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'EFFECT OF CLASSICAL INDIAN MUSIC ON VITAL PARAMETERS, GROWTH AND MORBIDITY IN PREMATURE NEONATES.'

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INTRODUCTION

Advancement in technology in neonatal care, has resulted in improved survival, even in extremely preterm infants. Unfortunately this achievement has been associated with long term disabilities such as developmental delays, learning disorders or attention deficit and hyperactivity disorders in neonatal intensive care units (NICU) graduates. Part of these adverse outcomes has been attributed to stress related to NICU environment and neonatologists have been looking into ways to reduce stress associated with NICU care. Kemper and Scheve in their work suggested that music is a tool for removing stress in neonates, without causing hindrance in routine ward work [1,2].Standley JM found positive effect of music on long-term follow up of preterm infants on length of hospitalization, nonnutritive sucking rate, weight gain, and on other parameters such as oxygen saturation, heart rate, and stress related behavioral scores[3].

We conducted this study to observe effect of Indian classical music on neonates admitted in a tertiary level neonatal intensive care unit.

MATERIAL AND METHODS

It was a Case control Observational study conducted in the NICU of Army Hospital (R&R) from Jul 2010- Jul 2012. Two hundred inborn neonates below 36 weeks of gestation (based on LMP/clinical examination) were included. Hearing assessment was done for all the neonates and inclusion criteria included normal hearing confirmed by OAE**,** baby on full enteral feeds (tube / spoon) and consent for exposure to music. While neonates requiring surgical treatment, having neurological illness like Intraventricular Haemorrhage (IVH), Periventricular Leucomalacia (PVL) or those who were on medication like phenobarbitone or oxygen were excluded from this study.

Neonates were randomized into two groups who were either exposed to music or not for 30 minutes of one session. 4 such sessions in 24 hours for 7 days were conducted. These sessions were started 30 minutes after feeding. During these sessions babies were not given external stimuli like IV cannulations, injections, suctioning and temperature recording. Heart rate and SpO2 were monitored 30 minutes before, during and 30 minutes after exposure to music therapy with pulse oxymeter. Weight was monitored initially after enrolment in the study and later once a day with weighing machine with sensitivity of 1gram. All the neonates were given enteral feeds as practiced in neonatal ICU and neonatal Nursery. Sequential conduction of the study is shown in the Figure 1.

Statistical Analysis

All values are presented as Mean ± SEM. The data was examined, first, for normality of distribution using Shapiro Wilk's 'W' statistic to select an appropriate statistical test for analysis. For the comparison of dichotomous variables, chi square test was employed, a two way repeated measure ANOVA was employed for the analysis of the HR, SpO2 & weight. The two factors considered were periods of observation (with 7 levels (Day1 across Day7) & intervention with 2 levels (music therapy & no music therapy). The Odd's ratio was calculated for comparison of morbidities namely Retinopathy of Prematurity (ROP), IVH, Neonatal Jaundice (NNJ), Septicemia, Patent Ductus Arteriosus (PDA).

Results

Base line data and other physical characteristics of the neonates exposed to intervention and control group are shown in Table 1. Both groups are comparable in all physical characteristics viz. sex, number of AGA, number of SGA, mode of delivery, gestational age and weight. Outcome measures (fluctuations in Heart Rate (HR), SpO2, and weight (mean±2SD) of the neonates over 7 day period) in respect of the intervention and control group are depicted in Table 2. Analysis of the observations depicted in table 2 is shown in Table 3. Two way repeated measure ANOVA was employed for statistical analysis of changes in the pattern of HR, SpO2 & weight gain. Results of analysis showed that the fluctuations in SpO2 were significantly low during 7 days period of observation. When we combined 7 days period of observation with intervention it still showed high F & significant p value ; which was F=7.67, p=0.006 . After combining period of observation of 7 days with intervention F and p value were statistically significant with F=2.56 &p=0.01 respectively. However, results were not statistically significant for fluctuation in HR and weight gain when case and controls were compared.

