

Knowledge of Nursing Personnel and the Adequacy of Care Provided To the Newborns on Mechanical Ventilator

*Mories sankar M.sc (N), **Ebenezer Ellen Benjamin (M.sc (N)

***Christy Simpson (M. sc (N)

Abstract

Birth of a Newborn is a special moment of joy with immense expectation. However the first minute after birth is full of anxious moments and rapid physiological adjustments. Most newborn go through the transition successfully as a matter of routine process. However, 10% of them may need varying. A high- tech care is needed when they are critically ill. A descriptive study was conducted to determine the knowledge of the nursing personnel and the adequacy of care provided to the newborn on ventilator admitted in LIII nursery, Christian Medical College, Vellore. In this study descriptive statistics and chi-square were used to analyze the data using statistical package for social sciences (SPSS) P value of < 0.05 was considered significant and P value of < 0.001 was considered highly significance. To assess the knowledge of the nursing personnel worked in LIII nursery regarding ventilator care, questionnaires were given to the nurses. A total of 22 nursing personnel's knowledge on ventilator care was assessed which showed that (9) 40.9 % had adequate knowledge and (13) 59.1 % had moderately adequate knowledge. To assess the adequacy of care provided by the nursing personnel 112 non participatory observations were made by the investigator. Out of 112 samples 17.9%, received adequate care, 78.6% received moderately adequate care and 3.6% received inadequate care. The care provided by nurses to mechanically ventilated newborn in the Neonatal Intensive Care Unit was moderately adequate. The nurses performed very well in those parameters which assessed basic nursing knowledge and techniques. The nurses performed less well in the parameters specifically related to ventilation and critical care. Hence training of nurses in Neonatal Intensive Care Unit should be more focused in these aspects of care.

Date of Submission: 13-07-2020

Date of Acceptance: 28-07-2020

I. Introduction

The health problems of newborn are unique and distinctive compared to problems of infants and older children. Neonates are prone to develop health problems due to transition from dependent fetal to independent neonatal physiology. Various iatrogenic disorders are due to aggressive use of technology in the neonatal intensive care unit. Global estimates indicate that four million newborns die annually, with almost 99% of these deaths occurring in low and middle- income countries. The millennium development goal for child survival cannot be met without substantial reductions in neonatal mortality in these countries (Lawn, Cousens & Zupan, 2005). A recent review indicated that universal implementation of sixteen interventions with proven efficacy during pregnancy, delivery, and post natal period could avert an estimated 41 % to 72% of neo natal deaths world- wide (Darmstadt et al., 2005). Nursing the newborn in NICU with assisted ventilation is a complex and challenging task which requires multi disciplinary care provided by nurses, physicians and therapists. The nurses provide a vital link between the high risk newborn and the multi disciplinary team. A neonatal nurse does time to time or sometimes minute by minute assessment and provides care to each newborn in the neonatal intensive care unit.

II. Background

Neonatal units are burdened with loud sounds, unpleasant sights and procedure and crowds of health care professional. Neonatal nursing is a challenging and changing specialty. The experienced Neonatal Intensive Care Unit (NICU) nurse serves as a link between a newborn and sometimes hostile environment. In the west, Nursing Practitioners are coming in vogue where nurses take on many function traditionally the domain of the physicians. In Britain, Advanced Neonatal Nurse Practitioner (ANNP) is recently introduced to the field of neonatal care. They are found to function well and such a delegation of responsibilities allows costs to come down and cares to improve as nursing care constantly at the bedside and can respond faster to the needs of the newborn. In India the general nursing staffs are looking after sick neonate. They are constantly observing newborn in NICU. It is important for them to observe any abnormality early and take action immediately to reduce morbidity and mortality. However, there are no studies from India showing how good or efficient they

are in this role (James et. al 2007). The investigator from her experience felt that, it is essential to conduct a study to determine the adequacy of care given to newborn on ventilator and its uniqueness today.

III. Objectives

The objectives of the study were

- To determine the knowledge of the Nursing Personnel regarding mechanical ventilator care.
- To assess the adequacy of care provided to the newborn on mechanical ventilator.
- To determine the association between knowledge and selected demographic variables of the Nursing Personnel.

