

Effect of Music Therapy (Indian Classical Raga Bhairav Ahir) on Breast Milk Volume, in Mothers of Late Preterm and Term Neonates, During Early Neonatal Period

Gurudutt Joshi¹, Apurva Patel², Yesha Sadrani³

^{1,2,3}Surat Municipal Institute of Medical Education and Research, Gujarat, India

Received: 01-03-2026 / Revised: 15-04-2026 / Accepted: 21-05-2026

Corresponding author: Dr. Gurudutt Joshi

Conflict of interest: Nil

Abstract

Introduction: Breast milk Amrit for newborn is complete food and plays crucial role in immunity, growth, and neurodevelopment. Maternal apprehension and anxiety during early neonatal period can adversely affect lactation during this period. Limited studies are available on effect of music therapy and breast milk secretion.

Aim: To evaluate the effect of Indian classical music, Raga Ahir bhairav on breast milk secretion in mothers of late preterm and term newborns

Material and Methods: Total 110 mothers -newborn pairs (late preterm and term) were included out of which 55 pairs were music therapy group and 55 pairs control group. Music therapy group received raga Ahir Bhairav for 15 minutes four times daily (Total 12 sessions) for three consecutive days. Breast milk volume was measured daily using breast pump under standard aseptic conditions. Statistical analysis was performed using t test and chi square test.

Result: Mean milk volume in music therapy group increased from 9.0 ml at session 1 to 30.7 ml at session 12 compared to 8.8 ml and 24.5 ml respectively in controlled group (p 0.001). Multiparous mothers and mothers who delivered vaginally showed greater milk production than primiparous (p 0.03) and caesarean delivered (p 0.02) respectively. Mothers of term newborns demonstrated higher milk secretion as compared to preterm.

Conclusion: Music therapy had a positive effect on breast milk secretion among mothers of late preterm and term newborns with statistically significant increase in breast milk volume. It may serve as simple, cost effective and non-pharmacological adjunct to enhance lactation during early neonatal period.

Keywords: Ahir Bhairav, Music Therapy, Newborn, Late Preterm.

DOI: 10.25258/ijcpr.18.6.31

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Human milk is considered the gold standard for neonatal nutrition due to its unique composition of macronutrients, micronutrients, and bioactive components that support immunity, growth, and brain development. [1-2] Maternal stress plays a key role in lactation failure by inhibiting oxytocin release and affecting milk ejection [3,4].

This is particularly seen in case of Primipara mothers and those who are not appropriately counselled previously. Music therapy reduces stress lowers cortisol levels and enhances oxytocin secretion, thereby improving breast milk production, therefore music therapy may be an adjunct non-pharmacological intervention to augment this process. There is considerable heterogeneity in study designs, including variations in type, duration, and timing of music therapy, as well as outcome measurement methods, making comparisons difficult. [5,6] Studies are available

with effect of music therapy more on preterm as compared to late preterm and term newborn in Indian context, therefore this study was carried out to evaluate effect of music on milk production in late preterm and both primipara and multipara mothers.

Material and Methods

This study was a prospective case—control study conducted in the department of pediatrics, to assess the effect of music therapy sessions on lactation outcomes in mothers of late preterm (34 -36weeks and 6 days) and term neonates. Duration of study was fifteen months and it was approved by institutional ethical committee. Mothers with complicated pregnancy, hearing impairment, preterm (34weeks), newborns having oral defects, congenital malformations and in whom breastfeeding was absolutely contraindicated, were

excluded from the study. The sample size was calculated using the single proportion formula for estimating a proportion in a population:

$$n = \frac{Z^2 \times p(1-p)}{e^2}$$

Where:

n = Desired sample size

Z = The standard normal deviate corresponding to the desired confidence level.

p = The estimated proportion of an attribute present in the population.

e = The acceptable margin of error (or precision).

