for care per shift/nurse		
1	0	0
2	3	6
3	47	94
4	0	0
Do you have regular in-service education on prevention of VAP?		
Yes	5	10
No	45	90
Frequency of in-service education on prevention of VAP		
No	45	90
Once in 6 months	3	6
Once in a year	2	4
Awareness of availability of organisational policy on VAP		
Yes	22	44
No	16	32
Not sure	12	24

An explanation of the participants' level of knowledge: The participants' mean knowledge score rose from 21.44±3.06 to 30.26±2.46. Pre-test knowledge scores ranged from 30 to 13, while post-test scores ranged from 34 to 24 (Table 2). Among the fifty contestants,

Table 2: Mean, Standard Deviation, Maximum and Minimum scores of pre-test and post-test Knowledge scores

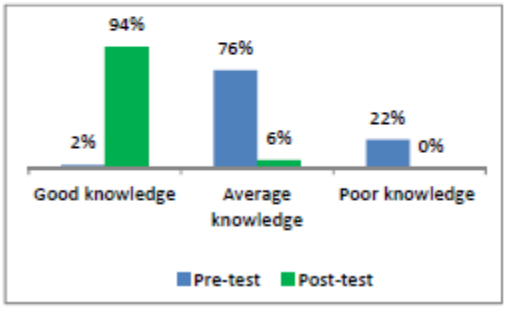
	Mean ± Standard Deviation	Maximum score (34)	Minimum score (0)
Pre test	21.44±3.06	30	13
Post test	30.26±2.46	34	24

Description of practices of the participants:: Practice has been classified as either unsatisfactory (<70%) or satisfactory (≥70%) based on the observational checklist scores. The frequency and percentage distribution of the participants' pre-test and post-test practice scores have been determined using descriptive statistics, as shown in Table 3. Before and after the intervention, the median score was 21 (interquartile range, Q1=20, Q3=22.5) and 24 (interquartile range, Q1=23, Q3=25). (Table 4)

Only 1 (2%) had strong knowledge, 38 (76%) had moderate knowledge, and 11 (22%) had bad knowledge in the pre-test, according to a detailed examination of the frequency and percentage of each observation in the checklist. On the other hand, the post-test findings indicate that the participants' knowledge has improved, with 47 (94%) having good knowledge and 3 (6%) having mediocre knowledge. (Fig. 1)

Figure 1. Bar diagram depicting the percentage distribution of pre-test and post-test knowledge scores of the staff nurses on prevention of VAP in neonates. N=50

Figure 1. Bar diagram depicting the percentage distribution of pre-test and post-test knowledge scores of the staff nurses on prevention of VAP in neonates. *N=50*



demonstrated an increase in the following post-test practices: keeping the head end elevated between 15 and 30 degrees; cleaning respiratory equipment with germicidal wipes; routinely draining tubing

condensation away from the patient without opening the circuit before care and before position changes; careful hand hygiene before and after oral care, after contact with any source of microorganisms, and after removing gloves; inhibition of saline lavage prior to suctioning; suctioning as clinically necessary, suctioning the mouth before the nose, suctioning using a negative suction pressure of less than 100 mm of Hg; evaluating feeding tube placement before or every two feeds. washing hands both before and after contact with the newborn, and tube feeding with the head of the bed raised between 15 and 30 degrees. (Table 5)

However, there are some areas of practice that still require improvement, such as routinely providing oral care every three to four hours, observing tongue cues and avoiding gagging the infant during oral care, identifying and notifying the doctor when the infant is ready to try off the ventilator, improving the use of minimally invasive ventilator support techniques, and checking for aspirates prior to feeding and recording the same with date and time. Regarding the documentation of the care provided, it was discovered that dental care and HOB (head of bed) elevation were not documented. Nonetheless, proper documentation was completed for warmer, ventilator, and suctioning maintenance. Additionally, only 10 of the 50 participants routinely checked their aspirates before feeding, and none of them recorded the results.

Table 3: Frequency and percentage distribution of the pre-test and post-test practice scores

N=50

Practice (Maximum score 33)	Pre test		Post Test	
	Frequency	Percentage	Frequency	Percentage
Satisfactory (≥70%)	12	24	49	98
Unsatisfactory (<70%)	38	76	1	2

Table 4: Description based on pre-test and post-test practice scores.