RESEARCH DESIGN

This research design was descriptive in nature. This study was done to assess the adequacy of care received by newborn babies on ventilator admitted in LIII nursery, Christian Medical College, Vellore.

IV. Data Collection Procedure

The data collection procedure is as follows, samples were selected using the inclusion criteria. The investigator observed care given to the newborn by non participatory observation every 2 hours and total of 4 observations per day. The care given to the newborn was observed two hours interactions between the baby and nurse. Then the rating scale was used to assign a score. Total of 112 interactions was observed. At the end of the study i.e. on the last day a knowledge questionnaire was distributed to all 22 staff nurses who were working in LIII neonatal unit to assess their knowledge on ventilator care.

V. Results And Discussion

It is vital for intensive care nurses to deliver high quality care to the critically ill newborn, using relevant technologies and knowledge (Urden 2006). Newborn assessment and safety checks, consideration of nursing care interventions to promote patient comfort and well-being need to be addressed. For this reason, intensive care nurses need to determine the unique interventions that will positively impact on the mechanically ventilated newborn and assist in the newborn progression towards desired outcomes.

The first objective of the study was to determine the knowledge of the nursing personnel regarding mechanical ventilator care.

The samples were chosen from Level III neonatal unit of CMC, Vellore. The investigator found that majority 54.4% of the health personnel fall between the age group of 20 – 25 years, With regard to the professional qualification, 90.9 % of the subjects had diploma nursing and only 9.1% had degree nursing. Among the 22 health personnel had 68.18% 1- 3 years of experience, 22.72%, had 4-6 years experience, 9.09 had above 6 years of working experience. All together 22 staff nurses working in Level III neonatal unit of which 31.81% are CMC, Vellore graduates and 68.18 % are outside graduates. To assess the knowledge of the nursing personnel worked in LIII nursery regarding ventilator care, questionnaires was given to the nurses. A total of 22 nursing personnel's knowledge on ventilator care was assessed which showed that (9) 40.9 % had adequate knowledge and (13) 59.1 % had moderately adequate knowledge. To support this study Ying-Siou Lin (2010) conducted a study on nurses' knowledge on intubated patients, in which the nurses' knowledge was 58.8%. 'Sharon (2003) conducted a study on the knowledge of nurses regarding care of critically ill children in PICU of CMC. She stated that the knowledge of 16 staff nurses was assessed regarding assessment and implementation of pediatric critical care. 75 % of the nurses had moderately adequate knowledge. 6.25% nurses had adequate knowledge and 18.75% of the nurses had inadequate knowledge. In this study, the investigator found that there was no association between the knowledge of nursing personnel and demographic characteristics like years of experience, working area, and care of newborn. However there was an association between the knowledge of nursing personnel and their educational qualification ($P < 0.007$)