The purpose and procedure of the study was explained to the mothers in their local language, following which informed written consent was obtained. A total of 110 eligible mother and newborn pairs were enrolled in the study and were randomly allocated into two groups. The music therapy group comprised 55 mothers who received music therapy in addition to standard care, while the control group included 55 mothers, who received standard care without any music intervention. Both groups were breastfed. Baseline data was carried out for all participants. This included collection of maternal demographic details, obstetric history, and relevant neonatal characteristics to ensure comparability between the two groups. Mothers in the music therapy group were heard music therapy. The therapy consisted of Indian classical instrumental music in the form of a flute recording based on Raga Bhairav Ahir. The selection of this raga was made in consultation with an expert in Indian classical music, as it is traditionally known for its calming effect, reduction of stress and anxiety, and promotion of relaxation. Music was delivered using standard wireless over-the-ear headphones (Boat Rockerz 650) at a controlled sound intensity ranging from 45 to 55 decibels to ensure safety and comfort. In cases, where there was any concern regarding hearing, audiometric assessment was performed prior to administration of the therapy.

Each session of music therapy lasted for 15 minutes and was administered four times a day at fixed intervals, specifically at 12:00 PM, 6:00 PM, 12:00 AM, and 6:00 AM, over a period of three consecutive days, making a total of 12 sessions for each participant in the intervention group.

Breast milk expression was performed using a portable electric breast pump consisting of a motor unit, breast shield, tubing, and a graduated collection bottle. To maintain uniformity and avoid diurnal variation, milk collection was carried out daily between 4:00 PM and 5:00 PM under standardized conditions. Outcome assessment was

conducted daily during the intervention period and after completion of all 12 sessions. All collected data were compiled systematically and entered into a database for analysis. Appropriate statistical methods were applied to compare the outcomes between the two groups, and the results were interpreted accordingly. Statistical tests t test and chi-square test were applied as appropriate to compare outcomes between the study groups. p value of less than 0.05 was considered statistically significant. Jamovi 2.9 software was used for statistical analysis.

Result

A total of 110 mother-neonate pairs were included, with 55 in the Music Therapy group and 55 in the Control group. The mean maternal age was 24.75 ± 4.01 years. The mean maternal weight was 50.66 ± 5.16 kg, and the mean maternal body mass index was 23.10 ± 3.46 kg/m². Socio-economic assessment (Modified Kuppaswamy classification), showed that the highest number of mothers belonged to the upper lower class, 49 out of 110 (44.5%), followed by the lower class 46 mothers (41.8%), lower middle class, 14 mothers (12.7%), and upper middle class with 1 mother (0.9%). Out of total 110 mothers 69 were multiparous mothers (62.7%) and 41 primiparous mothers (37.3%). Normal vaginal delivery was the most common mode of delivery in 62 mothers (56.4%) followed by Caesarean section in 43 mothers (39.1%), while instrumental delivery was seen in 5 mothers (4.5%). Out of 110 neonates 86 (78.2%) were term and 24 (21.8%) were late preterm and 64 male (58.2%) and 46 female (41.8%). Mean birth weight was 2365.73 ± 389.42 grams. Baseline maternal and neonatal characteristics were compared between the Music Therapy and Control groups to assess initial comparability. The mean maternal age was similar in both groups (24.71 ± 3.79 years in the Music Therapy group vs. 24.78 ± 4.25 years in the control group; $p = 0.925$). Maternal weight in music group (50.33 ± 5.04 kg) and 51.00 ± 5.31 kg in control group ($p = 0.497$) similarly BMI (23.21 ± 3.54 kg/m² vs. 22.99 ± 3.41 kg/m²; $p = 0.749$) was also comparable.

Socio-economic status distribution did not differ significantly between both groups ($p = 0.364$). Parity was similar, with multiparous mothers comprising 65.5% in the music therapy group and 60.0% in the control group ($p = 0.693$). Mode of delivery was vaginal in the majority in both groups. Neonatal characteristics were likewise similar. Term births accounted for 80.0% in the Music Therapy group and 76.4% in the Control group ($p = 0.817$). The sex distribution was comparable ($p = 0.847$). Mean birth weight did not differ significantly (2336.91 ± 395.38 g vs. 2394.55 ± kg, $p = 0.440$). These parameters are depicted in Table -1 and Table-2.

