

EVALUATION OF POTENTIAL LACTOGENIC EFFECT OF RECEPTIVE MUSIC THERAPY USING INDIAN CLASSICAL MUSIC IN PRIMIPARAS WOMEN- A CASE CONTROL STUDY

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Abstract

Background: Music therapy in recent years has been widely acclaimed as a non-invasive therapeutic modality for various disorders as well as a strategic tool in the promulgation of salutogenesis or wellness. Among the four major types of music therapy in vogue, receptive music therapy has been acquiring special significance as a tool of wellness in bestowing a relaxing and calming experience. However, very few reports, based on evidence generated data are available from India on the use of Indian Classical Music rAgas or musical modes in receptive music therapy, as applied to obstetrics-gynecology setting related to lactation management.

Methods: The Case control trial was carried out on 60 primipara mothers who had a normal delivery at a tertiary health care set up endowed with a school of music therapy. Blood samples were collected once each, prior to delivery, post-delivery and following 72 hours. Credentialed music was administered, using six sampUrNa rAgAs (musical modes having all the seven notes) twice daily for 30 minutes and fortified by an imagery script to facilitate bonding with the child. The study received the approbation of the competent authority. Biochemical estimation was carried out using ELISA kits. Appropriate statistical tools and stringent quality control in the laboratory were ensured.

Results: The study evaluated the changes in prolactin levels in immediate post partum women and the maternal perception of breastfeeding was also administered and analysed with the UNICEF Breastfeeding checklist. The results revealed positive improvement in prolactin levels in the Music therapy group in comparison to the control group. Some of the items of the checklist which included no of feeds per day. Time duration of each feed, comfort of the mother during breastfeeding and no of nappies changed during a day was found to be on a improvement over the control group.

Conclusion: Music therapy as a receptive method can be used in clinical areas where feasibility of complete silence may not be possible. The results of this study has shown that music therapy can be useful in lactating mothers with the increase biomarkers of hormones in lactating mothers. The maternal perception has also been positive towards the use of music therapy at the immediate postpartum period. The future implications may be directed towards other areas of stress, postpartum depression among others.

Keyword: postpartum, lactation, therapy, music, prolactin.

INTRODUCTION

Lactation is an important component for both mother and child.¹ Breastfeeding the child by the mother has proven effective on the child for enabling all round growth as well as for conferring long term health.² Besides, breastfeeding the child has also been a major determinant in maternal-infant bonding and the more a mother breastfeeds, the better would be the lactation.³

Among the important factors of breastmilk secretion is Prolactin (PRL), also referred to as the lactogenic hormone. PRL is responsible for milk production, and suckling by the baby is the major stimulus for the mammary glands to produce milk during the process of lactation. PRL elicits the desired response by inhibiting dopamine and enhances the endogenous opioids considered essential for lactation. It must however be said that the hormones, namely Estrogen and Progesterone secreted from

the placenta inhibit the secretion of PRL, until the baby is born. Following the birth of the baby, the circulating levels of progesterone and estrogen decline, thereby allowing the flow of PRL from the anterior pituitary gland, signaling the process of production of milk.⁴

The secretion of PRL from the anterior pituitary is subjected to feedback regulation. While the secretion as well as the levels of dopamine are higher, prior to childbirth, in association with estrogen and progesterone, PRL during childbirth inhibits the dopamine levels from secreting further thereby enabling the process of milk production to take place. This process of reduced dopamine from the hypothalamus continues for an elongated period and is believed to be an important physiological feature as lactation and breastfeeding are required for the good health of the infant.⁵