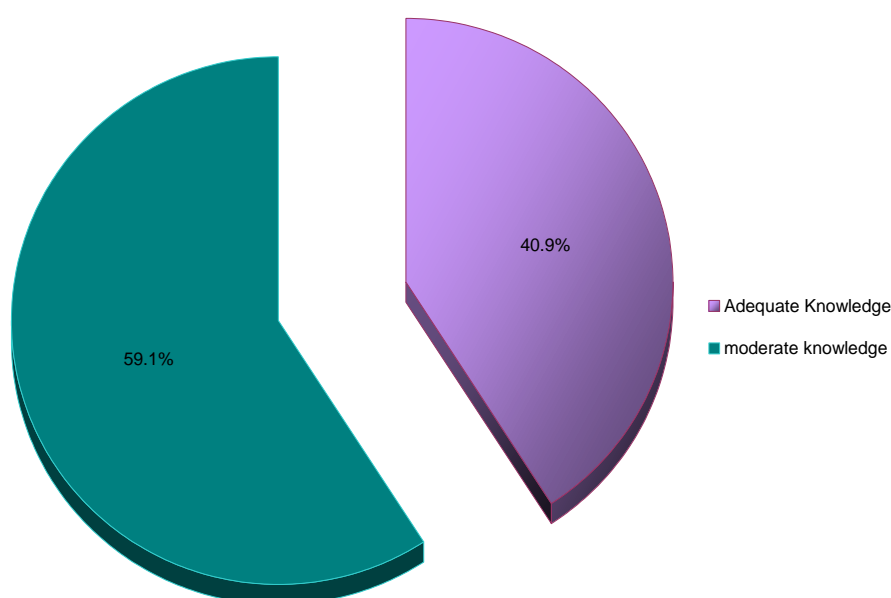


Figure.1 Distribution based on Knowledge of Nursing Personnel on Ventilator Care (N= 22)
Out of 22 samples 59.1 % (13) had moderately adequate knowledge, and 40.9 % (9) had adequate knowledge

The second objective of the study was to determine the adequacy of care given to the newborn on mechanical ventilator

One newborn was selected each time and was observed for 2 hours, when newborn connected to ventilator 112 observations was done over a period of 6 weeks. Nursing care was assessed by a rating scale, and graded adequate care, moderately adequate care, and inadequate care. All actions of the nursing care rendered in two hours rated at the end of the two hours. Nine important aspects of nursing care given to the newborn were observed. Nurses were observed to perform basic care like maintaining safe environment, prevention of infection, administration of medication, and monitoring vital signs which was adequate care, but in advanced technical tasks they didn't perform well like maintaining airway, monitoring ventilators parameters, endotracheal suctioning changing positions of newborn at regular intervals and chest physiotherapy was infrequently performed. Nurses in NICU were aware of their responsibilities regarding carrying out prescribed task, maintaining newborn safety and need for monitoring newborn, but they were not able to practice their expected role satisfactorily. Also because nurses perceived these activities were less important when compared to completion of routine / prescribed tasks and were subjected to work related stress. Hence, the over all care in terms of adequate care 17.9%, moderately adequate care was provided 78.6%, and inadequate care was 3.6%

A) MAINTAINING OF AIRWAY/BREATHING

With regard to airway maintenance, the care provided was found to be inadequate care 74.1%. It was found that interventions related to air way maintenance i.e suctioning done to clear the secretions 25.9%, performed chest physiotherapy 17.9%, checked air entry on both sides 15.2% was found to be inadequate. This could be because of negligence of nurses or due to lack of adequate knowledge and poor planning. 91.1% checked oxygen saturation continuously. This study finding was consistent with Ruth (2000) study on adequacy of care provided by the nursing personnel to children who are on mechanical ventilation in PICU. Airway maintenance was moderately adequate care i.e 55.8%, monitoring saturation was 100%. Cutler and Davis (2007) found that a total of 71% of nurses store the suctioning device in its original or protective packaging; 19% leave the device uncovered. A total of 33% of nurses used sterile isotonic sodium chloride solution to rinse the Yankauer device after use and 36% used tap water. Rinsing only if visible mucus is present was reported by 14% of nurses and 7% did not rinse the device at all. With new technology, single-use disposable suction devices are becoming more popular; 11% of nurses use such disposable devices as part of their oral suctioning practice. 45% of 139 patients had their mouths suctioned, but no patients received oropharyngeal suctioning. In care related to airway maintenance such as instilling normal saline before suction, chest physiotherapy, application of suction to clear oral secretions, and auscultation for breath sounds were inadequate.

B) MONITORING THE VENTILATOR PARAMETER

Monitoring the ventilator parameter is very important aspect when newborn is on mechanical ventilator. The investigator observed that 30.4% samples checked the water level in humidifier which was inadequate care. Here one sample filled the humidifier above the water level and finally water was going up to the endotracheal tube which is very dangerous to the newborn this is because of the carelessness of the sample, another aspect was maintaining ventilator tubing free of water in relation to this 27.7% which was again inadequate. To support this study findings Ruth (2000) reported that out of 42 samples only (29) 69% checked the humidifier water level hourly. Abraham, J., & Gupta, N. (2006). They stated that in the United States, most Neonatal Intensive Care Units (NICU) change ventilator circuit every 2-7 days. In Israel, 68 % of 22 NICUs change ventilator circuit at intervals of 48 hours. Those who frequently change ventilator circuit argue that they minimize the risk of hypoxemia and circuit contamination. They feel that this regimen is more likely to reduce the rates of circuit colonization and pneumonia.