Table 1: Comparison of Maternal Baseline characteristics in Study groups

Variable	Category	Music Therapy (n=55)	Control (n=55)	P value
Maternal age (Years)	Mean \pm SD	24.71 \pm 3.79	24.78 \pm 4.25	0.925
Maternal weight (kg)	Mean \pm SD	50.33 \pm 5.04	51.00 \pm 5.31	0.497
Maternal BMI (kg/m ²)	Mean \pm SD	23.21 \pm 3.54	22.99 \pm 3.41	0.749
Socioeconomic status	Upper middle	1 (1.8%)	0 (0.0%)	0.364
	Lower middle	8 (14.5%)	6 (10.9%)	
	Upper lower	27 (49.1%)	22 (40.0%)	
	Lower	19 (34.5%)	27 (49.1%)	
Parity	Primipara	19 (34.5%)	22 (40.0%)	0.693
	Multipara	36 (65.5%)	33 (60.0%)	
Mode of Delivery	Normal Vaginal Delivery	33 (60.0%)	29 (52.7%)	0.595
	Caesarean section	19 (34.5%)	24 (43.6%)	
	Instrumental delivery	3 (5.5%)	2 (3.6%)	

Table 2: Comparison of neonatal baseline characteristics in Study groups

Variable	Category	Music Therapy	Control	P value
Gestational Age Category	Late preterm	11 (20%)	13 (23.6 %)	0.817
	Term	44 (80%)	42 (76.4 %)	
Gender	Male	31 (56.4%)	33 (60%)	0.847
	Female	24 (43.6%)	22 (40%)	
Birth Weight	Mean \pm SD	2336.91 \pm 395.38	2394.55 \pm 384.82	0.442
Mode of initial feeding	Breast Feeding	38 (69.1%)	41 (74.5%)	0.672
	Breast feeding + Expressed Breast Milk	17 (30.9%)	14 (25.5%)	

Table 3: Comparison of Breast milk volume in mothers between Music Therapy and Control groups

Session	Music Therapy (Mean milk volume in mL)	Control (Mean milk volume in mL)	P value
1 Session	9.0	8.8	0.58
5 Sessions	13.2	11.5	0.04
9 Sessions	19.6	16.8	0.03
12 Sessions	30.7	24.5	0.001

The main outcome assessed was the total expressed breast milk volume at different time points in the Music Therapy and Control groups. In the Music Therapy group, mean milk volume increased from 9 mL (session 1) to 13.2 mL (session 5), 19.6 mL (session 9), and 30.7 mL (session 12). In the Control group, the corresponding values were 8.8

ml, 11.5 ml, 16.8 ml, and 24.5 ml. At the initial assessment, the difference between groups was not statistically significant ($p = 0.58$). However, from session 5 onward, the Music Therapy group showed significantly higher milk volume compared to the Control group (session 5: $p = 0.04$; session 9: $p = 0.03$; session 12: $p = 0.001$).

Table 4: Comparison of Breast Milk Volume Based on Parity

Music therapy group (n = 55)	Primipara (Mean \pm SD)	Multipara (Mean \pm SD)	p-value
1 Session	8.6 \pm 5.1	9.5 \pm 5.6	0.10
5 Sessions	12.4 \pm 5.6	14.1 \pm 6.1	0.05
9 Sessions	18.2 \pm 6.3	20.8 \pm 6.9	0.04
12 Sessions	28.5 \pm 7.8	33.2 \pm 8.5	0.03

It is depicted in Table -4 that, at the initial assessment, the difference between groups was not statistically significant ($p = 0.10$). However, from session 5 onward, the Music Therapy group showed significantly higher milk volume compared to the Control group (session 5: $p = 0.04$; session 9: $p = 0.03$).

