Effect of Recorded Chants of the "OM" Mantra as an Interventional Music Therapy on Reducing Stress in Newborns Admitted to the Neonatal Intensive Care Unit: An Observational Study

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Abstract

Introduction: Newborns admitted to the neonatal intensive care unit (NICU) are under tremendous stress. The "OM" sound is known to have a calming effect on adults. The effect of administering chants of "OM" to newborns is unknown.

Objectives:

Primary Objective: To evaluate the effect of the "OM" sound on vital parameters in newborns admitted to the NICU.

Secondary Objectives: To observe the duration of the effect of the "OM" sound on vital parameters after the music therapy and to observe its effect at various gestational ages.

Methods: Prospective observational study was carried out over 4 months. 57 newborns enrolled were administered music therapy by playing recorded chants of "OM" mantra (MTOM). Vitals were recorded before, during, and after MTOM.

Results: The heart rate (HR) before and with MTOM was 142 ± 7 and 130 ± 11 bpm (p = .001). The decrease in HR persisted even after 1 h of stoppage of MTOM (p = .001). A significant decrease in HR was observed in all gestations (p = .001). There was no significant difference in respiratory rate (RR) and SpO_2 before and with MTOM.

Conclusion: MTOM significantly reduces HR in newborns of all gestational ages, and its effect persists for at least 1 h after stopping MTOM.

Keywords

Music therapy, neonatal care, newborn, stress management

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Introduction

Newborns admitted to the neonatal intensive care unit (NICU) face many noxious stimuli, like exposure to alarm sounds, unpleasant odors from the spirit, and painful procedures. All of these lead to increased stress in newborns, which is manifested by changes in vital parameters during NICU care. Exposing the neonatal brain to stressful conditions also has long-term neuro-developmental consequences. It is therefore imperative to provide the sick neonates with a stress-free environment in the NICU for their optimal growth.

Music therapy is a cost-effective, non-pharmacological measure for providing stress relief to sick, vulnerable newborns. It is known that the cochlea develops by 24 weeks of gestation, and evoked responses have been recorded as early as 28 weeks of gestation in newborns.[1] Hence, music therapy interventions can be provided effectively after 28 weeks of gestation. There is enough evidence to show the benefits of music therapy for newborns.[2,3] Music therapy can promote sensorimotor, cognitive, and emotional development.[4] Music provides meaningful auditory stimulation and relieves stress, which is demonstrated by changes in vital parameters.[5,6]

Most of the studies on newborns used lullabies as the source of music.[7,8] An Indian study also tried to evaluate the effect of Indian classical music on preterm neonates vital parameters.[9] Similarly, playing recordings of chants of the "OM" mantra can be an effective way of providing soothing auditory stimulation for newborns, as "OM" is the sound of the universe. It is not specific to any religion. There are numerous physical, mental, and spiritual benefits to chanting "OM". Its effect on vital parameters such as decrease in heart rate (HR) is well documented in adults.[10] The auricular branches of the vagus nerve get stimulated during the chanting of "OM" and lead to relaxation, as demonstrated by electrophysiological evidence in adults[11] and by functional MRI in adults.[12,13]

There is tremendous potential for the "OM" sound as a source of providing relaxation from stress in newborns as

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well. However, there is no study available to see the effect of the "OM" sound/chanting on newborns. This study was planned to answer the question of whether administering chants of "OM", has any effect on reducing stress in newborns admitted in the NICU by stabilizing their vital parameters.

Materials and Methods

The prospective observational study was carried out in a Level III NICU in North India over a period of 4 months, from October 2022 to January 2023. Informed consent was obtained from the neonate's attendants.

Primary Objective

To evaluate the effect of the "OM" sound on vital parameters in newborns admitted in the NICU.

Secondary Objectives

To observe the duration of the effect of "OM" sound on vital parameters after the music therapy and to observe the response of "OM" sound on vital parameters among neonates of various gestational ages.

Inclusion Criteria

Newborns admitted to the NICU of gestational age >29 weeks and hemodynamically stable.