TABLE-1. Physical characteristic of neonates exposed to music vs not exposed to music

Variable	Exposed to music (n=100)	Not exposed to music (n=100)	Comparison
Male	56	55	X^2= 0.34, p= 0.924
Number of AGA	60	71	X^2= 0.56, p=0.337
Number of SGA	40	29	X^2= 0.67, p=0.185
LSCS	87	92	X^2=0.040, p= 0.709
NVD	13	08	X^2= 0.60, p= 0.275
Gestational age (weeks)	32.1±0.2	31.9±0.2	X^2= 0.89, p= 0.374
Weight (gms)	1494±31	1518±29	X^2= 0.57, p= 0.572

Table-2. Effect of Music Therapy on fluctuation of HR & SpO2 and Weight

Variable	D1	D2	D3	D4	D5	D6	D7
Exposed to music (n=100)							
HR change (bpm)	19±2	20±2	19±2	18±2	17±1	18±1	17±1
SpO2 change (%)	3.87± 0.23	3.31± 0.93	3.73± 0.65	3.46± 0.33	3.39± 0.32	3.46± 0.33	3.79± 0.30
Weight (g)	1487.9 ±29.9	1506.4 ±29.9	1521.8 ±30.3	1538.9 ±30.2	1554.0 ±30.6	1568.8 ±30.6	1585.9 ±30.8
Not exposed to music (n=100)							
HR change (bpm)	19±2	19±2	17±2	17±2	18±1	18±1	17±1
SpO2 change (%)	4.00± 0.29	6.29± 0.93	4.32± 0.34	5.41± 0.65	5.22± 0.33	4.77± 0.33	4.03± 0.30
Weight (g)	1500.9 ±29.9	1506.6 ±30.1	1515.3 ±30.3	1528.6 ±30.3	1537.4 ±30.6	1551.7 ±30.6	1565.4 ±30.8

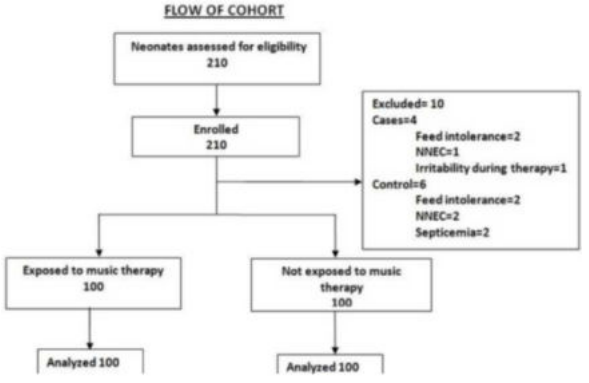
Table- 3. Variables in neonates exposed to music exposed to music therapy with

Variable	Period of observation	Intervention	Period of observation X Intervention
HR(bpm)	F=0.03, p=0.866	F=1.01, p=0.415	F=0.53, p=0.788
SpO2 (%)	**F= 7.67, p=0.006**	**F=1.29, p=0.256**	**F=2.56, p=0.018**
Weight(g)	F=0.03, p=0.866	F=1.01, p=0.415	F=0.53, p=0.788

Table- 4 : Odds' Ratio for all the morbidities

Morbidity	Cases (n=100)	Controls (n=100)	Odds' Ratio	Comparisons
ROP	**8**	**19**	**0.327(0.137 -0.799)**	**X^2= 0.90, p=0.016**
NNJ	66	59	1.349(0.795 -2.396)	X^2= 0.531, p= 0.466
PDA	4	8	0.479(0.140 -1.646)	X^2=0.248 , p= 0.618
Sepsis	23	31	0.665(0.354 -1.248)	X^2= 0.276, p= 0.599
IVH	0	3	0.000	X^2= 0.083, p= 0.773

Table 4 shows, odds' ratio for all the morbidities i.e. ROP, NNJ, PDA, Sepsis & IVH. The p value was calculated with chi square test amongst neonates exposed to music as compared to neonates not exposed to music. The analysis shows lower incidence of all the morbidities in cases, except for higher incidence of neonatal jaundice in cases in comparison to controls, however, the difference is not statistically significant with p value of 0.466. The incidence of ROP is cases was significantly low with p value of 0.016.



