SYNOPSIS

KEY POINT SUMMARY

OBJECTIVES

To promote awareness among healthcare workers regarding the potential adverse health effects of high noise levels in SCNUs.

Sound Levels and Its Effect on Physiology of Low Birth Weight Newborns in a Special Care Newborn Unit — a Prospective Observational Study

Das, S., Chakraborty, P., Bora, R., Chakraborty, P. 2023 | Egyptian Pediatric Association Gazette, Volume 71, Issue 1, Page(s) 30

Key Concepts/Context

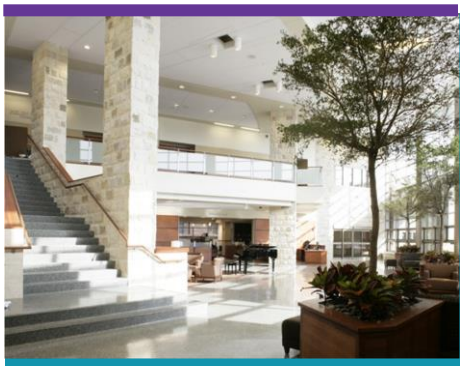
Special care newborn units (SCNUs), also known as neonatal intensive care units (NICUs), are technology-driven environments that can create stressful sonic environments for neonates. Exposure to noise levels above the 45 dB threshold recommended by the American Academy of Pediatrics may result in a variety of adverse health effects among developing neonates. Proposed methods for reducing noise levels in SCNUs include the use of designated quiet rooms and the proper maintenance of noise-producing technical hardware.

Methods

This study took place in a teaching hospital located in northeast India over the course of one month.

Ambient sound levels in two parts (levels 2 and 3) of an intensive care unit (ICU) and one kangaroo mother care (KMC) room were measured. The level 2 ICU cared for premature infants (LBW above 1500 grams and premature by more than 32 weeks), while the level 3 ICU provided comprehensive care for more seriously ill neonates. The KMC room was intended for babies who were moved from the ICU to regular nursery care.

All sound levels were measured in decibels (dB) utilizing the “iNVH” open-source Android application by Bosch Engineering Solutions. This application uses the built-in microphone of any smartphone to automatically measure noise levels in decibels Linst (instantaneous fluctuating noise level), Lmax (maximum sound level), Lmin (minimum sound level), and LEQ (mean equivalent continuous sound level). Data were collected in three shifts every day at 10 a.m., 5 p.m., and 11 p.m.



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Data on heart and respiratory rates were collected simultaneously from 40 low birth weight (LBW) neonates who did not require ventilatory or ionotropic support (i.e., hemodynamically stable neonates). Neonates on life support or with life-threatening congenital anomalies were excluded from the study.

During each data collection session, sound levels were measured simultaneously along with the observation of neonatal vital parameters.

SPSS, 3-way ANOVA tests, and t-tests were conducted to analyze mean heart rates, mean noise intensities, and respiratory rates.

Findings

Noise levels in the level 2 and level 3 ICU nurseries were significantly higher than the safety recommendations for newborns (45 dB). No diurnal variations in noise levels were noted. In level 2, the average noise level at 10 a.m. was 70.2 (+3.78) dB, while the noise level at 5 p.m. was 71.9 (+4.21) dB, and the noise level at 11 p.m. was 54.6 (+5.38) dB. For level 3, the noise levels were 66.4 (+3.71) dB, 64.9 (+3.88) dB, and 63.5 (2.52) dB respectively. For the KMC, noise levels were 55.06 (+5) dB, 54.66 (+5.38), and 47.7 (+5.1) dB respectively. Overall, the mean noise level in the SCNU was measured at 65.25 dB, 67.93 dB, and 64.87 dB respectively.

When comparing the heart and respiratory rates of neonates to noise levels, it was found that high noise levels disturbed sleeping patterns and contributed to restlessness and irritability. The differences in heart and respiratory rates when compared to noise levels were statistically significant when levels 2 and 3 were each compared with the KMC.

Data from the present study concerning heart and respiratory rates in neonates following noise exposure were compared with similar data from previous studies; the results corroborated with previous conclusions that prolonged exposure to noise resulted in stable persistent changes in breathing patterns and heart rates.

Limitations

This study took place over a relatively short period of time (one month) in a single location, and it also involved a relatively small cohort of neonates (40 in total). While noise measurements were collected during instances in the morning, afternoon, and evening, the exact duration of these collection periods was not specified; different durations in the collection time of both noise levels and health information could potentially produce different results.

Design Implications

Quiet environments such as special rooms designed for kangaroo mother care can help promote better sleep cycles in newborns; similarly, reducing noise pollution in

all NICU areas by monitoring sources such as equipment alarm volume may help prevent adverse health effects in neonates.