Exclusion Criteria

Severely sick neonates requiring mechanical ventilation and neonates with significant morbidities like severe respiratory distress syndrome, necrotizing enterocolitis, sepsis, meningitis, hypoxic ischemic encephalopathy, bilirubin encephalopathy, and persistent pulmonary hypertension of newborn (PPHN) were excluded. In addition, newborns with anomalies like aural atresia, brain, and spinal anomalies were excluded. Those newborns whose parents negatively consented to the study were excluded.

Methodology

All consecutively eligible neonates were enrolled in the study and were stratified into 3 groups depending on their gestation age: 30−33 weeks (very preterm and moderate preterm), 34−36 weeks (late preterm), and ≥37 weeks of gestation (term). All the newborns acted as controls for their vital parameters before and after the intervention. Music therapy by playing recorded chants of the "OM" mantra was used as the intervention. Robb et al.[14] and Detmer et al.[15] have provided guidelines for music-based studies, and the same was adhered to while deciding on the character of the "OM" mantra and the way of its delivery to the newborns. Music therapy by chanting of "OM" mantra (MTOM) was given to the newborns by playing a pre-recorded slow tempo, voice alone, without a music record of "OM", with a constant rhythm and volume. As newborns better hear melodies at a higher vocal range, a female voice was used. A 26-year-old female singer's voice at a frequency of 420−550 Hz and a tempo of 139 BPM was recorded and played. The recorded chanting of the "OM" mantra was played as "OMmmmmmmm" and lasted for 8 s. In this way, the sound was played at a slow rate for a longer period of time. This was played in loop via Android smart phone using VLC media player software for 1 h. The external output of the music therapy was provided through "in-ear" earphones, which were inserted using "ERO SCAN" ear tips of appropriate size for gestational age in the external auditory canal of the newborns. The intensity of the sound was fixed at <60 dB of sound pressure level (SPL) at the earphone end using the smart phone app "SOUND METER" and checked before intervention. This app was selected as the Sound Meter app best converges on a noise measurement level that is approximately within ±2 dB(A) of the true noise levels among available Android apps.[16] "OM" chants were played binaurally with background noise <45 dB. The ear tips and earphones were disinfected using 80% isopropyl alcohol before use. Vital parameters recorded were HR, respiratory rate (RR), mean arterial pressure (MAP), and oxygen saturation (SpO_2) of the newborn before, during, and after the music therapy sessions. The multiparameter monitor used was made by Mindray (Shenzen Mindray Bio-Medical Electronics Co., Ltd., Shenzen, China), model uMEC 10. It had an accuracy of ±2% for all the measurements. MAP was measured using a non-invasive method. It was measured using Mindray CM 12XX series non-invasive blood pressure cuffs, which were compatible with the Mindray multiparameter monitor. An appropriate BP cuff size was used for measurement. The duration for each BP measurement was 18–20 s and had an accuracy of ±2 mmHg. The trend display of these vital parameters from the multiparameter monitor was also recorded. Vitals were recorded 10 min before and just before MTOM, and their mean values were utilized as baseline vitals. The newborns received MTOM every day for 1 h for 5 consecutive days or till discharge from hospital, whichever was earlier, and the mean value of each of the parameters was calculated for analysis. MTOM was administered to the newborns for 1 h, and the vital parameters were noted at time intervals of 20 min (3 recordings over 1 h). The mean value of these three recordings was used as the observed value of the vital parameters while on MTOM. Similarly, after discontinuation of MTOM, vitals were again recorded for the next 1 h at intervals of 20 min (3 recordings over 1 h) to notice the time when the effect of MTOM (if any) weans off. Multiple recordings were taken to reduce the effect of chance on vitals. During the 2-h period of observation, essential baby care (e.g., diaper changes) was provided as per necessity. In all such instances, we waited 5 min after the

baby's care to negate the effect of this care on vital parameters. Subsequently, vital parameters were recorded. No sedation was used during the whole duration of MTOM. If the neonate exhibited continuous signs of overstimulation as manifested by grimacing, an arched back, and irregular breathing patterns, then the intervention was stopped and repeated only after stabilization. Adherence to study protocol was strictly followed throughout the whole study period.

