



Effectiveness of A Protocol in Reducing The Noise Level in NICU

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ABSTRACT

Background: A neonatal intensive care unit (NICU) is an intensive care unit, specializing in the care of ill or premature newborn infants. Materials and Methods: Case study method was used for this study. The study was conducted in the NICU of Father Muller Medical College Hospital, Mangalore. The hospital is a 1250 bedded multi- speciality hospital.

This NICU has the bed strength of 25 and has modern equipment's to manage critically ill new-borns. Purposive sampling technique was used. Digital sound level meter (Model: SL 4010) was used to measure the sound level. Results: The mean and standard deviation of pretest noise level was $62.19 \text{ dB} \pm 0.844$ and posttest noise level was $50.74 \text{ dB} \pm 1.373$. Conclusion: Average noise levels of equipment's and activities were reduced.

KEYWORDS : NICU, Protocol, Noise level

Introduction

A neonatal intensive care unit (NICU) is an intensive care unit, specializing in the care of ill or premature newborn infants. The NICU environment provides challenges as well as benefits to neonates. Stressors for the infants can include continual light, a high level of noise, separation from their mothers and painful procedures. A special aspect of NICU stress both for parents and staff is that infants may survive, but with damage to the brain, lungs or eyes. NICU can cause sensory stimuli which are inappropriate to the development of newborns, especially premature babies, due to the burden of events inherent to its character, principally the high level of activities with equipment sounds, alarms, telephones and voices, and the large number of workers and students (Brandon, D.H., Ryan, D.J. & Barnes, A.H., 2007).

The American Academy of Pediatrics recommends that sound levels be lower than 45 dBA in the NICU, based on a report from the US Environmental Protection Agency (EPA) (Environmental Protection Agency, 1974). According to the AAP (American Academy of Pediatrics), exposure to noise above 45 dBA may result in cochlear damage or disrupt the normal growth and development of premature infants (American Academy of Paediatrics, 2004). The EPA (1974) recommended all hospital environments maintain a sound level of 45 dBA to support 100% speech intelligibility among patients and staff (American Academy of Paediatrics, 2007 & Darcy, A.E., Hancock, L.E. & Ware, E.J., 2008).

The equipment used to sustain these neonates' lives and keep them healthy can generate noise: incubators, ventilators, oxygen saturation monitors, alarms and automatic paper-towel dispensers. Care giving routines involving talking, something as absent minded as setting a plastic bottle on the top of an incubator, use of room doors 110 dB (A) up to every 2.2 minutes, opening packaging, writing or tapping on incubators, dropping equipment, or leaving water to bubble in ventilator tubing can add from 62dB (A) to well over 100 dB (A) to the neonate's environment (Environmental Protection Agency, 1974).

Problems that are related to noise and health include: stress related illness, high blood pressure, speech interference, hearing loss, and sleep deprivation. Sudden and loud noise leads to physiological and behavioral disturbances including sleep disturbance, motor arousals, such as startles, crying, hypoxemia, tachycardia, and increased intracranial pressure. The longer an infant's stay in the NICU, the more they are exposed to moderate noise levels. Noise is one of the most significant contributors adversely affecting infants in the NICU (Environmental Protection Agency, 1974 & American Academy of Paediatrics, 1997).

Noise levels in the NICU typically range from 50 dB (A) to 75 dB (A), with peak levels often reaching 105 dB (A), found that noise levels that exceeded 77 dB (A) caused discomfort to the neonate (American Academy of Paediatrics, 1997).

Aims and Objectives

1. To measure the noise level in NICU by observation checklist with digital noise level meter.
2. To find the effectiveness of protocol in NICU in terms of reducing noise level.

Materials and Method

1. Setting:

The study was conducted in the NICU of Father Muller Medical College Hospital, Mangalore. The hospital is a 1250 bedded multi- speciality hospital. This NICU has the bed strength of 25 and has modern equipment's to manage critically ill newborns.

2. Research approach and design:

The research approach and design used for this study was case study method.

3. Population:

All the noise in decibels in 24 hours of NICU was setting with all the equipment's and activities and staff working in NICU.

4. Sample:

NICU

5. Sampling technique:

Purposive sampling

6. Inclusion criteria:

All the equipment's generated noise in NICU (Monitor alarms, SpO₂ alarms, ventilators, CPAP etc.)

All the activities generated noise of NICU (door opening and closing, equipment's handling, tray opening and closing, waste bin lid opening, pulling chairs and tables etc.)

The noise generated by the staff of NICU at the time of assessment (staff conversation, rounds, handing over and taking over at shift change etc.) and the noise level of baby cry.

One reading of the overall noise level is taken at every one minute interval.

7. Exclusion criteria:

The noise which is generated in the remaining 59 seconds is not recorded.

8. Data collection:

Digital sound level meter (Model: SL 4010) was used for this study. The investigator conducted the pre assessment of the noise level in NICU of Father Muller Medical College Hospital, Mangalore. The noise level in NICU is measured at every minute and 60 observations were done in one hour by using the digital sound level meter in each cubicle for 24 hours. All four cubicles are observed for 24 hours. An observation checklist was used for assessing the activities and equipment's of each cubicle.

Report of Pre test

In NICU assessment of the noise level is done by observation checklist with digital noise level meter for 24 hours in all four cubicles and the average noise level in NICU is 62.19 dB which is higher than the recommended noise level is 45 dB. The equipment's and the activities also show an increased noise level. Based on the observation checklist and the noise level, a noise reduction protocol is prepared for the implementation.