C) MONITORING VITAL SIGNS

In relation to monitoring vital signs 7 aspects were observed. 93.8% of samples checked the temperature which was adequate and 39.3% of observations failed to check respiratory rate which was inadequate. Ruth (2000) reported that the maximum percentage of adequate care provided for monitoring vital signs 75.2%. Out of 46 samples only (9) 19.5% checked the vital signs. The reason for not checking the respiratory rate was the samples were thinking that newborn was stable on ventilator, so no need to check the respiratory rate. To avoid this, reinforcement should be given about importance of checking the respiratory rate when newborn is on mechanical ventilator. Maintaining thermoregulation in newborn is very vital. Newborn are vulnerable to heat loss and should be kept in an environment that protects them from the stress of cold. A core body temperature below 36.4⁰C in newborn has been correlated with poor brain and somatic growth, and increased mortality. Therefore newborn who is unstable should be observed under radiant warmer for several hours to maintain normal body temperature.

D) MAINTENANCE OF FLUID AND ELECTROLYTE BALANCE

Calorie intake, fluid intake, vitamin and mineral supplementation should be sufficient for optimal growth without endangering the fragile gut of the newborn. Hence maintenance of fluid and electrolyte balance is considered highly important in the management of critically ill newborn who are on ventilator. Intravenous fluid plan was made for all newborn which was 100%. Except checking intravenous infiltration every hour other aspects are above 95 % which was adequate care this may be because of the continuous infusion pump makes their work easier.

E) ADMINISTRATION OF MEDICATION

In this aspect samples were following all the sterile procedure when they were doing administration of medication. The investigator found that only 7.1% counter checked with another staff. According to the neonatal unit policy to avoid medication error, the samples are supposed to counter check with another staff. Only 11.6% of samples labeled the drugs which were inadequate care, all other aspects were adequate.

F) MAINTAINING SAFE ENVIRONMENT

To improve medical and developmental outcomes for the high-risk infant environmental structuring must be considered. Optimal physical, psychological, social and ethical NICU environment is crucial for the best neonatal outcome. Frequent NICU management procedures like suctioning, heel sticks for blood tests, intravenous line placements, imaging are stressful for the newborn and also disrupt their sleep. The nursing personnel in NICU were more cautious about the safety needs of the newborn such as keeping side rails up, securing the endotracheal tube in place, keeping the environment clean and arranged the bed side equipment orderly to avoid confusion during emergency. In this study, all the important aspects of maintaining safe environment were 100%.

G) MEETING COMFORT NEEDS

Nurses need to know when newborn is connected to ventilators which are all the pressure points they have to take care like ears, occipital region, shoulder and buttocks. During observation investigator found that they were changing the position but they failed to take care of the important pressure points on the body. In relation to meeting comfort needs of newborn moderately adequate care was provided 50.9%, they provided wrinkle free bed which was adequate care 97.3% and positioned in normal body alignment was adequate care 99.1%. Ruth (2000) has reported that meeting the comfort measures and hygienic needs the care provided was moderately adequate 60.9% supporting the present study. Christine, A., & Schindler (2006) reported that the overall incidence of bed sore was 10.2%. Patients at greatest risk were those who were more than 2 years old;

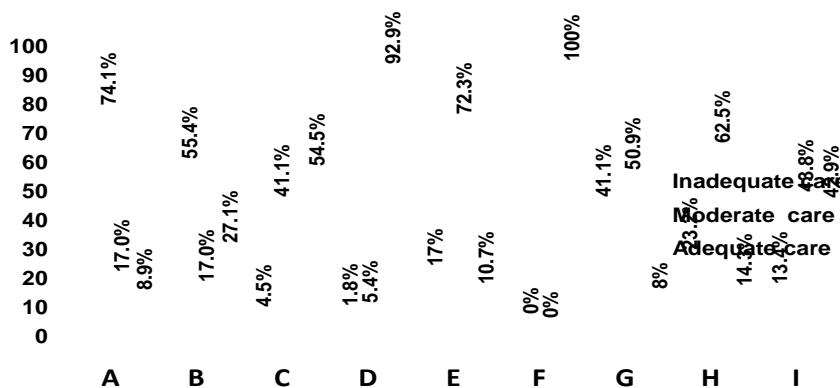
who were in the intensive care unit 4 days or longer; or who required mechanical ventilation, strategies associated with less frequent development of bed sore included use of specialty beds, egg crates, foam overlays, gel pads, dry-weave diapers, urinary catheters, disposable under-pads, body lotion, nutrition consultations, change in body position every 2 to 4 hours, blanket rolls, foam wedges, pillows, and draw sheets. Nursing interventions play an important role in the prevention of bed sores

