International Journal of Research In Paediatric Nursing

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Effectiveness of an educational package on awareness and adherence to standard acoustic environment among healthcare personnel in NICU

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DOI: https://doi.org/10.33545/26641291.2022.v4.i2a.99

Abstract
Background: A comfortable acoustic environment in NICU set up can play an important role in health, healing, and well-being for neonate's especially preterm babies. The current study aimed to evaluate the effectiveness of an educational package on awareness and adherence to standard acoustic environment among healthcare personnel in NICU.
Methodology: A quantitative approach with pre-experimental one group pre-test, post-test design was adopted for the study. The samples from the selected hospitals were selected using purposive sampling technique. The sample consisted of 25 health care personnel of NICU. The tools used for data collection structured knowledge questionnaire, observational check list and sound meter.
Result: Comparing the awareness and adherence between pre-test and post test revealed that in the awareness mean pre-test score rose from 6.20 to mean score 9.56 in post-test and was found to be statistically significant at $p < 0.001$. And adherence to acoustic environment pre-observation median percentage of behavioral pattern increased in post observation from 0.255 to 0.705 and median percentage of environmental control from 0.533 to 0.875. And was found to be statistically significant at level of I<0.05. Reduction in the decibel of sound level in each shift, after educational package showed that in the morning sound level 65 dB to 60 dB, in the afternoon sound level 62 dB to 60 dB and in the night shift 64 dB to 61dB.
Conclusion: Study results showed significant improvement in the level of awareness and adherence to acoustic environment in NICU. Thus, it can be concluded that educational package was effective to increase and update their awareness and adherence to maintain acoustic environment in NICU.

Keywords: Acoustic environment, effect, awareness, adherence, educational package

Introduction

The neonatal intensive care unit (NICU) is a specialized care unit that treats premature and medically fragile new born and infants. Advancements in medical technology, focused-training of skilled medical personnel, and the establishment of critical care protocols have resulted in greater neonatal survival in the NICU [1]. The NICU is an environment with various stimuli, including sounds, produced by the movements of people inside the unit, alarms from life-support machines, water rushing from taps, conversation between health care professionals and family members, and the opening and shutting of the incubators´ hatches, lids of waste-bins and entry doors into the unit [2]. The stressful stimuli present in the NICU environment have also been associated with long term effects on infant development. Modifying the neonatal intensive-care unit to reduce noise levels provides an environment more conducive to maturation and recovery from illness [3]. The American Academy of Paediatrics (AAP) Committee on Environmental Health has recommended that sounds levels should be at or below 45 dB in neonatal intensive care units [4]. The suitable modern technology and equipment are currently possible to measure sound levels. Comparing the measured sound levels in NICUs with standard levels would facilitate the identification of sources of noise and their effects on sound levels. New policies can accordingly be designed to eliminate or mitigate sources of noise and hence reduce sound levels. Reducing sound level in NICUs will in turn shorten the NICU stay of premature infants and support their growth and development [5]. Health care personnel in N I C U have an important role in providing holistic care and attention must be given to maintain standard acoustic environment that is soothing, quiet, and calm environment that is more conductive to healing, growth and development.

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Modifying the physical environment of the NICU and behavioural modification of health care personnel can minimize disturbances to infant's growth and development. In many previous studies revealed that teaching programs were effective in reducing noise, reducing noise in the environment, increasing the knowledge level of health personnel, and positively affected personnel' behaviours. Furthermore, frequent repetition of training is crucial in controlling noise and creating behavioral changes [6].

Objectives
1. To compare the awareness of standard acoustic environment in NICU among health care personnel before and after administration of educational package.
2. To compare the adherence to the standard acoustic environment among health care personnel before and after administration of educational package.
3. To determine the association of awareness with selected baseline variables.

Research Hypotheses
1. **H1:** There will be significant difference in the awareness of healthcare personnel regarding standard acoustic environment before and after the intervention.
2. **H2:** There will be a significant difference in the adherence to standard acoustic environment in NICU before and after the intervention.
3. **H3:** There will be a significant association of awareness regarding standard acoustic environment among healthcare personnel with selected baseline variables.

Methodology
Research Approach: Quantitative Research Approach.

Research Design: Pre-experimental one group pre-test-post-test-design.

Sampling technique: Purposive sampling technique.