Data Analysis

Major Findings of the Study:

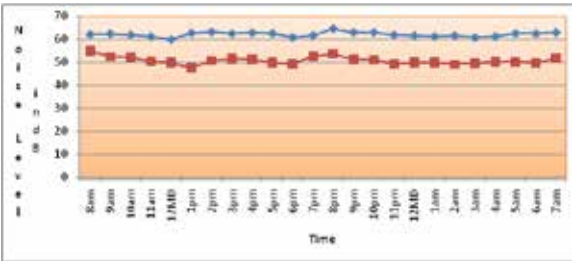
• The Mean and SD of pre test noise level was 62.19 dB ± 0.844 and post test noise level was 50.74 dB ± 1.373. The t' value is 30.589. Every hour and each session noise level and equipments and activities noise level were also reduced.

The SpO₂ alarms from 68.89 dB to 55.2 dB with a reduction of 13.69 dB. Door opening has reduced about 15.77 dB from 65.79 dB to 50.02 dB. The tables and chairs noise level was brought down from 78.26 dB to 54.91 dB with a reduction of 23.35 dB. Dropping of things, handling equipments, cleaning and waste bin lid opening has reduced the noise level from 74.20 dB to 59.49 dB with a reduction of 14.70 dB. Handing over and taking over noise level was 72.95 dB and it has come down to 57.11 dB with reduction of 15.84 dB. Hand washing which takes place very often in NICU was 58.47 dB and reduced to 52.21 dB with 6.26 dB reduction. Electricity fluctuations created the noise level of 69.45 dB have reduced to 61.25 dB with a difference of 8.2 dB. Staff conversation in NICU has reduced from 69.95 dB to 56.31 dB with a reduction of 13.64 dB. The old radiant warmer running alarms were silenced.

Table 1: Mean and SD of pre and post implementation of the protocol noise levels in NICU for 24 hours

Average noise level in NICU for 24 hours (Pre implementation)			Average noise level in NICU for 24 Hours (Post implementation)	
Time	Mean	SD	Mean	SD
8AM - 10.59 AM	62.21 dB	1.571	53.25 dB	6.3
11AM - 1.59 PM	61.33 dB	2.292	49.19 dB	2.402
2PM- 4.59 PM	62.96 dB	1.502	51.18 dB	0.193
5 PM -7.59 PM	61.77 dB	1.688	50.55 dB	0.036
8PM - 10.59 PM	63.63 dB	2.810	52.04 dB	1.69
11 PM - 1.59AM	61.65 dB	1.926	49.66 dB	1.166
2 AM - 4.59AM	61.28 dB	1.563	49.58 dB	1.345
5AM - 7.59 AM	62.72 dB	1.665	50.47 dB	0.072
Mean	62.19 dB	0.844	50.74 dB	1.373

Figure 1: Line graph shows Pre and post implementation of the protocol noise levels in every hour for 24 hours



Discussion

Table 1 shows that Mean and SD of pre and post implementation of the protocol noise levels in NICU for 24 hours was 62.19 dB ± 0.844. The 24 hours divided into 8 sessions at 3 hours intervals. From 8AM – 10.59AM the average noise level of pre implementation of protocol Mean and SD was 62.21 dB ± 1.571, from 11AM – 1.59 PM noise level was 61.33 dB ± 2.292, from 2PM – 4.59PM noise level was 62.96 dB ± 1.502, from 5PM – 7.59 PM noise level was 61.77 dB ± 1.688, from 8PM – 10.59 PM the noise level was 63.63 dB ± 2.810, from 11PM – 1.59AM the noise level was 61.65 dB ± 1.926, from 2AM – 4.59AM the noise level was 61.28 dB ± 1.563, from 5AM – 7.59 AM the noise level was 62.72 dB ± 1.665.

The Mean and SD of post implementation noise level in NICU for 24 hours was 50.74 dB ± 1.373. From 8AM – 10.59AM the average noise level of post implementation of protocol Mean and SD was 53.25 dB ± 6.3, from 11AM – 1.59 PM noise level was 49.19 dB ± 2.402, from 2PM – 4.59 PM noise level was 51.18 dB ± 0.193, from 5 PM – 7.59 PM noise level was 50.55 dB ± 0.036, from 8PM – 10.59 PM the noise level was 52.04 dB ± 1.69, from 11 PM – 1.59 AM the noise level was 49.66 dB ± 1.166, from 2 AM – 4.59 AM the noise level was 49.58 dB ± 1.345, from 5AM – 7.59 AM the noise level was 50.47 dB ± 0.072.

Figure 1 shows that the hourly pre and post implementation of the protocol noise levels in every hour for 24 hours in NICU.

To assess the effectiveness the protocol paired't' – test was applied on pre-test and post-test noise levels of 24 hours which is divided into 8 sessions at 3 hours intervals. Mean and standard deviation of each section was done. The mean and standard deviation of pre- test noise level was 62.19 dB ± 0.844 and post- test noise level was 50.74 dB ± 1.373. The t' value is 30.589.

The calculated 't' value is greater than table value ('t' value 2.37). So the research hypothesis is accepted and null hypothesis is rejected. There was significant reduction of noise level in NICU after the implementation of the noise reduction protocol.

Conclusion

Noise in all four cubicles of NICU can be reduced considerably by incorporating affordable behavioral and environmental modifications. The noise reduction protocol was effective.

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