N=50

VAP Prevention practices	Maximum score (33)	Minimum score (0)	Mean ± SD	Median	Inter Quartile Range(Q1-Q3)
Pre test	25	15	20.94±1.93	21	20, 22.5
Post test	30	21	24.50±1.53	24	23, 25

Table 5: Item-wise frequency and percentage distribution of practice scores on prevention of VAP in neonates

N=50

Practice items	*Pre test*				*Post test*			
	Yes		*No*		*Yes*		*No*	
	f	*%*	*f*	*%*	*f*	*%*	*f*	*%*
Head end elevation	35	70	15	30	46	92	4	8
Changes resuscitation bags	0	0	50	100	0	0	50	100
Decontamination of respiratory equipment	30	60	20	40	39	78	11	22
Drain tubing condensation away from patient.	5	10	45	90	26	52	24	48
Routinely provides [developmentally appropriate] oral care	0	0	50	100	5	10	45	90
Follows tongue cues and avoids gagging infant during oral care.	0	0	50	100	5	10	45	90
Meticulous hand hygiene before and after oral care, after contact with any source of microorganisms and after removing gloves.	21	42	29	58	34	68	16	32
Single use of products such as sponge applicator or gauze for every swab into mouth.	50	100	0	0	50	100	0	0
Meticulous hand hygiene before and after suctioning the ETT and after touching potentially contaminated objects.	21	42	29	58	35	70	15	30
Does not performing saline lavage prior to suctioning.	47	94	3	6	48	96	2	4
Suction as clinically needed and oral cavity after oral care and mouth before nose.	27	54	23	46	44	88	6	12
Suctioning performed using pressure of <100 mm of Hg	33	66	17	34	49	98	1	2
Recognizes and informs physician of infant readiness to trial off the ventilator	0	0	50	100	2	4	48	96
Enhances use of minimally invasive ventilator support techniques.	0	0	50	100	2	4	48	96
Assess feeding tube placement before each feed or after every two feeds	16	32	34	68	45	90	5	10
Checks for aspirates and documents the same with date and time.	10	20	40	80	14	28	36	72
Provides tube feeding with head of bed elevated between 15-30°	35	70	15	30	47	94	3	6
Adequate amount of sterile water is used in humidifiers	45	90	5	10	50	100	0	0
Washes hands before and after contact with the neonate	18	36	32	64	30	60	20	40
Washes hands after contact with body fluids and patient articles.	48	96	2	4	50	100	0	0

Effectiveness of the educational intervention:

The intervention was successful in increasing the staff nurses' understanding and proficiency in preventing VAP in newborns. The Shapiro-Wilk test was used to determine if the knowledge score data were regularly distributed. Therefore, the impact of the educational intervention on staff nurses' knowledge was examined using a paired t-test, and it was discovered that there was a significant difference in the nurses' knowledge following the intervention (t= -17.238, p<0.01) (Table 6). As a result, the first research hypothesis was approved.

The Shapiro-Wilk test was used to determine the normality of the practice score data, and the results showed that the data were not normally distributed. The effectiveness of the educational intervention on staff nurses' VAP prevention practices was thus examined using the Wilcoxon sign rank test, and the results indicated a significant difference in the nurses' practice scores following the intervention (z= -6.180, p<0.01) (Table 7). As a result, hypothesis 2—which suggested that NICU staff nurses should strengthen their VAP preventive practices—was accepted.

Table 6: Paired t-test values computed between the pre-test and post-test knowledge scores

N=50

Total scores Maximum score 34 Minimum score 0	Mean	Standard Deviation	Paired t-test value (t)	p- value
Pre test	21.44	3.058	-17.238	0.001
Post test	30.26	2.456		

*p<0.05

Table 7: Wilcoxon's sign rank values computed between pre-test and post-test practice scores

N=50

Total scores Maximum score 33 Minimum score 0	Median	Inter-quartile range(Q1-Q3)	Wilcoxon Sign Rank value(z)	p- value
Pre test	21	20-22.5	-6.180	0.001
Post test	24	23-25.0		

*p<0.05

Associations of study variables with demographic variables:

The results of the study showed that there was no significant correlation between the pre-test knowledge level and age, professional education, years of experience working as a critical care nurse, staff nurses' prior training on VAP and its prevention, and the number of infants assigned to staff nurses for care each shift (p>0.01), as determined by the Chisquare test of association. The purpose of the pre-test is to evaluate how it affects the staff nurses' knowledge and skills in a neonatal intensive care unit. With a mean score of 21.44±3.06 (maximum score 30 and minimum score 13), the study's results showed that

38 (76%) of the participants had average knowledge, 11 (22%) had poor information, and only 1 (2%) had strong knowledge on VAP prevention among newborns prior to the educational intervention. El-Khatib, Husari, and Bou-Khalil (2010), who sought to evaluate the nurses' knowledge of evidence-based VAP prevention guidelines, discovered that the nurses' lack of knowledge was correlated with the participants' age ($\chi 2=6.805$, $p=0.024$), which is consistent with the results of our study. However, the study's findings showed no significant correlation between the nurses' pre-test practice and the demographic factors or between the participants' pre-test knowledge and practice.