Sample size: 25

Setting of study: NICU of St. John's Medical College Hospital, Bangalore.

Tool used for data collection: Following tools used for the data collection

Section I: Demographic data: It consists of 7 items related to demographic data of participants.

Section II: Structured knowledge questionnaire: This section consists of 10 structured multiple-choice items with the multiple options for each item to assess the knowledge of health care personnel regarding acoustic environment in NICU

Section III: Observational check list: This section consists 14 items in two categories. It was categorised under the following headings
- Behavioural patterns
- Environmental control

Section IV: Sound meter: This Sound Meter used to measure and record the sound level in each shift in NICU.

Procedure
Data was collected after obtaining administrative permission from selected hospital of Bangalore. The investigator personally explained the participants the need and assured them of the confidentiality of their responses and written consent was obtained from the subjects. Assessed the adherence of health care personnel to standard acoustic environment in NICU for seven days in each shift morning afternoon and night with observational check list and measured the sound level in NICU with the help of sound meter. After seven days conducted pre-test with a structured questionnaire to assess awareness of health care personnel. Following pre-test an educational package- (teaching session and displaying of poster on noise reduction strategies) was administered. After educational package, post observation of adherence to acoustic environment and measuring of sound level in NICU was done for next seven days, on 8th post-test was done.

Result
a. The findings related to demographic variables of participants

Table 1: Frequency and percentage distribution of subjects n=25

SL No	Variables	Frequency (n)	Percentage (%)
	Gender		
1	Male	1	4
	Female	24	96
	Age in years		
	20-25	15	60
2	26-31	5	20
	32-37	2	8
	>37	3	12
	Designation		
	Senior resident	2	8
	Junior resident	0	0
3	Staff nurses	18	72
	Nursing aid	3	12
	Ward clerk	1	4
	Helper	1	4
	Educational status		
	M D Pediatrics	2	8
	BSc Nursing	16	64
4	G N M	2	8
	A N M	1	4
	Intermediate	3	12
	Primary Schooling	1	4
	Total years of experience as health care personnel		
	<1 Year	1	4
5	1-3Years	16	64
	4-6 Years	2	8
	>6 Years	6	24
	Years of experience in NICU		
	<1 Years	4	16
6	1-3Years	16	64
	4-6 Years	3	12
	>6 Years	2	8
7	**Previous exposure toawareness programme on acoustic environment**		
	Yes	0	0
	No	25	100

b. Comparison of awareness of standard acoustic environment in NICU among HCP before and after educational package

Table 2: Maximum Score, Mean, Standard Deviation, paired t test value and p value of awareness of standard acoustic environment in NICU among H C P before and after educational package. N=25

Item	Maximum score	Range	Mean	SD	Mean %	Mean difference	Paired t test
Pre-Test	10	2-9	6.20	1.60	62%	3.96	12.16
Post-Test	10	8-10	9.56	0.82	96%		

*= significant

The table 2 reveals that, the mean pre-test score was 6.20, maximum score was 10 with the range of 2-9 Mean percentage is 62% and standard deviation 1.60. The comparison of pre and post awareness scores shows that mean score rose from 6.20 to 9.56 with the range of 8-10, Mean percentage is 96% and standard deviation 0.82. It reveals that there is a significant difference in the average awareness before and after educational package, awareness which is statistically significant at $p < 0.001$ level. Hence hypothesis H1 is supported.

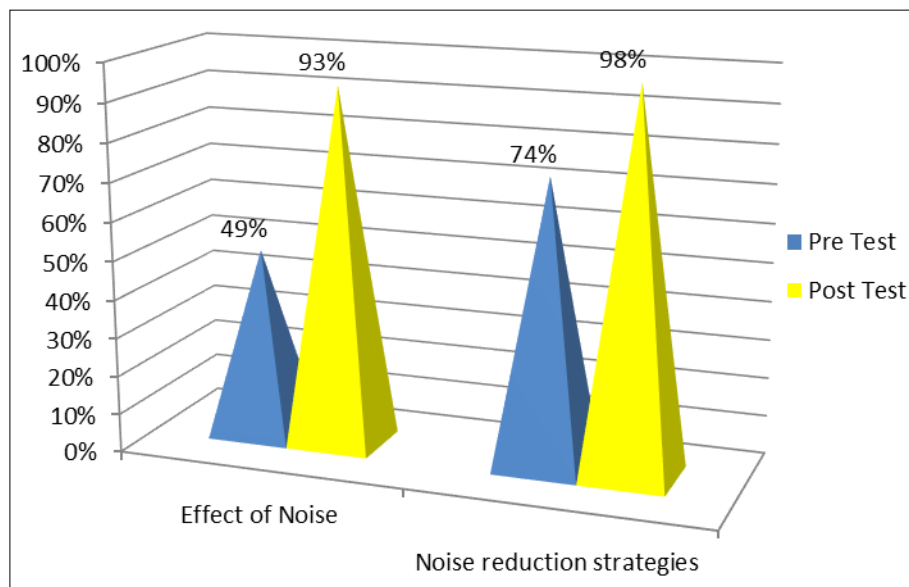**Percentage of score in area wise. N=25**