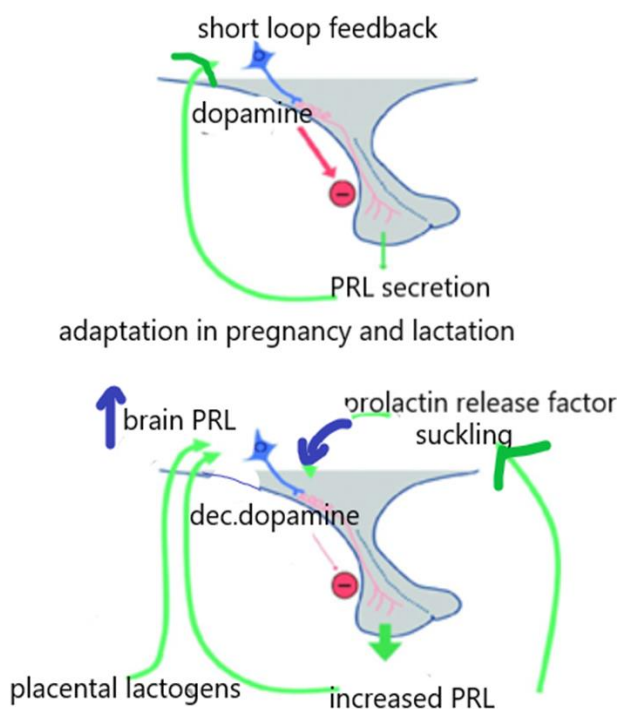


Fig 1. Cardinal endocrine events in the production of Prolactin (3)

The immediate postpartum period for *primiparas* women could well be regarded as a source of anxiety, thus affecting the ability of the mothers to breastfeed. There is documentary evidence available in the existing literature that point to stress and anxiety in new mothers. Stress in turn would culminate in the decline of milk production. Postpartum stress, anxiety and related phenomena have a profound impact on the effect of PRL, which subsequently affects the production of breastmilk.⁶

Evidence based scientific studies portray the fact that when mothers are in a relaxed state, it could facilitate the process of breastfeeding with subsequent improvement in the process of lactation. Studies have also shown a pronounced reduction in the stress hormone, namely cortisol when relaxing techniques such as aromatherapy, massage therapy and music therapy are adopted for implementation in the larger interest of the valuable clients.^{9,10} A systematic review paper on the effects of voice and instrumental music have been useful in reducing pain and anxiety, subsequently calming the mothers and showing improvement in lactation.¹¹ There are also studies that reveal an

enhancement in milk quantity as well as in the levels of oxytocin, upon administration of music.^{10,13,14} However, by comparison, the status of PRL has been studied to a lesser extent in that context. Hence, our study would acquire relevance in this regard.

The ancient medical science of India, namely Ayurveda possesses a branch that dwells on the fact as to how music could heal a variety of ailments. Further, music in general and Indian Classical music, in particular recognize a specific application that is appropriately assigned the nomenclature *rAga chikitsa* or *rAga vaidya* meaning therapy based on the administration of music as an intervention.

A *rAga*, also known as *rAg* is a musical mode in the broad spectrum of Indian classical music. The musical modes represent a conglomerate of musical notes with inherent rules, guidelines and specifications as to how delineation of the same could be accommodated. Most significantly, there are two styles in the Indian Classical music tradition, namely *Carnatic* (karnAtak) and *Hindustani*. These styles employ the musical modes for improvisation and there are hundreds of *rAgas* in the Indian Classical music on the basis of permutation and combination.

In our study, we made a sincere attempt to evaluate the use of Carnatic music fortified with imagery as a music assisted relaxation for the benefit of the *primipara* mothers in the first week, following a normal delivery (spontaneous vaginal delivery). The aim of the study was to record and analyze the changes in prolactin levels of the first-time mothers upon administration of music (receptive music therapy)

METHODOLOGY

Study type, population:

The study is a case control with 60 *primiparas* mothers who have delivered normally. The total sample size was 60 (30 in each group). The study was conducted after approval of the human ethical committee (EC (PhD project/08/2019/00) and was conducted in a tertiary hospital in the south of India.