H) PREVENTION OF INFECTION

In relation to prevention of infection, four aspects were observed. In three aspects the score was 77% which was adequate, only one aspect they didn't perform well i.e performed hand washing after procedure which was 15.2%. In general, better practices for prevention of infection should be practiced, starting with enforcing strict hand washing, offering better nutritional support, practicing proper skin care, minimizing the use of vascular access, avoiding prolonged intubation if possible, and establishing sound policies and procedures for central line and blood draws for laboratory studies are important to prevent infection. Study done by Grap and Munro in 1997, related to ventilator associated pneumonia 90% of nurses surveyed reported compliance with hand washing, but when the nurses were observed, only 22% were actually following the procedure.

I) MANAGEMENT OF EMERGENCY

The investigator found that, during the emergency the staff nurses failed to give oral and endotracheal suctioning and they did not keep emergency things like endotracheal tube and oxygen ready at that time of emergency. The overall care related to management of emergency was only 42.9% which was inadequate.



Distribution based on different aspects of nursing care given to newborn on mechanical ventilator (n=112)

- A – Maintains airway breathing the ventilator parameters
- B – Monitoring the ventilator parameters
- C – Monitoring the vital signs
- D – Maintenance of fluid and electrolyte balance
- E – Administration of medication
- F – Maintaining safe environment
- G – Meeting comfort needs
- H – Prevention of infection
- I – Management of emergency

Third objective of the study was to determine the association between knowledge and selected demographic variables of the nursing personnel

The findings of the present study revealed statistically, that there was no association between the knowledge and demographic variables of age, years of experience, professional qualification of nursing personnel. There is a significant association between knowledge of the CMC graduate and outside graduate and the P value is 0.007. Epiphany (2001) did a study on knowledge and adequacy of care given by the nursing personnel for the newborn undergoing phototherapy. She reported that there is no association between knowledge and demographic variables of age, professional qualification, in-service education and training institution. She reported that there is a significant association between knowledge and total years of experience P value is 0.001.

