View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by Repositório Científico do Instituto Politécnico do Porto

Short Communication

iMedPub Journals
www.imedpub.com

Global Environment, Health and Safety

2017
Vol. 1 No. 1: 1

Newborns Safety at Neonatal Intensive Care Units: Are they Exposed to Excessive Noise during Routine Health Care Procedures?

Carlos Carvalhais*, Manuela V Silva, Ana Xavier and Joana Santos

Scientific Area of Environmental Health, Research Centre on Health and Environment (CISA/ESS. PPorto), School of Health of Polytechnic Institute of Porto (ESS. PPorto), Rua Dr. António Bernardino de Almeida, 400, 4200-072 Porto, Portugal

***Corresponding author:**
Carlos Carvalhais

caa@ess.ipp.pt

Scientific Area of Environmental Health, Research Centre on Health and Environment (CISA/ESS. PPorto), School of Health of Polytechnic Institute of Porto (ESS. PPorto), Rua Dr. António Bernardino de Almeida, 400, 4200-072 Porto, Portugal

Tel: +351222061000

Citation: Carvalhais C, Silva MV, Xavier A, Santos J. Newborns Safety at Neonatal Intensive Care Units: Are they Exposed to Excessive Noise during Routine Health Care Procedures? Glob Environ Health Saf. 2017, 1:1.

Abstract

Neonatal Intensive Care Unit (NICU) noise may be stressful to preterm infants. This research evaluated the newborns exposure to noise during several health care activities of two NICU. The measurements of the equivalent continuous A-weighted sound pressure level and peak sound pressure level were carried were performed with a sound level meter, as close as possible of the newborn. The results showed that sound pressure levels were excessive in all the evaluated tasks, exceeding international guidelines. The levels ranged between 46.6 dBA to 74.6 dBA. There is a need for more research in order to verify the effectiveness of specific strategies to reduce the impact of noise in NICU.

Keywords: Noise; NICU; Newborns; Infants

Received: August 01, 2017; **Accepted:** August 08, 2017; **Published:** August 14, 2017

Introduction

The fragility of newborns, the increasing implementation of high-risk procedures and the low tolerance to medication errors are some of the concerns of health care professionals working in neonatal intensive care units (NICU). However, indoor environmental conditions may also induce some risks to the newborns development. Since infants in the NICU are constantly surrounded by high sound pressures levels, the acoustic environment of NICU and the potential auditory and non-auditory impact of excessive levels have been important topics of research for the past 20 years [1]. There are recommendations and guidelines stating that a pressure level above 45 dBA can be harmful to the infant's ears and can affect their growth and development. In fact, WHO goes even further and recommend that the average background noise in hospitals should not exceed 35 dB L_{Aeq} for areas where patients are treated or observed [2]. Previous observations identified that some of the greatest noise in the NICU comes from staff conversation (often related to rounding), equipment's, visitors and healthcare procedures [3]. It is undeniable that the greatest continuous sound load in NICU comes from respiratory equipment, gas flow, monitor alarms, among others [4]. On the other hand, the noise exposure of premature infants in incubators is determined by the noise situation in the neonatological care unit and by the acoustical properties of the incubator. However, nursing manipulation of the patient can also cause a rather high sound level inside the incubator and produce physiological changes in the neonate [5].

Wachman et al. [6] considered that there is a gap in knowledge regarding the determination of types of noise and sounds that are least harmful to premature infants. Indeed, there is lack of studies assessing the noise production of specific health care procedures [7], in contrast with studies monitoring background noise levels and identification of different equipment as noise source. The main purpose of this work is to verify if newborns are exposed to excessive noise levels during daily health care activities.