Music therapy intervention

Music therapy was rendered to the mothers twice a day for 30 minutes (once in the morning and once in the evening). The music therapy sessions were rendered by a credentialed music therapy. The music was planned on 6 *sampurna ragas* (scales that have all the 7 notes in them) improvised and included an imagery script to create a sense of bonding with the child.

Sample collection

The serum samples for prolactin assessment were collected once prior to delivery (1st stage of labor), once post-delivery (at 8 hours) and once at 72 hours. The evaluation of the samples was done using prolactin Eliza kits.

The UNICEF breastfeeding checklist was used to find the maternal perception of the breast-feeding ability of the infant and the comfort levels of the mother in breastfeeding. The checklist was administered for three days and at the end of the working day.

Statistical analysis

The data was evaluated with the Independent t test to record the changes between the two groups. The data was first checked for normality as the samples were 60 (30 in each group) following the data being normal the independent t test was performed. The descriptives were performed for the demographic details of age and employment of the subjects and a chi squared test to bring out the counts and frequencies.

RESULTS

Tables 1 and 2 reveal sociodemographic details.

The mother’s age is about 25 in both the groups with the minimum age being 19 and maximum age being 32 (Table 1). -

Table 1: Age range of study participants

Demographics	Group	n	Mean	SD	Min.	Max.
Age (Range in years)	Music therapy intervention (Group 1)	30	25.40	3.29	19	32
	Control (Group 2)	30	25.10	2.80	21	31

Table 2 depicts the educational levels in the participant mothers. The educational background of the mothers (study participants) provides an interesting insight into the attributes of a developing country such as India, more so in the light of the fact that the Gross Enrolment Ratio (GER) is far from satisfactory in several

Indian states and Union Territories. With reference to the present study, a major percentage of mothers are in possession of a degree acquired from a Higher Educational Institution (HEI), followed by those who have completed only primary education.

Table 2: Educational levels in the study subject

Group	1	2	3	4	Total
Music therapy intervention (Group 1)	5	0	23	2	30
Control (Group 2)	11	2	15	2	30
Total	16	2	38	4	60

1. Primary School 2. High school 3. Graduates 4. Postgraduates

Table 3 describes the distinction in prolactin levels as perceived between the music therapy intervention and control groups. Independent t Test was employed for the purpose.

Table 3: Prolactin levels in the study groups

Days	Group	n	Mean	SD	Df	P
At first stage of labor	Music therapy intervention (Group 1)	30	55.75	15.23	58	0.657
	Control (Group 2)	30	52.66	15.99		
post-delivery 8 hours (Baseline)	Music therapy intervention (Group 1)	30	68.30	13.12	58	0.011*
	Control (Group 2)	30	75.71	6.57		
72 hours following delivery	Music therapy intervention (Group 1)	30	86.48	5.56	58	0.001**
	Control (Group 2)	30	75.74	8.11		

p- value <0.05 significant

For the sake of explicit clarity, the levels of Prolactin (PRL) in the three scenarios are exhibited in the figures (Fig. 1,2,3) as given below. In all the three, comparison has been made between the music intervention and control groups.

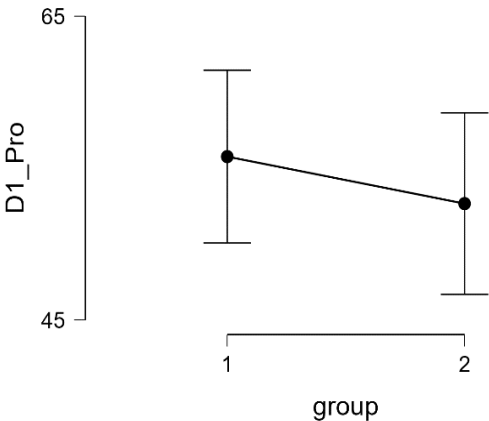


Fig .1. PRL Day 1 (prior to delivery)