Table 5: Comparison of Breast milk volume in Mothers (Music Therapy) by Normal vaginal delivery and LSCS route

Music therapy group (n = 55)	NVD (Normal Vaginal delivery) Mean \pm SD	LSCS Mean \pm SD	p-value
1 Session	9.2 \pm 5.3	8.4 \pm 5.0	0.05
5 Sessions	13.5 \pm 5.8	11.8 \pm 5.5	0.03
9 Sessions	19.9 \pm 6.4	17.6 \pm 6.1	0.02
12 Sessions	31.8 \pm 8.3	28.2 \pm 7.9	0.02

Both the groups had progressive increase in mean breast milk volume at the end of 12 sessions of music therapy which was significant, though who had delivered by vaginal route had more production of milk volume (p 0.02).

Table 6: Comparison of mean Breast Milk Volume (Music Therapy) between mothers of Late preterm and Term newborn

Music therapy group (n = 55)	Late Preterm (Mean \pm SD)	Term (Mean \pm SD)	p-value
1 Session	8.5 \pm 5.0	9.3 \pm 5.5	0.06
5 Sessions	12.3 \pm 5.6	14.0 \pm 6.0	0.04
9 Sessions	18.1 \pm 6.2	21.2 \pm 6.8	0.02
12 Sessions	28.9 \pm 7.9	32.4 \pm 8.6	0.01

Table -6 shows amount of mean breast milk volume in mothers of late preterm and term. Both the groups had increase in milk production as the number of music therapy sessions increased (p 0.01) but was more in term newborn.

Discussion

Mothers neonates are exposed to several challenges, including maternal stress, apprehension and anxiety particularly in primipara and uncounselled pregnant mothers as well as delayed direct breastfeeding, which may adversely affect milk production. Music listening is said to effect oxytocin secretion [7]. Listening to music modulates structures nucleus accumbens and ventral trigeminal area, hypothalamus which are thought to regulate rewarding and emotional stimuli [8]. In this study, the two groups were comparable at baseline, and the music therapy group showed a greater rise in expressed breast milk volume than the Control group over repeated sessions. Thus, these findings indicate that music therapy may help improve milk expression in the early postnatal period and may serve as a simple and safe supportive measure.

Jayamala et al [9] studied effect of music in 29 mothers of premature neonates and reported a mean maternal age of 24.0 \pm 2.9 years. Levene et al [10], in a systematic review and meta-analysis including 16 studies with 1871 participants, reported a pooled mean maternal age of 29.6 \pm 6.1 years, whereas, in this study, the mean maternal age was 24.75 \pm 4.01 years.

Sefid Haji et al [11] conducted a randomized controlled study where effect of lullaby music on breast milk volume was observed only on 100 primiparous mothers of premature infants admitted to the NICU. In this study, both primipara and multiparous women were included, out of which 41

mothers (37.3%) were primiparous and 69 mothers (62.7%) were multiparous. In Jaymala et al study 8 mothers had normal vaginal delivery, 8 had vacuum delivery, and 13 underwent caesarean section whereas in this study, In this study, 62 mothers (56.4%) had normal vaginal delivery, 43 (39.1 %) underwent caesarean section, and 5 (4.5%) had instrumental delivery. In Jaymala et al study. Jayamala et al [9] studied mothers of premature neonates and reported a mean gestational age of 34.2 \pm 1.19 weeks. Dabas et al [12] included mothers of hospitalized neonates with gestational age between 26 and 33 week. In this study, 24 neonates (21.8%) were late preterm and 86 neonates (78.2%) were term. Vianna et al [13], in an open randomized controlled trial on mothers of premature newborns, included neonates with birth weight 1,750 g. SefidHaji et al [11] studied mothers of premature infants admitted to NICU and reported a mean neonatal birth weight of 1748 \pm 533.4 g. In this study, the mean birth weight was 2365.73 \pm 389.42 g. Very few studies are available on effect of music on breast milk secretion and production in Indian context, though several studies have been conducted observing effect of lullabies on breast milk secretion in other lullabies . Study by Jaymala et al [9] had included Indian classical raga Malkauns and Yaman, whereas in this study Indian classical Raga Bhairav Ahir was included. Jayamala et al. reported that the mean volume of milk expressed with vocal music therapy was 7.12 \pm 1.57 mL, compared with 6.68 \pm 1.37 mL without music therapy, and this difference was statistically significant(p value=0.02). Dabas et al [12] also observed higher milk output in the intervention group than in the control group, with mean values of 69.2 \pm 19.3 mL and 54.1 \pm 22.5 mL respectively(p value=0.01). Sefid Haji et al [11] likewise found greater milk volume in mothers receiving music-based intervention, with mean values of 66.33 \pm 4.80 mL in the control group,