Fig 1: Comparison of pre-test and post-test percentage of score in area wise

The figure: 1 represents that there is a difference in percentage of awareness in category of acoustic environment, that is effect of noise and Noise reduction strategies between pre-test and post-test.

C. Comparison of adherence to standard acoustic environment in NICU before and after educational package

Table 3: Median, quartile, wilcoxon statistic value and p value of adherence to standard acoustic environment in NICU among HCP before and after educational package.

SL. No	Items	Pre-Test		Post-Test		Wilcoxon	P value
		Median	Q1&Q3	Median	Q1&Q3		
1	Behavioral pattern	0.2558	0.2217, 0.3093	0.7051	0.6847, 0.7668	-4.015[b]	0.000*
2	Environmental control	0.5333	0.4580, 0.6795	0.8750	0.8000,1.0000	-3.922[b]	0.000*

*= significant

The table shows that there is a significant difference in the behavioural pattern of HCP as well as environmental control to maintain acoustic environment in NICU before and after the administration of educational package at level of $p < 0.05$.
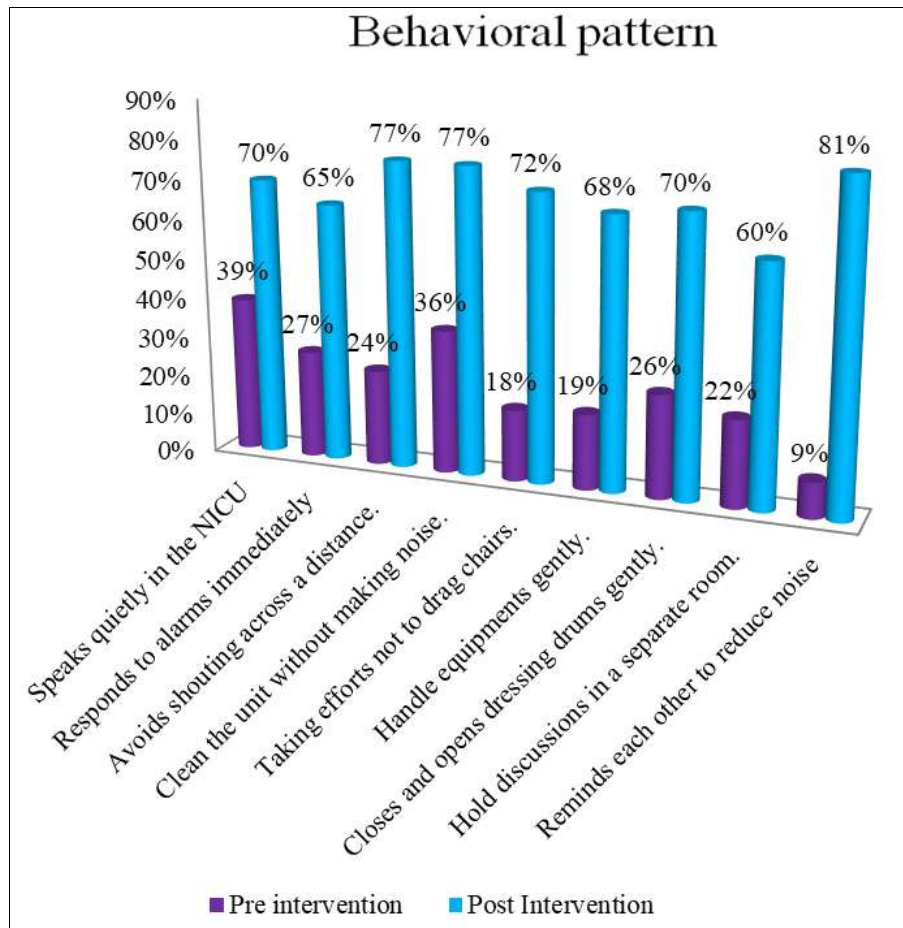
Fig 2: Percentage of adherence to standard acoustic environment in NICU regarding behavioral pattern of HCP before and after educational package.