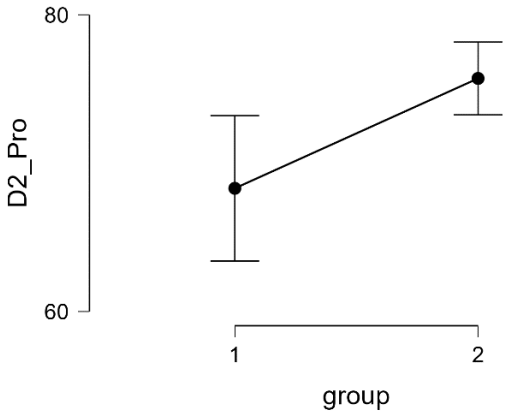


Fig. 2. PRL post-delivery baseline

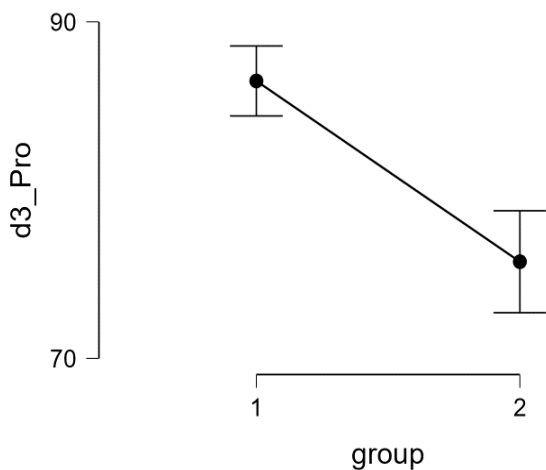


Fig. 3. Levels of prolactin 72 hours post-delivery

Table 4 represents the outcomes, as per the maternal perception enabled on the basis of UNICEF breastfeeding checklist. The checklist has inherent items to check the number of times the infant feeds each day, time recorded in minutes pertaining to each feed, the feeding quality of the infant and the mother's comfort during feeding.

Our results depict the fact that there is statistical significance between post-delivery and 72 hours following delivery where the feeds have increased with the intervention group. This is consistent with the time of each feed. Furthermore, it was also observed that the number of napkins had increased each day. However, the parameter, namely Mother's comfort did not reveal statistical significance

Table 4: UNICEF Breastfeeding checklist – as deployed in the groups

Details	Group	n	Mean	SD	p value
No. of feeds per day _a	1	30	1.27	0.45	0.098
	2	30	1.10	0.30	
No. of feeds per day _b	1	30	1.83	0.37	< .001**
	2	30	1.20	0.40	
No. of feeds per day _c	1	30	1.90	0.30	0.
	2	30	1.53	0.50	
5 mins. Feed time _a	1	30	1.43	0.50	0.104
	2	30	1.23	0.43	
10 mins. Feed time _b	1	30	2.43	0.62	< .001**
	2	30	1.40	0.56	
15 mins. Feed time _c	1	30	3.36	0.66	< .001**
	2	30	1.93	0.74	
Feeding quality _a	1	30	1.73	1.99	0.589
	2	30	1.93	0.25	
Feeding quality _b	1	30	1.10	0.30	.001*
	2	30	1.93	0.25	
Feeding quality _c	1	30	1.00	0.00	.001*
	2	30	1.53	0.50	
No of nappies _a	1	30	1.76	0.43	.001*
	2	30	1.23	0.43	
No of nappies _b	1	30	1.867	0.346	.001*
	2	30	1.367	0.490	
No of nappies _c	1	30	1.900	0.305	.001*
	2	30	1.467	0.507	
breast-feed comfort a	1	30	1.133	0.346	1.000
	2	30	1.133	0.346	
breast_feed comfort b	1	30	1.100	0.305	0.171
	2	30	1.2 33	0.430	
breast_feed comfort c	1	30	1.100	0.403	1.000
	2	30	1.100	0.305	