Sample Size

A previous study by Keith et al.[6] showed that out of all vital parameters, SpO_2 showed the most significant improvement, and it increased by 1.51% following music intervention. Using this as a reference study and after using the Cochran formula for an observational study with a squared pooled deviation of 8.24, a 95% confidence interval, and a power of 80%, a minimum sample size of 57 was obtained. A total of 57 neonates were enrolled in our study.

Statistical Analysis

The data were entered in a Microsoft Excel spreadsheet, and analysis was done using IBM SPSS version 20. Categorical variables are presented as absolute numbers and percentages (%), while continuous variables are presented as mean ± SD. The data's normality was checked by the Kolmogorov-Smirnov test. Normally distributed continuous variables were compared using a paired t-test. A p-value of <.05 was considered statistically significant.

Results

The baseline characteristics of the study group are provided in Table 1. Newborns with gestational ages 30−33 weeks, 34−36 weeks, and ≥37 weeks were 14 (24.6%), 11 (19.3%), and 32 (56.1%), respectively. Thirty-two (56.1%) of the enrolled neonates were males, and the majority of the enrolled newborns were delivered vaginally (54.3%). Level 2 Prechtl's scale of alertness before music therapy was observed in 24 babies (43.9%) as compared to 26 babies (45.5%) during music therapy. The rest of the babies had level 1 on Prechtl's scale of alertness. There was no statistical change in level of alertness before and after music therapy.

The HR before MTOM and with MTOM (Table 2) were 142 ± 7 and 130 ± 11 bpm, respectively, with a difference of 11.7 ± 5.75 bpm, which was statistically significant (p = .001). On average, HR decreased by 8.23%. RR before MTOM and with MTOM (Table 2) were 53.5 ± 5.32 and 53.4 ± 5.2 per min, respectively, with a difference of 0.16 ± 2.83 per min, which was statistically insignificant (p = .664). SpO_2 before MTOM and with MTOM (Table 2) were 95.18 ± 2.46% and 94.65 ± 3.55%, respectively, with a difference of 0.54 ± 3.96%, which was also statistically insignificant (p = .308). MAP before MTOM and with MTOM (Table 2) were 44.42 ± 3.39 and 44.98 ± 3.45 mmHg, respectively, with a difference of 0.56 ± 1.94 mmHg, which was statistically significant (p = 0.033); however, this change is insignificant clinically.

Out of all the vital parameters, HR showed a beneficial effect on MTOM; hence, its duration of sustenance was studied as part of our pre-determined secondary objective (Table 3). The decrease in HR persisted even after 1 h of stoppage of MTOM, indicating its sustained effect (p = .001).

Table 1. Baseline Characteristics.

Parameters	Number (%)
Gestational age	
30−33 weeks	14 (24.6)
34−36 weeks	11 (19.3)
≥37 weeks	32 (56.1)
Gender	
Male	32 (56.1)
Mode of delivery	
Vaginal	31 (54.3)

Table 2. Comparison of Change in Various Vital Parameters with MTOM.

Vital Parameters	Before MTOM (Mean ± SD)	With MTOM (Mean ± SD)	p-Value
HR (bpm)	142.11 ± 7.22	130.41 ± 11.19	**.001**
RR (per min)	53.56 ± 5.32	53.40 ± 5.28	.664
MAP (mmHg)	44.42 ± 3.39	44.98 ± 3.45	**.033**
SpO_2 (%)	95.18 ± 2.46	94.65 ± 3.55	.308

Abbreviations: MAP, mean arterial pressure; HR, heart rate; RR, respiratory rate; SpO_2, oxygen saturation; SD, standard deviation; MTOM, music therapy by chanting of "OM" mantra.

Note: Bold characters signify statistically significant results.

Table 3. Comparison in HR Before and After MTOM.

Duration After Stopping MTOM	After Stopping MTOM (Mean ± SD)	Before MTOM (Mean ± SD)	p-Value
20 min	135.88 ± 9.47	142.11 ± 7.22	**.001**
40 min	137.25 ± 10.21	142.11 ± 7.22	**.001**
60 min	139.21 ± 983	142.11 ± 7.22	**.001**

Abbreviations: HR, heart rate; SD, standard deviation; MTOM, music therapy by chanting of "OM" mantra.