The data from above figure represents that there was an improvement in adherence of health care personnel regarding their behavioral pattern to maintain acoustic environment in NICU after administration of educational package with the highest change observed in reminding each other to reduce noise in NICU that is from 9% to 81%.
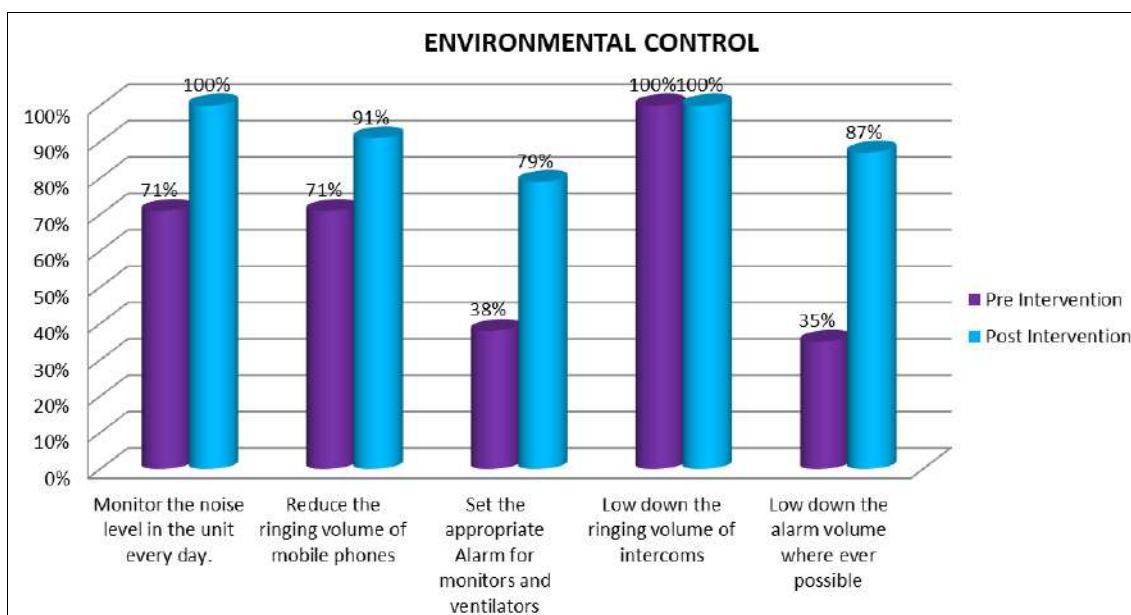

Fig 3: Percentage of adherence to standard acoustic environment in NICU regarding environmental control to maintain acoustic environment before and after educational package.

The data from above figure represents that there was an improvement in adherence of health care personnel to control the environment to maintain acoustic environment in NICU after administration of educational package.
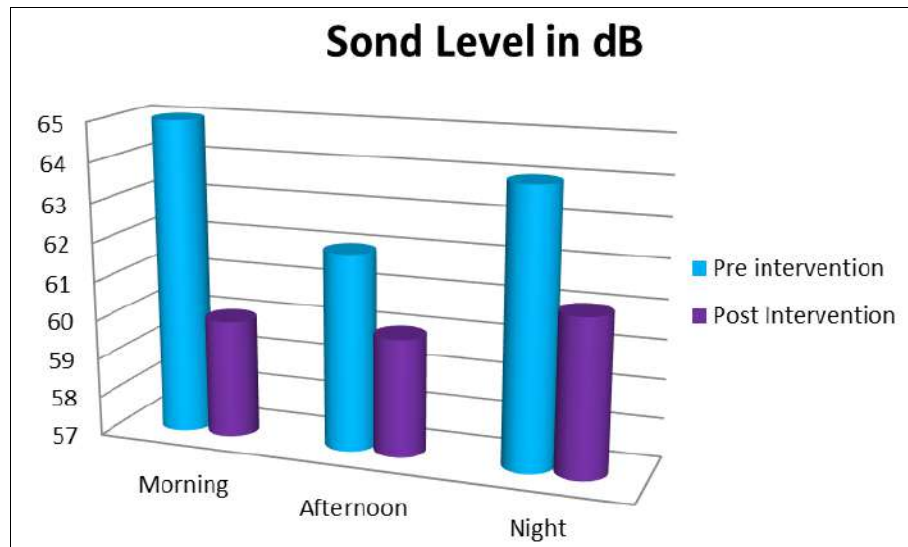
Fig 4: Comparison of average sound level in dB before and after educational package all three shifts