P<0.05 was considered statistically significant

a. Prior to delivery b. post-delivery baseline c. 72 hours following delivery

DISCUSSION

The study conducted was based on the previous literature that brought out the lacunae in studies establishing the effect of music therapy in biomarkers, within the spectrum of pregnancy and lactation. Major number of studies in the area of pain and anxiety pre and postpartum period of pregnancy.⁹

Range of age: The age of the mother averages at 25 in both groups with the min around 19 to 21 and max falling in the range of 30 and 32. Literature says that the age of the mother has an effect on the maternal health which could relate to issues related to pregnancy and the data is consistent with the evidence that between the ages of 20 and 35 is the right time for childbirth and breastfeeding. The reason being the ability and maturity of the mother to cope in terms of physical strength, emotional ability to handle the pregnancy and the taking care of the child after delivery. This is very consistent with studies conducted with similar populations.¹⁴

The Educational qualification of the mothers were consistent with the age as well. It can be understood the two major slots of education that were majorly found in the data. India is at the verge of moving forward to be claimed a developed country from being a developing country. The educational levels of the mothers were found to be at the graduate levels, bringing to light the aspects of being aware of taking care of themselves, their family and in terms of pregnancy as well. The ability of the mothers to acquire knowledge of how to understand their body and to take care of their child and to make the right decisions in terms of breastfeeding and health of their child, education plays an important role.

Music therapy on Prolactin levels

In the Indian subcontinent a study to record prolactin levels with classical Indian music is probably one the very few. Table three shows the prolactin levels with two baseline values and one post value. The first base line value was to understand the difference in the prolactin at childbirth, while the second baseline was to understand the changes in contrast to the post results of the intervention and control period. The results are quite interesting and at a glance in conjunction with what has been found in previous studies about the levels of prolactin secretion pre and post-delivery. The mean values at the first baseline levels of prolactin in both groups are at 55.756 in the treatment group and 52.661 in the control, which are more or less in the same range. However, the second baselines scores shows an increase in both groups with 68.30 and 75.71 in the treatment and control groups respectively.

The scores change course with the treatment group post 72 hours along with music therapy rendered. The scores being 86.486 and 75.745 in treatment and control groups respectively clearly showing an increase in the treatment group.

The UNICEF breastfeeding checklist

Studies have shown that relaxing the mother can improve the ability to feed and the infant showing comfort in suckling which in turn can have a positive outcome in lactation and breastmilk secretion.¹⁵ The therapeutic aspects of listening to music can have a positive effect on the perception of the mother and the child and that is consistent to the time increase in the time of the feeds by the baby and the quality of feeding as well.¹⁶

Maternal perception of breastmilk secretion is said to be an important objective measure to understand the comfort of feeding.¹⁶ the current study has found with similarity to the previous studies an increase in feeding duration, times of feeding and increase in the use of nappies that signifies the breastfeeding

pattern and increase. The checklist takes into account not only the child's wellbeing, but also the comfort level of the mother in breastfeeding that would be connected to being relaxed to feed the infant.

CONCLUSION

The recent study demonstrated a significant increase in prolactin secretion among participants receiving music therapy, as noted through the UNICEF breastfeeding checklist. This offers a promising avenue for utilizing music therapy in obstetrics and gynecology departments to enhance lactation biomarkers. Notably, this interdisciplinary approach involving credentialed music therapists in tertiary hospitals presents a novel direction for research. However, further investigation is warranted to explore the nuanced mechanisms underlying these changes, including potential contrasting effects of stress on prolactin levels and implications beyond simply increasing breast milk production.