Note: Bold characters signify statistically significant results.

Table 4. Change in Vital Parameters with MTOM at Various Gestational Age.

Vital Parameters	Before MTOM (Mean ± SD)	With MTOM (Mean ± SD)	*p*-Value
HR (bpm)			
30–33 weeks	140.67 ± 6.89	130.42 ± 11.98	**.001**
34–36 weeks	143.31 ± 8.17	131.57 ± 11.14	**.001**
≥37weeks	142.33 ± 7.15	130.01 ± 11.20	**.001**
RR (per min)			
30–33 weeks	54.25 ± 3.31	53.49 ± 2.53	.270
34–36 weeks	52.47 ± 6.03	53.12 ± 6.61	.580
≥37weeks	53.64 ± 5.85	53.46 ± 5.79	.696
MAP (mmHg)			
30–33 weeks	40.97 ± 1.67	41.49 ± 1.89	.227
34–36 weeks	43.15 ± 2.44	44.02 ± 2.47	.082
≥37weeks	46.36 ± 2.80	46.84 ± 2.94	.240
SpO_2 (%)			
30–33 weeks	94.72 ± 1.49	92.65 ± 5.79	.203
34–36 weeks	94.92 ± 3.08	94.57 ± 3.40	.819
≥37weeks	95.48 ± 2.60	95.54 ± 1.54	.882

Abbreviations: MAP, mean arterial pressure; HR, heart rate; RR, respiratory rate; SpO_2, oxygen saturation; SD, standard deviation; MTOM, music therapy by chanting of "OM" mantra.

Note: Bold characters signify statistically significant results.

The effect of music therapy on vital parameters was observed for different gestational ages after stratification into very/moderate preterm, late preterm, and term groups (Table 4). A statistically significant decrease in HR was observed in all three gestation groups (p = .001), while there was no significant change in RR, MAP, and SpO_2 levels with MTOM.

Discussion

In our study, 57 neonates were enrolled in MTOM. A significant decrease of 11.7 ± 5.75 bpm in HR with MTOM was observed in the newborns of all the gestational age groups. This was similarly observed with music intervention in studies done by Keith et al.,[6] Loewy et al.,[17] and Tramo et al.[18] Similar effect was also observed by Paul et al.[9] in their cohort of preterm neonates while using Indian classical music. There was no statistically significant change with respect to MTOM on RR and SpO_2, which is similar to study by Tramo et al.[18] This indicates the stabilizing effect of MTOM on RR and SpO_2, as the observed values were nearly similar before and during intervention. Yue et al.[19] in a recent meta-analysis concluded that music therapy effectively improves HR, stabilizes RR and ultimately leads to decrease in stress in preterm newborns. Our study result also concurs with their conclusion. A statistically significant increase in MAP of 0.56 ± 1.94 mmHg was observed in our study. This finding is opposite to the effect found by Keith et al.[6] This change in MAP is clinically insignificant and is probably due to small sample size.

In our study, we also found that the effect of MTOM on HR was persistent for up to 1 h after stopping MTOM. This reveals the lasting relaxation effect of MTOM on the newborn brain. A similar study was not available for comparison with our study findings.

Our study has certain limitations. First, the study was conducted at a single center. The small sample size is another limitation.

A recent overview of systematic reviews provided insights into the beneficial effects of music therapy in preterm infants; however, safety and long-term outcomes were not reported.[20] The findings from our study pave the way for further research to determine whether MTOM has a beneficial effect on short-term gains like weight gain and early discharge from the hospital or on long-term gains like better neurodevelopment outcomes. A well-designed randomized controlled trial with a larger sample size will give further, well-defined answers.

Conclusion

MTOM significantly reduces HR in newborns of all gestational ages >29 weeks, and its effect persists for at least 1 h after stopping MTOM. MTOM also has a stabilizing effect on RR and SpO_2. MTOM is helpful in decreasing stress in newborns admitted to the NICU.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Approval

The study was initiated after obtaining approval from the Institutional Research Committee and Institutional Ethics Committee (Ethics/2022/403).

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Informed consent

The participant has consented to the submission of the article to the journal.

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