DISCUSSION

The issue of survival of preterm and extremely low birth weight infants was the main concern in earlier days. Now with increasing survival of this group of neonates, the main concern of neonatologists and pediatric neurologists is prevention of long-term morbidities in this group of neonates. It is a known fact that, preterm birth interrupts the normal embryological development of brain structures. In the present era doctors dealing with this group of infants are concerned, that the unfavorable influences in environment of the NICU may aggravate morbidity patterns these infants with immature brains. Modification of the environment to which neonates are exposed is expected to attenuate iatrogenic effects of this traumatic exposure[4]. Interventions to minimise effects of such an environment include, minimising the external stimuli (auditory, vestibular, visual, and tactile), clustering of nursery care routines, giving sucrose solutions or expressed breast milk while performing painful procedures and swaddling of the preterm infant etc.[5,6] Individual neonatal care routines have also been combined to form programs such as the Newborn Individualized Developmental Care and Assessment Program (NIDCAP) [7,8].

In their study Rauscher et al [9] found improvement in spatial-temporal intelligence in a group of 36 college students after listening to 10 minutes of a Mozart sonata. These findings were named "the Mozart effect." This effect is an enhancement of performance which is associated with listening to the music [10,11] . There are many studies explaining the mechanism of"Mozart effect" on the brains of adults. Now the question arises, whether the "Mozart effect" is also applicable to neonates. As per Mozart effect hypothesis the neuronal activity of the adult cerebral cortex resonates with the organization which is in Mozart's music[12]. If this hypothesis is true, then it would be exciting to know whether such neuronal organization also exists in the immature developing brains of preterm infants; if yes, may be soothing Indian classical music will have the similar effect in cerebral cortex of the premature brains.

In preterm infants, music seems helpful in decreasing heart rate, decreasing salivary cortisol, and also stress related behavior. This in turn leads to an increase in oxygen saturation, and nonnutritive sucking rate[13]. In our study with music versus no music exposure, we found that fluctuations in SpO2 were significantly low without any significant difference in heart rate fluctuations and weight gain patterns between both the groups. Stable SpO2 i.e. less fluctuations in SpO2, translates less Oxygen requirement, in turn less stress that may be a reason behind a lower incidence of ROP, the leading cause of blindness in premature neonates[14]. There are many possible mechanisms by which exposure to music leads to improved weight gain. Standley JM. In his studies found that the gain in weight could be due to better appetite or effective suck-swallow mechanism [3,14]. However there is scarcity of literature regarding effect of music on absorption of nutrient through a hormonally mediated mechanism.

In this study secondary outcome measures were to study the effect of exposure to Indian classical music on morbidities like Retinopathy of prematurity (ROP), Jaundice, septicemia and IVH. A comparison was made for the same morbidities with the control group not exposed to music therapy. After data analysis results showed reduced incidence of all the morbidities in cases except for higher incidence of neonatal jaundice in cases cohort. Results showed the difference in morbidity patterns was statistically significant only in ROP with p value of 0.01(Table-4). Incidence of ROP in control group is 19 percent which is in accordance with other published studies[15] but it was significantly low in the group exposed to music. Although incidence of jaundice was higher in neonates exposed to music therapy, however the difference in occurrence was not found to be statistically insignificant with p value of 0.466. (Table-4).

CONCLUSIONS

This study was undertaken to address whether music can be considered as a recommended supportive therapy for preterm infants.

However more studies are the need of the hour to determine

whether music should be an integral part of NICU environment and be a part of evidence-based care to improve outcome in preterm infants.

This study shows positive effects of exposure to Indian classical music on vital parameters like SpO2 and morbidity i.e. ROP in preterm infants. Music therapy is a part of developmentally supportive care in neonates more so for preterm neonates. This also brings out the role of exposure to soothing music, like Indian classical music in stabilizing the vital parameters and decreasing morbidities in preterm neonates. However, more studies are needed to study the long term effect of exposure to music on long term growth and neurodevelopment outcome in preterm infants.

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