Ethical approval – Yes

Conflict of interest – NIL for all authors

External Financial aid – NIL

References

1. *Section on Breastfeeding. Breastfeeding and the use of human milk. Pediatrics.* 2012 Mar;129(3):e827-41. doi: 10.1542/peds.2011-3552. Epub 2012 Feb 27. PMID: 22371471)
2. (Binns C, Lee M, Low WY. *The Long-Term Public Health Benefits of Breastfeeding. Asia Pac J Public Health.* 2016 Jan;28(1):7-14. doi: 10.1177/1010539515624964. PMID: 26792873
3. Ondrušová S. *Breastfeeding and Bonding: A Surprising Role of Breastfeeding Difficulties. Breastfeed Med.* 2023 Jul;18(7):514-521. doi: 10.1089/bfm.2023.0021. Epub 2023 May 23. PMID: 37219989).
4. Freeman ME, Kanyicska B, Lerant A, Nagy G. *Prolactin: structure, function, and regulation of secretion. Physiol Rev.* 2000;80(4):1523–1631
5. *The Effect of Breast Care on Prolactin Levels in Postpartum Primipara Mothers*
6. Grattan DR. *60 years of neuroendocrinology: the hypothalamo-prolactin axis. Journal of Endocrinology.* 2015 Aug 1;226(2):T101-22.
7. Faron-Górecka, A.; Latocha, K.; Pabian, P.; Kolasa, M.; Sobczyk-Krupiarz, I.; Dziedzicka-Wasylewska, M. *The Involvement of Prolactin in Stress-Related Disorders. Int. J. Environ. Res. Public Health* 2023, 20, 3257. <https://doi.org/10.3390/ijerph20043257>
8. Anna Fodor, Dóra Zelena, "The Effect of Maternal Stress Activation on the Offspring during Lactation in Light of Vasopressin", *The Scientific World Journal*, vol. 2014, Article ID 265394, 15 pages, 2014. <https://doi.org/10.1155/2014/265394>
9. Kosova F, Demirtaş Z, Çalım S, Sapmaz L. *The effect on lactation of back massage performed in the early postpartum period. Journal of Basic and Applied Research in Biomedicine.* 2016;2(2):113-8.
10. Kittithanesuan Y, Chiarakul S, Kaewkungwal J, Poovorawan Y. *Effect of Music on Immediately Postpartum Lactation by Term Mothers after Giving Birth: A Randomized Controlled Trial. Journal of the Medical Association of Thailand.* 2017 Aug 1;100(8).

11. Kohn MM. *Music elements addressing selected physiological breastfeeding challenges: A systematic review (Doctoral dissertation, North-West University).*
12. Simavli S, Gumus I, Kaygusuz I, Yildirim M, Usluogullari B, Kafali H. *Effect of music on labor pain relief, anxiety level and postpartum analgesic requirement: a randomized controlled clinical trial. Gynecologic and obstetric investigation.* 2014 Nov 1;78(4):244-50.
13. Niwayama R, Nishitani S, Takamura T, Shinohara K, Honda S, Miyamura T, Nakao Y, Oishi K, Araki-Nagahashi M. *Oxytocin mediates a calming effect on postpartum mood in primiparous mothers. Breastfeeding Medicine.* 2017 Mar 1;12(2):103-9.
14. Jayamala AK, Lakshmanagowda PB, Pradeep GC, Goturu J. *Impact of music therapy on breast milk secretion in mothers of premature newborns. Journal of clinical and diagnostic research: JCDR.* 2015 Apr;9(4):CC04.
15. Keith DR, Weaver BS, Vogel RL. *The effect of music-based listening interventions on the volume, fat content, and caloric content of breast milk-produced by mothers of premature and critically ill infants. Advances in Neonatal Care.* 2012 Apr 1;12(2):112-9.
16. Widyantari KY, Dasuki D, Daryanti MS. *Effects of Relaxation Therapy Using Music on Breast Milk Production in Postpartum Mothers. Jurnal Kesehatan.* 2020 Jul 1;11(2):093-9.
17. Shukri NM, Wells J, Mukhtar F, Lee MH, Fewtrell M. *Study protocol: An investigation of mother-infant signalling during breastfeeding using a randomised trial to test the effectiveness of breastfeeding relaxation therapy on maternal psychological state, breast milk production and infant behaviour and growth. International breastfeeding journal.* 2017 Dec;12:1-4.