Materials and Methods

This study was conducted in the NICU of two hospitals (A and B) located in north region of Portugal. The clinical area of the NICU A, is divided in two areas and has capacity to provide care for

© Bajo licencia de Creative Commons Attribution 3.0 License

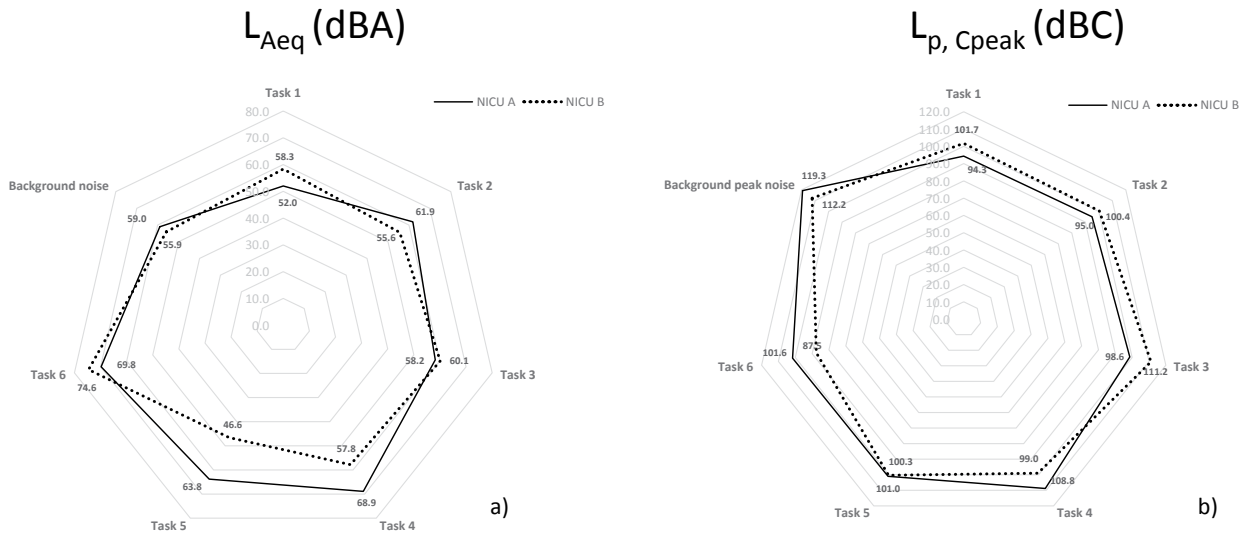

Figure 1 Average values of L_{Aeq} (a) and $L_{p, Cpeak}$ (b) during health care tasks.

Task 1 - administering medications and feeding; Task 2 - administering medications, feeding and aspiration of the respiratory tract; Task 3 – hygiene and administering medications; Task 4 - monitoring vital signs and blood drawn; Task 5 - monitoring vital signs and hygiene; Task 6 - monitoring vital signs and aspiration of the respiratory tract.

19 patients with a total of 14 incubators. The NICU B consists of three areas, equipped with a total of 9 incubators and 8 nurseries. The study included short measurements (5 up to 10 min.) for the assessment of the sound pressure levels (peak sound pressure level ($L_{p,Cpeak}$) and A-weighted equivalent sound pressure level (L_{Aeq}). Three short measurements were made *per* set of tasks. The tasks under study included administering medications, monitoring vital signs, providing hygiene and supplying vital nutrients to newborns. Measurements were performed using a sound level meter class 1 (01 dB®, model Solo-Premium) which was calibrated with an acoustic calibrator class 1 (RION®, model NC-74). The main position was inside the incubator, as close as possible to the infant ear avoiding any chance of contact between the newborn and the microphone. The data were processed in the dBTRAIT software, and the analysis involved descriptive and inferential statistics. The Student's t-test for independent samples and ANOVA one way were applied. The software IBM SPSS (Statistical Package for the Social Sciences) 20th version was used for statistical analysis.