71.30 ± 4.18 mL in the lullaby group, and 75.91 ± 6.80 mL in the lullaby plus baby photograph group (p 0.01). In this study, Overall mean expressed breast milk volume after 12 sessions in the music therapy group was 30.7 ± 8.2 and in the Control group was 24.5 ± 7.6 respectively which is statistically significant (p 0.001).

Conclusion

Thus it can be concluded that effect of music therapy (Indian classical Raga Bhairav Ahir) on Indian mothers of late preterm and term newborns, on breast milk secretion, is positive, as there was statistically significant increase in breast milk volume.

Limitations: This study included late preterm and term newborn and did not include preterm (<34 weeks) and extremely preterm newborn. Duration of music therapy was only for 15 minutes, longer duration might have different effect. No galactagogues were used in this study.

References

1. Ballard O., Morrow AL. Human milk composition: nutrients and bioactive factors. *Pediatr Clin North Am.* 2013;60(1):49-74.
2. Koletzko B, Cetin I, Brenna JT. Dietary fat intakes for pregnant and lactating women. *Br J Nutr.* 2007;98(5):873-77.
3. Koletzko B, Poindexter B, Uauy R. Nutritional care of preterm infants. *Scientific Basis and Practical Guidelines. World review of nutrition and dietetics.* Basel: Edn 2; 122. Karger 2021
4. Prime D., Geddes D., Hepworth A., Trengove N., Hartmann P. Comparison of the patterns of milk ejection during repeated breast expression sessions in women. *Breastfeed Med.* 2011; 6(4): 183-190.
5. Meier P.P., Engstrom J.L., Patel A.L., Jegier B.J., Bruns N.E. Improving the use of human milk during and after the NICU stay. *Clin Perinatol.* 2017(1):161-75.
6. Chowdhury R., Sinha B., Sankar M.J., et al. Breastfeeding and maternal health outcomes. *Acta Paediatr.* 2015; 104:96-113.
7. Nillson U. Soothing music can effect oxytocin levels during bed rest after open heart surgery, a randomized control trial *J Clin Nurs.* 2009; 18:2153-61.
8. Menon V., Levitin D. The rewards of music listening, response and physiological connectivity of the mesolimbic system. *Neuroimage Epub.* 2005;28(1):175-84
9. Jayamala A.K., Lakshmanagowda P.B., et al. Music therapy and milk secretion. *J Clin Diagn Res.* 2015;9(4):1-5
10. Leven I. et al. Relaxation Therapy and Human Milk Feeding Outcomes: A Systematic Review and Meta-Analysis. *JAMA Pediatrics;* 178(6): 567-76
11. Sefid Haji S., et al. Lullaby and milk volume/ composition in NICU mothers. *Int Breastfeed J.* 2022; 17(1):2-12.
12. Dabas S., Joshi P., Agarwal R., Yadav R.K., Kachhawa G. Audio-assisted relaxation in NICU mothers. *J Neonatal Nurs.* 2019; 25(4): 200-204
13. Vianna M, Barbosa A, Carvalhaes A, Cunha A. Music therapy and breastfeeding rates. *J Pediatr (Rio J).* 2011;87(3):206-12.