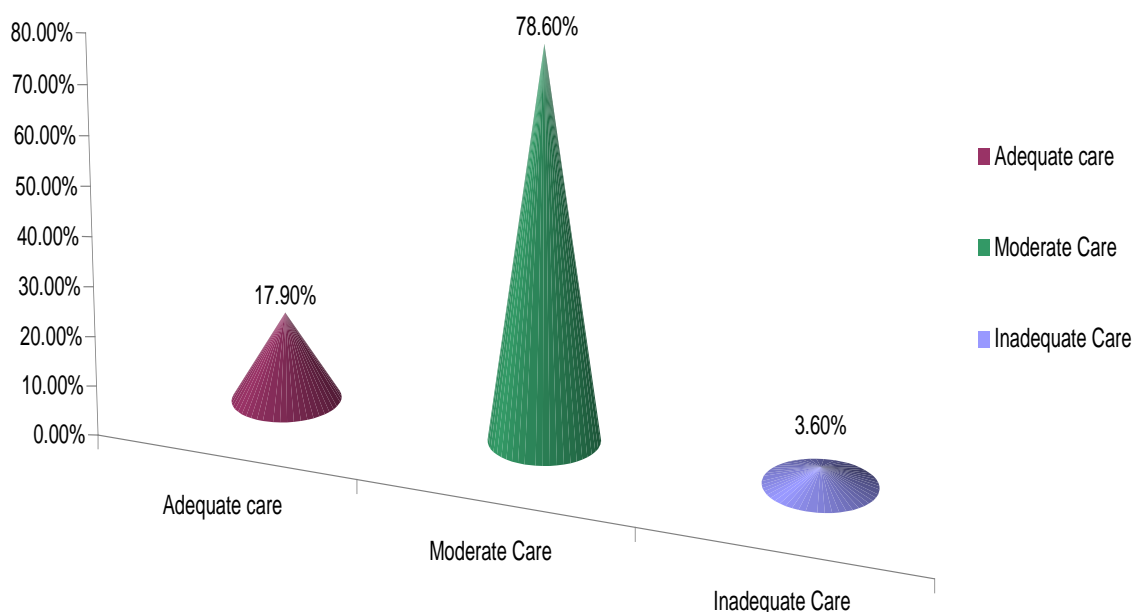


Figure .3 Distribution based on adequacy of nursing care given to newborn on mechanical ventilator (n=112)

Out of 112 samples 17.9% received adequate care, 78.6% received moderately adequate care and 3.60 received inadequate care.

VI. Conclusion

The care provided by nurses to mechanically ventilated newborn in the Neonatal Intensive Care Unit was moderately adequate. The nurses performed very well in those parameters which assessed basic nursing knowledge and techniques. The nurses performed less well in the parameters specifically related to ventilation and critical care..

Hence training of nurses in Neonatal Intensive Care Unit should be more focused in these aspects of care.

Reference

- [1]. Abraham, J., & Gupta,N. (2006). How frequently ventilatory circuits should be changed in neonates.*Journal of Neonatology*, 20 (4), 392 - 393.
- [2]. Christine, A.,& Schindler.(2011).Protecting Fragile Skin: Nursing Interventions to Decrease Development of Pressure Ulcers in Pediatric Intensive Care. *American journal of critical care*, 20, 26–35
- [3]. James, J., Tiwari, L., Swahney, P., Srinivas, V., Francis, M.R, & Kumar,N. (2007).Observational sickness assessment by the NICU staff nurses, *Indian journal of Pediatrics* 74 ,123 - 125.
- [4]. Cutler, C.J., & Davis N.(2005). Improving oral care in patients receiving mechanical ventilation. *American journal of Critical care*,14, 389 - 394.
- [5]. Darmstadt,G., Bhutta,Z.,Cousens,S., Adam, T., Walker, N., &Bernis,L.D.
- [6]. (2005).Evidence- based, cost-effective interventions: How many newborn can we save? *Lancet*, 365,977-988.
- [7]. M. Rivas-Fernandez, M. R. I. Figuls, A. Diez-Izquierdo, J. Escribano, and A. Balaguer, "Infant position in neonates receiving mechanical ventilation," *Cochrane Database of Systematic Reviews*, vol. 11, Article ID CD003668, 2016.View at: [Publisher Site](#) | [Google Scholar](#)
- [8]. Lawn, J.,Cousens, S., & Zupan, J. (2005). Four million neonatal deaths:When? Where? Why? *Lancet*,365, 891 - 900.
- [9]. J. Scott and F. Roberts, "Chest physiotherapy in mechanically ventilated infants: a narrative literature review," *Communicare*, vol. 1, no. 1, 2014.View at: [Google Scholar](#)
- [10]. L. C. de Abreu, V. E. Valenti, A. G. de Oliveira et al., "Chest associated to motor physiotherapy improves cardiovascular variables in newborns with respiratory distress syndrome," *International Archives of Medicine*, vol. 4, p. 37, 2011.View at: [Publisher Site](#) | [Google Scholar](#)
- [11]. J. L. Hough, V. Flenady, L. Johnston, and P. G. Woodgate, "Chest physiotherapy for reducing respiratory morbidity in infants requiring ventilatory support," *Cochrane Database of Systematic Reviews*, no. 3, Article ID CD006445, 2008.View at: [Publisher Site](#) | [Google Scholar](#)
- [12]. M. W. Davies, K. R. Dunster, and D. W. Cartwright, "Inspired gas temperature in ventilated neonates," *Pediatric Pulmonology*, vol. 38, pp. 50–54, 2004.View at: [Publisher Site](#) | [Google Scholar](#)
- [13].