Results

The average noise levels obtained during the 6 health care tasks of the assessed NICUs are shown in **Figure 1. (**Task 1 - administering medications and feeding; Task 2 - administering medications, feeding and aspiration of the respiratory tract; Task 3 – hygiene and administering medications; Task 4 - monitoring vital signs and blood drawn; Task 5 - monitoring vital signs and hygiene; Task 6 - monitoring vital signs and aspiration of the respiratory tract). In NICU A, L_{Aeq} (dBA) values ranged between 52.0 ± 1.2 and 69.8 ± 5.4 dBA, being the highest value obtained in Task 4. Regarding NICU B, values ranged between 46.6 ± 4.3 and 74.6 ± 6.8 dBA. In this case, Task 4 had the highest average noise level. No significant differences were found between tasks (*P*=0.063) and NICU (*P*=0.052). The highest $L_{p, Cpeak}$ (dBC) value was found during the Task 3 of NICU B (111.2 dBC). The lowest $L_{p, Cpeak}$ value, was found during Task 6. Regarding NICU A, $L_{p, Cpeak}$ (dBC) values ranged between 94.3 ± 3.5 and 108.8 ± 7.2 dBA (Task 4). In general, NICU B had highest peak levels. Nevertheless, no significant differences were found between tasks (*P*=0.120) and NICU (*P*=0.077).

Discussion

The identification of the source of the resulting noise levels involved continuous direct observation by the research team, identifying the source of the sounds and the approximate time interval of its occurrence. It was found that certain manipulations to the incubator, such as closing the doors improperly cause significant increase to sound levels within the incubator or produce a noise peak. Other factors such, baby crying, placing material on the incubator or closing the portholes, could influence the noise production near the newborn and the obtained levels. In all the tasks, the noise levels were above the recommended. Data analysis revealed that once the incubator is turned on and manipulations are performed to provide appropriate care, sound levels increase. As Farrehi et al. [8] stated that "hospital noise is a multifactorial problem and that a single solution is unlikely". In this sense, educational, environmental and infrastructural measures should be fully analyzed and considered (combined or isolated) to minimize the impact of noisy environments on occupants. In this case, periodic awareness/training sessions should be considered as a first measure to minimize noisy events originated by health care staff.

Acknowledgements

The authors thank the participants of the study and the assistance given by the Occupational Health Services of the studied hospitals. The authors are also grateful to the Environmental Health undergraduate students (from ESS.PPorto) Raquel Lázaro, Cláudia Nunes and Maria João Coelho, for partial data collection. This work is part of the "NeoNoise" project, which is being conducted and supported by the Occupational and Environmental Health Research Group of the Research Centre on Health and

Environment (SOA/CISA), School of Health of Polytechnic Institute of Porto (ESS.PPorto). Carlos Carvalhais also thanks the financial support given by PPorto through PAPRE (Programa de Apoio à Publicação em Revistas Científicas de Elevada Qualidade).

References

1 American Academy of Pediatrics: Committee on Environmental Health (1997) Noise: A Hazard for the Fetus and Newborn. Pediatrics 100: 724-727.

2 Berglund B, Thomas L, Dietrich HS (1999) Guidelines for Community Noise. Geneva, Switzerland.

3 Carvalhais C, Santos J, Da Silva MV, Xavier A (2015) Is there sufficient training of health care staff on noise reduction in neonatal intensive care units? A pilot study from neonoise project. J Toxicol Environ Heal - Part A 78: 897-903.

4 Pugh RJ, Griffiths R (2007) Noise in critical care. Care Crit Ill 23: 105-109.

5 Romeu J, Cotrina L, Perapoch J, Linés M (2016) Assessment of environmental noise and its effect on neonates in a Neonatal Intensive Care Unit. Appl Acoust 111: 161-169.

6 Wachman EM, Lahav A (2011) The effects of noise on preterm infants in the NICU. Arch Dis Child Fetal Neonatal Ed 96: F305-F309.

7 Santos J, Carvalhais C, Xavier A, Silva M V (2017) Assessment and characterization of sound pressure levels in Portuguese neonatal intensive care units. Arch Environ Occup Health 13: 1-7.

8 Farrehi PM, Nallamothu BK, Navvab M (2016)Reducing hospital noise with sound acoustic panels and diffusion: a controlled study. BMJ Qual Saf 25: 644-646.

© Under License of Creative Commons Attribution 3.0 License