The above figure shows that there is a reduction in the sound level in NICU in every shift after administration of educational package.

Environment revealed the pre-observation median percentage of behavioral pattern was 0.255 and it increased in post observation median percentage to 0.705 and median percentage of environmental control from 0.533 to 0.875. There exists there is a statistically significant difference in the behavioural pattern of HCP as well as environmental control in NICU before and after intervention at level of $p<0.05$. Hence the research hypothesis H2 is supported.

d. Association of Awareness with demographic variables.
The computed ANOVA value for association between level of awareness of health care personnel regarding acoustic environment in NICU and their selected demographic variables is found to be statistically significant at $p<0.05$ levels for educational status, and designation and is not found statistically significant for other demographic variables. Therefore, the findings partially support the hypothesis H3, inferring that health care personnel's level of knowledge regarding acoustic environment is significantly associated only with educational status, and designation.

Discussion
Enhancing health personnel's knowledge regarding noise in NICUs would eventually aid in creating a healing, pleasant, and comfortable environment in NICU by eliminating the negative effects environmental stressors. The present study has been undertaken to compare the awareness and adherence of the health care personnel to maintain acoustic environment in NICU before and after administration of educational package that is teaching session and protocol regarding maintenance of acoustic environment in NICU. The awareness evaluation revealed that, the comparison of pre and post awareness the mean score rose from 6.20 to 9.56 with the range of 2-9 to 8-10, Mean percentage from 62% to 96% and standard deviation from 1.60 to 0.82. It reveals that there is a significant difference in the average awareness before and after educational package, awareness which is statistically significant at $p< 0.001$ level. Thus, the study results show that the educational package that is teaching session and noise reduction protocol was effective in improving the awareness. The similar findings which

were also evident in other study was done in Bagcilar Turkey where the findings revealed that the mean percentage was 67.35% in pre-test, 82.35% in post-test, and there was a significant difference between pretest and post-test at the level of ($p<0.05$) [6].

In the present study the evaluation of adherence to acoustic environment revealed the pre-observation median percentage of behavioral pattern was 0.255 and it increased in post observation median percentage to 0.705 and median percentage of environmental control from 0.533 to 0.875. There is a statistically significant difference in the behavioural pattern of HCP as well as environmental control in NICU before and after intervention at level of $p<0.05$. There was a difference in every aspects of behavioral pattern in the adherence, the high difference is seen in the aspects of reminds each other to reduce noise level in the unit (from 9% to 81%) and taking efforts not to drag chairs (from 18% to 72%). In the adherence to environmental control the most difference is seen in the aspect of low down the alarm volume where ever possible (from 35% to 87%). This shows that reminders among the staffs and exhibiting a poster on noise reduction strategies ensure adherence to acoustic environment. A similar another Study conducted in Bagcilar in Turkey also showed that observation of health personnel's behaviors in reducing noise in NICU was statistically significant at $p<0.05$ after the education even though some behaviors like not dragging things, using mobile phones in silent mode, remained the same[6].After introduction of educational package there is reduction in the decibel of sound level in all the shift, that is in the morning 65 dB to 60 dB, in the afternoon 62 dB to 60 dB and in the night shift 64 dB to 61dB. This shows that the teaching session and exhibition of the poster on noise reduction strategies motivated the HCP to maintain the acoustic environment in NICU.

Conclusion
Present study findings proved that the teaching session and exhibition of the poster on noise reduction strategies motivated the HCP to maintain the acoustic environment in NICU. The study was effective in reducing sound level and maintaining acoustic environment in NICU. The study findings also stressed the need for introducing educational programs to health care personnel and exhibiting

appropriate noise reduction strategies in the departments.

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