Discussion:

With a mean percentage score of 71.8% ± 10.6, all 41 nurses who were selected for the study were given an educational intervention on preventing VAP in newborns. Ali (2013) also noted that the nurses' knowledge ratings were inadequate (mean = 7.46 ± 2.37) and that they did not follow ventilator-associated pneumonia bundling practices. (mean = 8.62 ± 7.9 out of 29). Prior to the intervention, the majority of nurses (38, or 76%) used inadequate methods to avoid VAP in neonates in the NICU. Just 12 people (24%) obtained practice ratings that were satisfactory. Before the intervention, the median score was 21 (interquartile range, Q1=20, Q3=22.5).

Similar results were reported by Heyland, Cook, and Dodek (2002), who discovered that hospitals' current VAP prevention procedures were insufficient to stop VAP in patients. Another supporting study by Sierra, Benítez, León, and Rello (2005) similarly demonstrated that different ICUs had different VAP preventive measures that did not follow evidence-based recommendations and standards. Gonclaves, Brasil, Ribeiro, and Tipple's observational cross-sectional study, which focused on nursing interventions for the prevention of ventilator-associated pneumonia in Brazil between October 2010 and January 2011, revealed that the majority of the protocols, including bronchial hygiene, mouth care, head of bed elevation, and handling mechanical ventilator circuits, were not followed by the nurses.

Regarding the efficacy of the educational intervention on the staff nurses' knowledge and practice regarding the prevention of VAP in neonates, the results of this study demonstrated an improvement in the nurses' knowledge and practice scores following the educational sessions ($p<0.01$ at the 0.05 level of significance). The post-test scores in Meherali, Parpio, Ali, and Javed's (2011) study, which examined the efficacy of a teaching module on nurses' knowledge to practice evidence-based guidelines for the prevention of VAP, were higher than the pre-test scores. However, the post-test scores after four weeks of the intervention were lower than the post-test scores taken right after the intervention (pre-test = 7.8±2.9, post-test 1=10.8±2.0 & post-test 2 = 9.8±2.1).

Gatell et al. (2012) carried out a study to evaluate the effect of a training session on the knowledge of the staff nurses working in a 16-bed medical surgical ICU in Spain. They found that the training program had a significant impact on the staff nurses' knowledge because the post-test knowledge scores were higher than the pre-test scores (17·87±2·69 versus 15·91±2·68; p=0·002). After a teaching module on International Nosocomial Infection Control (INICC) guidelines was implemented, Yuvaraja, Sivakumar, and Balasubramanian (2016) discovered a substantial increase in the critical care nurses' level of knowledge ($p<0.01$).

According to Danchaivijitr, Assanasen, Apisarnthanarak, Judaeng, and Pumsuwan's (2005) study, the educational intervention on modifiable risk factors in preventing VAP among ventilated patients significantly reduced VAP rates among ventilated patients; therefore, it can be used as an intervention to

reduce VAP in hospitals. VAP rates were reduced by 31% following the implementation of a multifaceted educational program that included infection control bundle interventions, education, process and outcome evaluation, feedback on VAP rates, and feedback on the performance of infection control practices in pediatric intensive care units (PICUs) across five developing nations.Prior to the program's implementation, the VAP rate was 11.7 per 1000 ventilator days; following the intervention, it was 8.1 per 1000 ventilator days (Rosenthal et al., 2012).

Concerning the recording of the care provided being given to the newborns on ventilation, it was discovered that there was no HOB documentation. (head of bed) elevation and dental hygiene. Morinec Additionally, Iacaboni & Molley (2012) noted a lack of documenting of HOB, repositioning, and dental care elevation, suctioning technique, and two-hourly suctioning Condensation, circuit modifications, and cuff inspections elimination by the majority of participants despite regularly carrying out these interactions between the ventilated individuals.

Therefore, the current study's findings showed that the educational intervention was successful in raising staff nurses' awareness of and proficiency with preventing VAP in newborns.

Study limitations

Because of the small sample size (50), the study's conclusions can only be applied to the population being studied. Additionally, hospital regulations may dictate different practices. One individual was only observed once due to the study's time constraints, which limits how far their approach may be applied. Because it was only done in one location, there was a chance that the study samples were contaminated. The participants' knowledge and practice were more likely to be influenced by unrelated factors such the internet, assistance from senior staff nurses, etc.

Conclusion

Through an educational intervention, this study sought to increase the staff nurses' understanding of and proficiency with preventing VAP in newborns in the NICU of the chosen tertiary hospital. The primary methods employed in this study were evaluating the pretest knowledge and providing an educational intervention to enhance the understanding and application of VAP prevention in newborns. Following the educational intervention, it was discovered that the staff nurses' knowledge and practices had improved.

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